IV. RECOVERY

A. Recovery Strategy

This section describes the approaches and strategies for recovering the southwestern willow flycatcher. These include the geographic approach in the following discussion, followed by the information and rationales used to identify recovery goals.

1. Recovery Units

The breeding range of the flycatcher encompasses all or portions of seven States. Habitat and breeding site characteristics, potential threats, management responsibilities and status, and recovery options vary widely among the breeding sites across this broad geographic area. Because of this broad geographic range and site variation, recovery is approached by dividing the flycatcher's range into six Recovery Units, which are further subdivided into Management Units. This provides a 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. Further, using Recovery and Management Units assures that populations will be well distributed when recovery criteria are met.

Recovery Units are defined based on large watershed and hydrologic units. Advantages of this approach are: (1) there are clear relationships between watershed characteristics and the riparian habitats on which flycatchers depend; (2) current data show that flycatchers move among breeding sites within watersheds more often than between watersheds; (3) watershed boundaries are geographically based and thus can be clearly delineated; (4) standard watershed boundaries have been defined for other purposes (e.g., Hydrologic Unit Codes [HUCs]; Seaber et al. 1994) and can be readily applied within the flycatcher's range; (5) watershed-based management builds on recent trends for agencies to cooperatively approach recovery and general resource planning at ecosystem, watershed, and landscape levels.

The "Hydrologic Units" (Seaber et al. 1994) used in this process depict standardized boundaries of river basin units of the United States. They are widely accepted by Federal, regional, State, and local water resource agencies for use in planning and describing water use and related land use activities, and in geographically organizing hydrologic data. "Accounting Units" are the third of the four levels of classification of hydrologic units. Accounting Units may be a subdivision of an area drained by a river system, a reach of a river and its tributaries in that reach, a closed basin(s), or a group of streams forming a coastal drainage area. In this plan, Accounting Units were aggregated into Recovery Units, except where they are truncated by the northern subspecies boundary.

Recovery Unit boundaries were defined using the following decision process:

1. Wherever possible, Recovery Unit boundaries coincide with watershed boundaries to facilitate management of water and land resources, critical to flycatcher recovery, using watershed principles.

2. Most Recovery Unit boundaries were defined by watershed boundaries at the Accounting Unit level, as defined by USGS and Water Resource Council "Hydrologic Accounting Units."

3. In areas where an Accounting Unit boundary extended beyond the historic or currently known distribution of the flycatcher (e.g., along the northern and eastern edges of the subspecies' range), the subspecies' range (as derived from published and unpublished literature) defined the outer boundary. Approximate subspecies boundaries are represented by smoothed lines. Where subspecies boundaries are known, they are represented by the more detailed Accounting Unit boundaries.

4. In a few cases, flycatcher breeding sites were more closely related (from geographic, ecological, and management perspectives) to nearby sites in a neighboring Recovery or Management Unit than to other sites (typically quite distant) in their own Hydrologic Accounting Unit. In such cases, Recovery or Management Unit boundaries were altered. In one case, a breeding site along the lower Gila River near its confluence with the Colorado River was assigned to the Colorado River Recovery Unit, even though the site is physically located within the Gila Recovery Unit. This decision was made because the site was geographically close to other ecologically similar Colorado River sites, and very distant from all other Gila sites. In another case, a site in the upper Canadian River drainage in New Mexico, part of the Mississippi River system, was included with nearby Sangre de Cristo Mountains sites in the Rio Grande Recovery Unit.

2. Management Units

Within each Recovery Unit, Management Units were delineated following the same general decision process, but were based on watershed or major drainage boundaries at the HUC Cataloging Unit level. Cataloging Units are the fourth and smallest level in the hierarchy of hydrologic units. They may be a geographic area representing part or all of a surface drainage basin, a combination of drainage basins, or a distinct hydrologic feature. Most Management Units identified here are Cataloging Units. In some cases, a single (usually large) Cataloging Unit was divided into multiple Management Units, based on (a) local small-scale drainages, or (b) distinct geographic or man-made features (e.g., confluences, smaller watersheds, dams). In other cases, two Cataloging Units were combined to form one Management Unit: (a) based on the distribution and abundance of occupied flycatcher habitat; (b) where no flycatcher breeding sites exist in one of the Cataloging Units; and (c) where watershed divisions were indistinct. As with Recovery Units, the "outer" boundaries of some Management Units were defined by the flycatcher's range boundaries.

Using this approach, the Service defines six Recovery Units, each with four to seven Management Units (Tables 7 and 8, also Figures 4 through 11. Management actions (e.g., urban development, water withdrawal, grazing, mining) occurring within a particular Recovery Unit or Management Unit, or even outside the subspecies' range, may have an impact farther downstream within a nearby Unit. Managers must understand the watershed properties "upstream" in order to decide whether a particular action may have an impact elsewhere within the range of the subspecies. Conversely, managers throughout and "upstream" of the flycatcher's range must consider the downstream effects their actions may have, within an adjacent Recovery or Management Unit. This necessitates ecosystem and watershed management approaches to evaluating threats to, and developing recovery actions for, the flycatcher.

Table 7. Recovery Units and Management Units for the southwestern willow flycatcher. See also Figures 4 through 10.

Recovery Unit	Management Units
Coastal California	Santa Ynez, Santa Clara, Santa Ana, San Diego
Basin and Mojave	Owens, Kern, Amargosa, Mojave, Salton
Upper Colorado	San Juan, Powell
Lower Colorado	Little Colorado, Middle Colorado, Virgin, Pahranagat, Hoover - Parker, Bill Williams, Parker - Southerly International border
Gila	Upper Gila, San Francisco, Middle Gila/San Pedro, Santa Cruz, Roosevelt, Verde, Hassayampa/Agua Fria, Lower Gila
Rio Grande	San Luis Valley, Upper Rio Grande, Middle Rio Grande, Lower Rio Grande, Texas, Pecos

3. Recovery Unit Descriptions

Following are general descriptions of the location of each Recovery Unit, and selected characteristics of the known flycatcher breeding sites associated with each Unit. Data regarding the number and location of flycatcher territories, and their habitat and management characteristics, represent the best available information *at this time* (See also Figures 5-11and Tables 8-9). Because (a) no Recovery Unit has received 100% survey coverage, (b) flycatcher numbers vary annually at each site, and (c) other site characteristics change over time, the values reported below will change with each survey year and as new information becomes available.

Coastal California

This unit stretches along the coast of southern California from just north of Point Conception south to the Mexico border. There are 186 known flycatcher territories in this Recovery Unit (19% of the rangewide total), distributed along 15 relatively small watersheds, mostly in the southern third of the Recovery Unit. Most breeding sites are small (<5 territories); the largest populations are along the San Luis Rey, Santa Margarita, and Santa Ynez rivers. All territories occur in native or native-dominated habitats; over 60% are on government (Federal, State, and/or local) managed lands.

Basin and Mojave

This unit is comprised of a broad geographic area including the arid interior lands of southern California and a small portion of extreme southwestern Nevada. The 69 known flycatcher territories (7% of the rangewide total) are distributed among five widely-separated drainages. Almost all sites have <5 territories; the largest populations occur in the Kern and Owens river drainages. All territories are in native or native-dominated riparian habitats, and approximately 70% are on privately-owned lands.

Upper Colorado

This unit covers much of the Four-corners area of southwestern Colorado, southern Utah, northeastern Arizona, and northwestern New Mexico. The northern boundary of this unit is delineated by the northern range boundary of the flycatcher. Ecologically, this may be an area of intergradation between the southwestern willow flycatcher and the Great Basin form. Flycatchers are known to breed at only four sites in this unit, with only three flycatcher territories (<1% of the rangewide total) documented as of the most recent surveys. However, these low numbers of known flycatchers are probably a function of the relatively low survey effort in this unit, rather than an accurate reflection of the bird's numbers and distribution. Much willow habitat occurs along drainages throughout this Recovery Unit, and remains to be surveyed. All occupied sites occur in native (willow) habitats between 1,400 to 2,420 m elevation.

Lower Colorado River

This is a geographically large and ecologically diverse Recovery Unit, encompassing the Colorado River and its major tributaries, from Glen Canyon Dam downstream to the Mexico border. Despite its size, the unit includes only 146 known flycatcher territories (15% of the rangewide total), most of which occur away from the mainstem Colorado River. Most sites include <5 territories; the largest populations (most of which are <10 territories) are found on the Bill Williams, Virgin, and Pahranagat drainages. Approximately 69% of territories are found on government-managed lands, and 8% on

Tribal lands. Habitat characteristics range from purely native (including high-elevation and low-elevation willow) to exotic (primarily tamarisk) dominated stands.

Gila

This unit includes the Gila River watershed, from its headwaters in southwestern New Mexico downstream to near the confluence with the Colorado River. The 454 known flycatcher territories (46% of the rangewide total) are distributed primarily on the Gila and lower San Pedro rivers. Many sites are small (<5 territories), but sections of the upper Gila River and lower San Pedro River (including its confluence with the Gila River), and the inflows to Roosevelt Lake, support larger sites. Private lands host 50% of territories, including one of the largest known flycatcher populations, in the Cliff-Gila Valley, New Mexico. Approximately 50% of the territories are on government-managed lands. Although 58% of territories are in native-dominated habitats, flycatchers in this Recovery Unit make extensive use of exotic (77 territories) or exotic-dominated (108 territories) habitats (primarily tamarisk).

Rio Grande

This unit encompasses the Rio Grande watershed from its headwaters in southwestern Colorado downstream to the Pecos River confluence in southwestern Texas, although no flycatcher breeding sites are currently known along the Rio Grande in Texas. Also included is the Pecos River watershed in New Mexico and Texas (where no breeding sites are known) and one site on Coyote Creek, in the upper Canadian River watershed. The majority of the 128 territories (13% of the rangewide total) are found along the Rio Grande itself. Only three sites contain more than 5 territories. Most sites are in native-dominated habitats; exotic-dominated sites include primarily tamarisk or Russian olive. Of 56 nests that have been described in the middle and lower Rio Grande in New Mexico, 43 (77%) used tamarisk as the nest substrate. Government-managed lands account for 63% of the territories in this unit; Tribal lands support an additional 23%.

Table 8. Southwestern willow flycatcher site codes and names, by Recovery Unit. Site codes match those shown in figures 5 - 11.

Recovery Unit	Site Code	Site Name
Coastal California	AHMACA	Agua Hedionda - Macario Canyon
	LFLAFL	Las Flores Creek
	SACIEN	Santa Ana River - Cienega Seca
	SADAYC	Santa Ana River - Day Canyon
	SAJNKS	Santa Ana River - Jenk's Meadow
	SALACA	Santa Ana River - La Cadena to Waterman
	SAMILL	Santa Ana River - Mill Creek
	SAPRAD	Santa Ana River - Prado Basin
	SARTSN	Santa Ana River - Rattlesnake Creek
	SASNTI	Santa Ana River - San Timoteo Creek
	SASNCR	Santa Ana River - Sand Creek
	SAWACR	Santa Ana River - Waterman Creek
	SASTCR	Santa Ana River - Strawberry Creek
	SAMTNH	Santa Ana River - Mtn. Home Village
	SAOAGL	Santa Ana River - Oak Glen
	SAGRTH	Santa Ana River - Greenspot Thicket
	SAFOFA	Santa Ana River - Forest Falls
	SA38BC	Santa Ana River - SR 38 Bridge Cross
	SAMECR	Santa Ana River - Metcalf Creek
	SABANN	Santa Ana River - Banning Canyon
	SAVDCA	Santa Ana River - Van Dusen Canyon
	SADEER	Santa Ana River - Deer Creek
	SABEAR	Santa Ana River - Bear Creek
	SABAUT	San Jacinto River - Bautista Canyon
	SDSADI	San Dieguito River
	SDTICA	Santa Ysabel Creek - Tim's Canyon
	SDBATT	Santa Ysabel Creek- Battlefield
	SLCOUS	San Luis Rey River - Couser Canyon
	SLGUAJ	San Luis Rey River - Guajome Lake
	SLPILG	San Luis Rey River - Pilgrim Creek
	SLSLUP	San Luis Rey River - Upper
	SLAGTI	San Luis Rey River - Agua Tibia
	SLACCR	San Luis Rey River - Agua Caliente
	SLPALA	San Luis Rey River - Pala
	SLI5CO	San Luis Rey River - I5 to College
	SLCI15	San Luis Rey River - College to I15
	SMCAPE	Santa Margarita River - Camp Pendelton
	SMFALL	Santa Margarita River - Fallbrook Creek
	SGLALA	San Diego Creek - Laguna Lakes
	SDELCA	San Diego River - El Capitan
	SDWHPA	San Diego River - William Heise Park
	SOSMCR	San Mateo Creek
	STSAPA	Santa Clara River - Santa Paula
	STSATI	Santa Clara River - Saticoy
	STSFCR	Santa Clara River - San Francisquito Creek
	STUPPI	Santa Clara River - Upper Piru Creek
	STSOCA	Santa Clara River - Soledad Cyn
	STFILL	Santa Clara River - Fillmore Fish Hatchery
	SBSAGA	San Gabriel River
	SUCAGO	San Juan Creek - Canada Gobernadora
	SYBUEL	Santa Ynez River - Buellton

Table 8. Southwestern willow flycatcher site codes and names, by Recovery Unit. Site codes match those shown in figures 5 - 11.

Recovery Unit	Site Code	Site Name
Coastal California, cont.	SYGIBR	Santa Ynez River - Gibralter
	SYVAND	Santa Ynez River - Vandenberg AFB
	SWCUYA	Sweetwater Creek - Cuyamaca Lake
	SWSWRE	Sweetwater Creek - Sweetwater Reservoir
	TEAGUA	Temecula Creek - Aguanga
	TEOAKG	Temecula Creek - Oak Grove
Basin & Mojave	AMAMCS	Ash Meadows National Wildlife Refuge - Carson Slough
	AMAMPR	Ash Meadows National Wildlife Refuge - Point of Rocks
	MOLBRS	Holcomb Creek - Little Bear
	KECANE	Kern River - Canebrake Preserve
	KEKERN	Kern River - Kern River Preserve
	MOMOFR	Mojave River -Mojave Forks
	MOORGR	Mojave River - Oro Grande
	MOUPNA	Mojave River - Upper Narrows
	MOVICT	Mojave River - Victorville I-15
	OWBIGP	Owen's River - Big Pine
	OWCHBL	Owen's River - Chalk Bluff to 5 Bridges
	OWHWY6	Owen's River - Hwy 6
	OWLPCR	Owen's River - Lone Pine Creek
	OWPOLE	Owen's River - Poleta Road
	SESAFE	San Felipe Creek - San Felipe
Upper Colorado	SJSHIP	San Juan River - Shiprock
	SJWICR	San Juan River - Williams Creek Reservoir
	SJBAYF	San Juan River - Bayfield
	SJEAFO	San Juan River - East Fork (Piano Creek)
Lower Colorado	BSLOBS	Big Sandy River, Lower
	BSUS93	Big Sandy River - US 93
	BWALMO	Bill Williams River - Alamo Lake
	BWBUCK	Bill Williams River - Buckskin
	BWDEMA	Bill Williams River - Delta Marsh Edge
	BWGEMI	Bill Williams River - Gemini
	BWMONK	Bill Williams River - Monkey's Head
	COBHSL	Colorado River - Big Hole Slough
	COADOB	Colorado River - Adobe Lake
	COBLAN	Colorado River - Blankenship
	COBRLA	Colorado River - BR Lagoon
	COCIBO	Colorado River - Cibola Lake
	COCLLA	Colorado River - Clear Lake
	CODRAP	Colorado River - Draper Lake
	COEHRE	Colorado River - Ehrenberg
	COFERG	Colorado River - Ferguson Lake
	COGILA	Colorado River - Gila Confluence
	COHAVA	Colorado River - Lake Havasu - Neptune
	COHEAD	Colorado River - Headgate Dam
	COLAME	Colorado River - Lake Mead Delta
	COMITT	Colorado River - Mittry Lake
	COPICA	Colorado River - Picacho East (Is. Lk)
	COTAYL	Colorado River - Taylor Lake

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Recovery Unit	Site Code	Site Name
Lower Colorado, cont.	COTOPO	Colorado River - Topock Marsh
	COTRAM	Colorado River - Trampas Wash
	COWACO	Colorado River - Waterwheel Cove
	COWALK	Colorado River - Walker Lake
	COG50L	Colorado River - Grand Canyon RM 50-51 L
	COG65L	Colorado River - Grand Canyon RM 65.3 L
	COG71L	Colorado River - Grand Canyon RM 71 L
	CO246L	Colorado River - Grand Canyon RM 246 L
	CO257R	Colorado River - Grand Canyon RM 257.5 - 257.0 R
	CO259R	Colorado River - Grand Canyon RM 259 R
	CO259L	Colorado River - Grand Canyon RM 259.5 L
	CO263L	Colorado River - Grand Canyon RM 263-262
	CO265L	Colorado River - Grand Canyon RM 265-263L
	CO266L	Colorado River - Grand Canyon RM 266 L
	CO268R	Colorado River - Grand Canyon RM 268-264 R
	CO268L	Colorado River - Grand Canyon RM 268-265 L
	CO270L	Colorado River - Grand Canyon RM 270-268 L
	CO272R	Colorado River - Grand Canyon RM 272-268 R
	CO273L	Colorado River - Grand Canyon RM 273-270 L
	CO277L	Colorado River - Grand Canyon RM 277-273 L
	CO277R	Colorado River - Grand Canyon RM 277-274 R
	GIFOWA	Gila River - Fortuna Wash
	LCBLAC	Zuni/Black Rock
	LCNUTR	Zuni/Nutria Diversion Reservoir
	LCGREE	Little Colorado - Greer River Reservoir
	LCGRTO	Little Colorado - Greer Township
	MVMVO1	Meadow Valley Wash - Site 1
	PAKEYP	Key Pittman Wildlife Management Area
	PAPAHR	Pahranagat Lake National Wildlife Refuge
	PANRRA	Pahranagat River - North River Ranch
	SNSMLO	Santa Maria River, Lower
	VILAME	Virgin River Delta - Lake Mead
	VILITT	Virgin River - Littlefield
	VIGEOR	Virgin River - St. George
	VIMOME	Virgin River - Mormon Mesa
	VIMURI	Muddy River Delta - Overton Wildlife Area
	VISEEG	Virgin River - Seegmiller
Gila	GIBIRD	Gila River - Bird Area
	GIDUNC	Gila River - Duncan
	GIFORT	Gila River - Fort West Ditch
	GIFOTO	Gila River - Fort Thomas, Geronimo
	GIGN04	Gila River - GRN004
	GIGN09	Gila River - GRN009
	GIGN10	Gila River - GRN010
	GIGN11	Gila River - GRN011
	GIGN18	Gila River - GRN018
	GIGN20	Gila River - GRN020 (Kelvin Bridge)
	GIGN33	Gila River - GRN033
	GIGI31	Gila River - GRSN031
	GIGS07	Gila River - GRS007

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Recovery Unit	Site Code	Site Name
Gila, cont.	GIGS10	Gila River - GRS010
	GIGS11	Gila River - GRS011
	GIGS12	Gila River - GRS012
	GIGS13	Gila River - GRS013
	GIGS15	Gila River - GRS015
	GIGS18	Gila River - GRS018
	GIKRNY	Gila River - Kearny Sewage Ponds
	GILBCO	Gila River - Lower Box, Cottonwood
	GILOBX	Gila River - Lower Box
	GILBMC	Gila River - Lower Box; Main Canyon
	GIFTBR	Gila River - Fort Thomas Bridge
	GIFTMS	Gila River - Fort Thomas MS
	GIPIBR	Gila River - Pima Bridge
	GIPIEA	Gila River - Pima East
	GIREDR	Gila River - Redrock
	GISAJO	Gila River - San Jose
	GISANC	Gila River - Sanchez Road
	GISMIT	Gila River - Smithville Canal
	GISONW	Gila River - Solomon NW
	GISPRG	Gila River - Dripping Springs Wash
	GIUBAR	Gila River - U Bar Ranch
	HAHASS	Hassayampa River Preserve
	SFALPI	San Francisco Creek - Alpine Horse Pasture
	SFH180	San Fransisco River - Hwy 180
	SPAPPO	San Pedro River - Apache Powder Rd
	SPARAV	San Pedro River - Aravaipa Cr Confluence
	SPARIN	San Pedro River - Aravaipa Inflow North
	SPCBCR	San Pedro River - CB Crossing
	SPCOLA	San Pedro River - Cooks Lake
	SPDUVI	San Pedro River - Dudleyville Crossing
	SPINHI	San Pedro River - Indian Hills
	SPMAHI	San Pedro River - Malpais Hill
	SPPZRA	San Pedro River - PZ Ranch
	SPSR90	San Pedro River - SR 90
	SPWHEA	San Pedro River - Wheatfields
	SPARIS	San Pedro River - Aravaipa Inflow South
	SPBICI	San Pedro River - Bingham Cienega
	SPCATA	San Pedro River - Catalina Wash
	SZCICR	Santa Cruz River - Cienega Creek
	SRCOTT	Salt River - Cottonwood Acres I
	SRSALT	Salt River Inflow - Roosevelt Lake
	SRLAKE	Salt River Inflow - Roosevelt Lake; Lakeshore
	SRSCHN	Salt River - School House Point North
	SRSCHS	Salt River - School House Point South
	TOTONT	Tonto Creek Inflow - Roosevelt Lake
	VECAVE	Verde River - Camp Verde
	VEISTE	Verde River - Ister Flat
	VETAVA	Verde River - Tavasci Marsh
	VETUZI	Verde River - Tuzigoot Bridge

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Recovery Unit	Site Code	Site Name
Rio Grande	CHOJOS	Los Ojos Highway 95 Bridge
	CHPARK	Parkview Fish Hatch
	CNCOYO	Coyote Creek
	CNGUBR	Coyote Creek - Guadalupita Bridge
	CNGUNO	Coyote Creek - Guadalupita North
	RIALAM	Alamosa National Wildlife. Refuge
	RIAZUL	Tierra Azul (Rio Grande del Rancho)
	RIBLUE	Bluewater Creek
	RIBOSQ	Rio Grande - Bosque del Apache
	RIELGU	Rio Grande - Velarde-El Guique
	RIGARC	Rio Grande - Velarde-Garcia Acequia
	RIISLE	Rio Grande - Isleta
	RILACA	Rio Grande - Velarde-La Canova Acequia
	RILARI	Rio Grande - Velarde-La Rinconada
	RILAJO	Rio Grande - La Joya
	RIMCSP	McIntire Springs (Conejos River)
	RIORIL	Rio Grande - Orilla Verde
	RIRADI	Rio Grande - Radium Springs
	RISAJU	Rio Grande - San Juan Pueblo Bridge
	RISAMA	Rio Grande - San Marcial
	RISELD	Rio Grande - Selden Canyon
	RISEVL	Rio Grande - Sevilleta National Wildlife Refuge
	RITAOS	Rio Grande - Taos Junction Bridge
Outside currently known range of *E.t. extimus*		
	COPLAT	Colorado River - Plateau Creek
	COVEGA	Colorado River - Vega Reservoir
	COSILT	Colorado River - Silt
	DOBEAV	Dolores River - Beaver Creek
	DOCLEA	Dolores River - Clear Creek
	FRFILA	Fremont River - Fish Lake
	FRMMRE	Fremont River - Mill Meadow Reservoir
	GUESCA	Gunnison River - Escalante State Wildlife Area
	GUFRUI	Gunnison River - Fruit Growers Reservoir
	PGPACR	Panguitch Creek - Panguitch Creek
	PGPALA	Panguitch Creek - Panguitch Lake
	PRFISH	Price River - Fish Creek (above Scofield Reservoir)
	SVSWCR	Sevier River - Swamp Creek - Bryce Canyon National Park
	SVYELL	Sevier River - Yellow Creek - Bryce Canyon National Park

4. Population Viability Analysis

A population viability analysis (PVA), conducted to provide guidance for setting recovery objectives, was composed of two parts: a demographic analysis (Noon and Farnsworth 2000) and an incidence function analysis (Lamberson et al. 2000). Following is a brief summary of the most relevant PVA results.

Demographic analysis

The demographic analysis identifies the life history aspect (fecundity, juvenile survival, adult survival) that has the greatest effect on population growth. The model concluded that management focused on increasing fecundity (number of fledglings per female), followed closely by first year survival, will have the most influence on increasing the population (Noon and Farnsworth 2000). Analysis was based primarily on data from the Kern River in California (Whitfield unpubl. data, 1989–1999), with comparisons from some Arizona populations (Paxton et al. 1997, Netter et al. 1998). The demographic analysis was limited by the unavailability of long-term reproductive data at most sites, therefore results may not be applicable across the entire range of the bird.

Incidence Function Analysis

The incidence function analysis (Hanski 1994, Lamberson et al. 2000), which estimates population persistence over time within an existing network of occupied willow flycatcher sites, was based on data from 143 sites surveyed between 1994 - 1998 (USGS, unpubl. data). Separate models were developed for each of the six Recovery Units, assuming each may function as a metapopulation. A metapopulation is a group of spatially disjunct local willow flycatcher populations connected to each other by immigration and emigration. Results showed that the status of the southwestern willow flycatcher varies geographically. Metapopulations are most stable where many connected sites and/or large populations exist (Coastal California, Gila, Rio Grande Recovery Units). The model results predict greatest stability when sites can be established <15 km apart, each with 10 - 25 territories. Sites <15 km apart assures a high likelihood of connectivity. Once a threshold of about 25 territories/site is reached, the benefit of increasing the number of birds diminishes. Instead, metapopulation persistence (stability) is more likely to increase by adding more sites rather than adding more territories to existing sites. In addition to maximizing the colonization potential of sites within the metapopulations, this risk-spreading strategy reduces the likelihood that catastrophic events (e.g. fire, flood, disease) will negatively impact all sites.

In establishing population targets for recovery, the Technical Subgroup strove to identify a distribution and abundance of flycatchers that would minimize the distance between populations, connect isolated sites to other breeding populations, and increase population sizes to achieve metapopulation stability. The goal of the Recovery Plan is to assure long-term persistence of the species throughout its range, rather than maximize the number of birds or achieve historical

pre-European settlement population levels.

Incidence Function Model Limitations

Although the incidence function model provided some insight into the current status of each metapopulation, it has some limitations. The main limitations are summarized below:

1) If the maximum number of territories detected in any one year between 1994 - 1998 does not truly represent each site in a dynamic colonization-extinction equilibrium, the model results will overestimate or underestimate occupancy rates. Equilibrium at many sites is unknown, because the number of territories varies annually.

2) Differences in how sites are designated can make a difference in model output. For example, what is considered a single large site in one drainage might be treated as several small sites at another. The model calculates greater enhancement potential (increase in population) for small sites near each other than for one large site of the same area and the same number of birds.

3) Insufficient survey effort or absent data may be responsible for low occupancy rates for some metapopulations (Basin and Mojave, Upper Colorado, Lower Colorado). Additional data have been collected at new and existing sites since the population viability analysis was conducted.

4) The incidence function analysis does not include catastrophic events. However, they were simulated in separate analyses by increasing and decreasing number of territories in all or a subset of sites within a metapopulation.

5) The model can underestimate the enhancement and colonization potential of a site because it assumes all sites are known and does not allow for colonization of new areas. New areas continue to be colonized or discovered.

6) It is unknown whether parameters derived from a subset of populations (Gila and Rio Grande Recovery Units) to calculate constants relating extinction and colonization probabilities to patch size and migration rates are applicable rangewide.

7) A rangewide analysis, pooling all data, was not conducted because of the absence of evidence that flycatchers belong to a single large metapopulation.

Therefore, the model should not be used to:

1) estimate the number of territories needed for population persistence. Instead, model recommendations for distance between sites and number of birds/site were used to develop the number of territories needed for recovery.

2) make predictions about persistence for more than five years into the future, especially if there are significant changes in pattern of site occupancy, site area, or costs to dispersal among sites.

3) predict extinction and recolonization rates of individual sites. Annual variation in number of territories/site, site inconsistencies in site designations, and inability of the model to allow for colonization of new sites limit the model's ability to predict site-specific events. Instead, model results were assessed at the metapopulation level.

5. Approach to Identifying Recovery Criteria

Within the Recovery Units and Management Units, the next issues to address are how many flycatchers are needed, and in what geographical distribution, to achieve recovery. The following text summarizes the USFWS' approach in determining recovery criteria (goals).

Rationale for Downlisting Criteria

The recovery criteria identified below and in Table 9 were developed based on information in published and unpublished sources including the population viability analysis (Lamberson et al. 2000, Noon and Farnsworth 2000), and the Technical Subgroup's collective knowledge and information relating to: distribution of current and potential flycatcher nesting areas; flycatcher dispersal and settlement patterns; and information on genetic variation and exchange.

The central points used in developing recovery criteria for downlisting were:

1. Territory is the unit of measure. Southwestern willow flycatchers are a territorial species, where males select and defend exclusive breeding territories in which they attempt to attract a mate and breed. Because it can be difficult to determine whether a particular male is paired with a female, the Service selected "territory" as the unit of measure for recovery goals (rather than "pairs"), recognizing that overall one territory generally equates to two flycatchers (one male and one female).

2. Populations should be distributed throughout the bird's range. Southwestern willow flycatcher populations should be geographically distributed throughout the bird's range in order to provide for sustainable metapopulations, minimize risk of simultaneous catastrophic loss, and avoid genetic isolation of breeding groups.

3. Populations should be distributed close enough to each other to allow for movement. Flycatcher populations should be spaced so that there is a likelihood of movement of individuals between populations, providing for genetic exchange and recolonization of other sites in the same and other Recovery Units. Therefore, breeding populations should be distributed among different Management Units within a Recovery Unit.

4. Large populations contribute most to metapopulation stability. Large populations (>10 territories), centrally located, contribute most to metapopulation stability, especially if other breeding populations are nearby. Such populations persist longer than small ones, and produce more dispersers emigrating to other populations or

colonizing new areas.

5. Smaller populations can contribute to metapopulation stability when arrayed in a matrix with high connectivity. Within a Management Unit or portion thereof, a matrix of smaller populations may provide as much or more stability than a single isolated population with the same number of territories because of the potential to disperse colonizers throughout the network of sites.

6. As the population of a site increases, the potential to disperse and colonize increases. As number of territories in a population increases, the potential to colonize nearby areas also increases, although in a non-linear fashion. Based on preliminary PVA data, the rate of increase in colonization potential (likelihood that birds will emigrate to new or existing sites) as population size increases is greatest between 4-10 territories, is less steep above 10 territories, and flattens out completely above 25 territories. Thus, numerically small increases in small populations may have a disproportionately large effect on colonization potential, and may be more beneficial than adding the same small number of territories to a large site, particularly when sites are close together. Therefore, 25 territories is used as a minimum recovery goal for each Management Unit. Where more than the minimum number (25) of territories is desired (because of habitat potential, isolation, and/or contribution to metapopulation stability), goals are set in multiples of 25. Spatial distribution within some of these Management Units is not specified, but it is likely that flycatchers will occupy more than one site within a Management Unit. Therefore, a Management Unit with a recovery goal of 25 territories could be distributed as one or several sites with varying distances between sites. Twenty-five territories distributed among several sites within close proximity to one another may function ecologically as one large site.

7. Increase/decrease in one population affects other populations. In functioning metapopulations, increases or decreases in one population may affect other populations. Thus, it is important to meet and maintain recovery objectives in each Recovery and Management Unit, each of which may influence adjacent units.

8. Some Recovery/Management Units have stable metapopulations; others do not. Some Recovery Units and/or Management Units currently have large and well distributed populations such that, with continued appropriate management, recovery goals for these units can be met and maintained. Other units require large increases in the number and distribution of breeding populations.

9. Maintaining/augmenting existing populations is a greater priority than allowing loss and replacement elsewhere. Maintaining and augmenting existing breeding populations is a faster, easier, and more reliable way to achieve and maintain population goals than to allow loss of existing populations with the hopes of replacement elsewhere. Thus, maintenance and protection of existing breeding populations is a priority.

10. Establishing habitat close to existing breeding sites increases the chance of colonization.

11. Additional survey effort is critically needed in some Management Units. Recent survey data are limited

or absent in some parts of the flycatcher's range, even regarding the presence of suitable flycatcher breeding habitat. Therefore, additional survey effort is most critically needed in Recovery Units and Management Units where recent survey efforts have been minimal or absent (e.g., portions of the Basin and Mojave, Upper Colorado, and Lower Colorado Recovery Units). These surveys will determine if flycatchers and/or breeding habitat are present, and to what degree they may be contributing to local populations and/or metapopulation stability.

In developing specific downlisting criteria, a methodology was sought that would produce an increase in the total number of individuals and of occupied sites sufficient to minimize the chances of extinction over the course of several centuries or more. Although there is a great deal of uncertainty in any assessment of population stability, there is general agreement among ecologists and conservation biologists that large populations are more secure than small ones. Just how large a population has to be to have a minimal chance of extinction over a long time period depends on many factors but those that have a size of 2,000 to 5,000 individuals are generally considered secure if their habitat is protected and obvious threats are removed (Haig et al. 1993, Pulliam and Dunning 1994, Lande 1995, Hanski et al. 1996, Wiens 1996). Populations in this size range are unlikely to be affected seriously, in the short-term at least (several thousand years), by random events such as genetic drift and demographic stochasticity (consecutive years with poor reproduction, heavily skewed sex ratios, etc.).

A population of 2,000 to 5,000 can still be devastated or even extinguished by catastrophic events, but for populations distributed over a large range, such as the flycatcher's, no single natural catastrophe or even several co-occurring natural catastrophes would likely cause the extinction of the entire taxon. Each flycatcher Recovery Unit occupies so large an area that catastrophes are unlikely to impact even all of the flycatchers within a unit. Nevertheless, catastrophes, whose effects are nearly impossible to model, could affect most individuals in Recovery Units where large proportions of territories are in the same Management Unit, river reach, or site.

Given these various uncertainties, the Technical Subgroup decided the best course was to determine goals for both the number of territories and the number of separate populations in each Recovery Unit. Rather than assume that a minimum overall population of X number of individuals is needed (based on conservation biology theory), the Technical Subgroup considered every Management Unit where flycatchers now occur, or could potentially occur given feasible management actions, and developed population targets (based on a minimum of, and multiples of, 25 territories). Population goals differed among some Management Units. Targets for Management Units centrally located within a particular Recovery Unit were sometimes higher than for less centrally located units. Goals were set higher for some Management Units with a greater potential for development or improvement of flycatcher habitat than for those with limited potential. If a Management Unit currently supports more than 25 territories, the goal for that unit was set *no lower than the current population level.* Thus, the recovery goals maintain *at least* the current number of territories in each Management Unit (and hence, each Recovery Unit).

It was assumed, a priori, that any substantial increase in overall flycatcher numbers projected by this method would result in a substantially decreased probability of extinction (given current data on persistence of flycatcher populations and current theory on metapopulations). With this method, the Technical Subgroup arrived at an overall target population of about 1,950 territories, which is an approximate doubling of the roughly 990 territories now documented to exist. These 1,950 territories infer a population size of about 3,900 individuals, assuming that most territories include monogamous pairs. Thus the current recovery goal of 1,950 territories is within the theoretical "secure range" of a population size of 2,000 to 5,000 individuals (approximately 1,000 to 2,500 territories).

B. Recovery Objectives and Criteria

1. Recovery Objectives

The overall recovery objective for the flycatcher is to attain a population level and an amount and distribution of habitat sufficient to provide for the long-term persistence of metapopulations, even in the face of local losses (e.g., extirpation). This requires that the threats that led to listing the flycatcher as an endangered species are ameliorated. The specific objectives are to recover the southwestern willow flycatcher to the point that it warrants reclassification to "threatened" status, and then further to the point where it is removed from the list of threatened and endangered species. The estimated date for downlisting is 2020. The estimated date for delisting is 2030.

2. Recovery Criteria

The recovery criteria (or goals) to achieve the above objectives are presented in the following discussion. These recovery criteria will be re-evaluated at least once every 5 years, and may be modified in the future in light of new scientific or technical information.

Reclassification: from Endangered to Threatened

There are two alternative sets of criteria that will allow for reclassifying the southwestern willow flycatcher from endangered to threatened. Neither set of criteria equate to achieving approximate historical, pre-European settlement population levels. Reclassification can occur if either set of criteria are met.

Criteria set A: Increase the total known population to a minimum of 1,950 territories (equating to approximately 3,900 individuals), geographically distributed to allow proper functioning as metapopulations, so that the flycatcher is no longer in danger of extinction. For reclassification to threatened status, these prescribed numbers and distributions must be reached

as a minimum, *and maintained over a five year period*. Specific reclassification/downlisting criteria for each Recovery and Management Unit are presented in Table 9.

Each Management Unit must meet and hold *at least 80%* of its minimum population target, yet each Recovery Unit must at least meet its goal, as listed in Table 9. Therefore, if one Management Unit targeted for 50 territories reaches 40 territories, its shortage of 10 territories may be offset by a overage of 10 territories in another Management Unit *within that same Recovery Unit*. This flexibility is based on the fact the recovery goals specified for each Management Unit are estimations of the number needed, and that small departures from those specific goals are not biologically significant and therefore will not likely imperil the flycatcher- *as long as the overall Recovery Unit and rangewide goals are met.*

Criteria set B: Increase the total known population to a minimum of 1,500 territories (equating to approximately 3,000 individuals), geographically distributed among Management Units and Recovery Units, so that the flycatcher is no longer in danger of extinction. For reclassification to threatened status, these prescribed numbers and distributions must be reached *as a minimum*, *and maintained over a three year period*, and the habitats supporting these flycatchers must be protected from threats and loss.

Each Management Unit must meet and hold *at least 50%* of its minimum population target, and each Recovery Unit must meet at least 75% of its goal, listed in Table 9. For Recovery Units to attain 75% of their population goal, some Management Units within each Recovery Unit will need to exceed 50% of their goals. Similarly, in order to meet the rangewide goal of 1,500 territories, some Recovery Units will need to exceed 75% of their goals.

The habitats supporting these flycatchers must be provided sufficient protection from threats to assure maintenance of these habitats over time. Protection must be assured into the foreseeable future through development and implementation of conservation management agreements. Conservation management agreements may take many forms, including but not limited to the public land management planning process for Federal lands, habitat conservation plans (under Section 10 of the ESA), conservation easements, land acquisition agreements for private lands, and inter-governmental conservation agreements with Tribes. USFWS must be satisfied that the agreements provide adequate protection and/or enhancement of habitat.

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By providing two sets of criteria, the USFWS recognizes the need to allow flexibility in achieving and maintaining recovery goals, to accommodate management logistics, differing jurisdictions, natural stochastic events, and local variances in habitat quality and potential. Both criteria provide for substantial progress towards attaining a population level and an amount and distribution of habitat sufficient to provide for the long-term persistence of metapopulations. This flexibility is most effectively achieved at the Management Unit level. Therefore, numerical population goals for a particular Management Unit can be attained anywhere within that unit. This flexibility is intended to allow local managers to apply their knowledge to meet goals, possibly in areas the Service cannot identify and/or may not foresee. For example, local managers may know of areas that are logistically and/or biologically easier to recover than others. Managers should not focus recovery efforts only at the sites identified; for example, tributary stream reaches can and should be considered for recovery efforts. This is why the goals are generally specified only down to the Management Unit level. However, the Technical Subgroup highlighted some specific reaches where potential or suitable habitat exist, and/or where greater metapopulation stability can be achieved by establishing or enhancing populations in these areas (Table 10).

Note that, under either criteria set, any additional flycatchers above the minimum needed within a Recovery or Management Unit are not "excess", and are deserving of (and require) the full protection afforded to all southwestern willow flycatchers until the flycatcher is delisted. Population levels above the minimum targets can provide for an important hedge against local catastrophic events, and are potential colonizers to other units.

Removal from the Federal Endangered Species List

The following criteria must be achieved to remove the southwestern willow flycatcher from the Federal list of threatened and endangered species:

1. Meet and maintain, at a minimum, the population levels and geographic distribution specified under reclassification to threatened criteria set A; increase the total known population to a minimum of 1,950 territories (equating to approximately 3,900 individuals), geographically distributed to allow proper functioning as metapopulations, as presented in Table 9.

2. Provide protection from threats and create/secure sufficient habitat to assure maintenance of these populations and/or habitats over time. The sites containing flycatcher breeding groups, in sufficient number and distribution to warrant downlisting, must be protected into the foreseeable future through development and implementation of conservation management agreements. Conservation management agreements may take many forms, including but not limited to the public land management planning process for Federal lands, habitat conservation plans (under Section 10 of the ESA), conservation easements, and land acquisition agreements for private lands, and inter-governmental conservation agreements with Tribes. The flycatcher may be considered for

delisting when (a) the USFWS has confirmed that the agreements have been created and executed in such a way as to achieve their role in flycatcher recovery, and (b) the individual agreements for all areas within all Management Units (public, private, and Tribal) that are critical to metapopulation stability (including suitable, unoccupied habitat) have demonstrated their effectiveness for a period of at least 5 years prior to delisting.

The current distribution of flycatcher breeding populations includes public, private, and Tribal lands in at least six of the seven States comprising its historical range. Given the dynamic nature of Southwestern riverine systems, where ecological processes vary both spatially and temporally, coupled with the complex nature of land management and ownership along river corridors, a recovery strategy that relies solely on public lands is impractical and improbable. To achieve and maintain recovery of this bird, it is likely that a network of conservation areas on Federal, State, Tribal, and other public and private lands will be necessary. To ensure that the population and habitat enhancement achieved for downlisting persist over the long-term, and to preclude the need for future re-listing of the flycatcher under the ESA, the management agreements must address the following:

1. Minimize the major stressors to the flycatcher and its habitat (including but not limited to floodplain and watershed management, groundwater and surface water management, and livestock management);

2. Ensure that natural ecological processes and/or active human manipulation needed to develop and maintain suitable habitat prevail in areas critical to achieving metapopulation stability; and,

3. The amount of suitable breeding habitat available within each Management Unit is at least double the amount required to support the target number of flycatchers described under reclassification to threatened criteria set A (page 78) and presented in Table 9.

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. Furthermore, as the vegetation at sites matures, it can lose the structural characteristics that make it suitable for breeding flycatchers. These and other factors can destroy or degrade breeding sites, such that one cannot expect any given breeding site to remain suitable in perpetuity. Thus, the Service believes that long-term persistence of flycatcher populations cannot be assured by protecting only those habitats in which flycatchers currently breed. Rather, it is necessary to have additional suitable habitat available to which flycatchers, displaced by such habitat loss or change, can readily move.

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 southwestern willow

flycatcher population sizes presented in published and unpublished literature (Appendix D), a patch has an average of 1.1 (± 0.1 SE) ha 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) 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 (50 territories x 1.1 ha 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 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 habitat conditions at a site may be maintained over time through natural processes and/or active human manipulation.

Habitat objectives are incorporated in 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 habitat patches is skewed heavily toward small patches and small population sizes (see Section II. C. 3; Patch Size and Shape); this situation inhibits recovery. Following the central points identified under the Rationale for Downlisting Criteria (above), 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 acres) (see Section II. C. 3; Patch Size and Shape). Alternatively, along the lower San Pedro River and nearby Gila River confluence, smaller, occupied habitat patches with an average nearest-neighbor distance of approximately 1.5 km (USGS unpubl. data; Appendix D) show substantial between-patch movement by flycatchers (English et al. 1999, Luff et al. 2000) and function effectively as a single site. Thus, to promote recovery land managers and other conservation entities should strive to protect larger habitat patches (on the order of 25 ha) within management units and/or to minimize the distance between smaller occupied patches so that they function ecologically as a larger patch.

Measures To Minimize Take and Offset Impacts

To ensure achievement of recovery criteria, the following guidelines apply to designing projects, while minimizing impacts to the southwestern willow flycatcher.

1) Research, monitoring and survey projects should be used to evaluate the efficacy of measures intended to minimize or reduce impacts from project-related effects, but should not be used to offset actions that may result in loss, fragmentation, or modification of designated critical habitat, or areas not officially designated but that contain occupied habitat, or potential habitat.

2) Cowbird trapping should not be used to offset actions that may result in loss, fragmentation, or modification of designated critical habitat, occupied habitat, or potential habitat. Rather, cowbird control should be implemented at a site only after data collection shows that at least 20-30% of flycatcher nests are parasitized for two or more successive years as described in Section IV.E.; Narrative Outline for Recovery Actions.

3) All efforts should focus on preventing loss of flycatcher habitat. However, where occupied, unoccupied suitable, or unoccupied potential habitat is to be lost, modified, fragmented, or otherwise degraded, habitat should be replaced, permanently protected and managed within the same Management Unit. All efforts should strive to acquire, protect, restore and manage compensation habitat prior to project initiation. Recent research explores adequate replacement of both the land area and functional values of riparian and other wetland systems (National Research Council 2001, Wilson and Mitsch 1996, Briggs et al. 1994). Field data collected at flycatcher sites show that currently-suitable habitat patches on free flowing rivers occupy up to 20% of the floodplain in any given year and change in spatial location over time (Stromberg et al, 1997; Hatten and Paradzick, in review). Given the flycatcher's endangered status and typically small population sizes, there is a high degree of uncertainty as to whether flycatchers will colonize compensation habitat. There also is uncertainty regarding the comparability of ecological values between affected lands and compensation lands and regarding the long-term success of compensation lands. Given these uncertainties and the available data, specific analyses must be conducted on a project-by-project basis to determine the amount of compensation habitat required to approach no net loss. For instance, a relatively high compensation ratio may be required if the affected habitat has a higher than average population density; if the habitat has been occupied consecutively over the long-term; if the habitat contains a large population [>25 territories]; or if compensation lands are not proximate to affected habitat or metapopulation.

4) Permanent habitat loss, modification, or fragmentation resulting from agency actions should be offset with habitat that is permanently protected, including adequate funding to ensure the habitat is managed permanently for the protection of the flycatcher.

5) Habitat loss, modification, or fragmentation on Federal lands should not be offset with protection of Federal lands that would otherwise qualify for protection if the standards set forth in the Recovery Plan or other agency guidance were applied to those lands.

6) Areas slated for protection as a means of offsetting impacts should be identified using existing documents that have evaluated habitat conservation priorities rangewide (e.g., USBR 1999c); and should be conserved based on the following priorities: (1) occupied, unprotected habitat; (2) unoccupied, suitable habitat that is currently unprotected; (3) unprotected, potential habitat.

7) Modifying or converting occupied habitat dominated by exotic vegetation to habitat dominated by native vegetation does not constitute reduction or minimization of effects.

8) Occupied habitat is considered occupied year-round for project-related effects that degrade habitat quality.

Table 9. Recovery Criteria, by Recovery and Management Units: Minimum number of southwestern willow flycatcher territories needed to achieve reclassification to Threatened. Values for current number of known territories are based on the most recent available survey data for all breeding sites known to be occupied for at least one year between 1993 and 2001.

Recovery Unit	Management Unit	Current Number of Known Territories	Minimum Number of Territories for Reclassification
Coastal California	Santa Ynez	33	75
	Santa Clara	13	25
	Santa Ana	39	50
	San Diego	101	125
	Recovery Unit Total	**186**	**275**
Basin & Mojave	Owens	28	50
	Kern	23	75
	Amargosa	3	25
	Mojave	13	25
	Salton	2	25
	Recovery Unit Total	**69**	**200**
Upper Colorado	San Juan	3	25
	Powell	0	25
	Recovery Unit Total	**3**	**50**
Lower Colorado	Little Colorado	6	50
	Middle Colorado	16	25
	Virgin	40	100
	Pahranagat	34	50
	Hoover - Parker	15	50
	Bill Williams	32	100
	Parker - Southerly International Boundary	3	150
	Recovery Unit Total	**146**	**525**

Table 9, Continued. Recovery Criteria, by Recovery and Management Units: Minimum number of southwestern willow flycatcher territories needed to achieve reclassification to Threatened. Values for current number of known territories are based on the most recent available survey data for all breeding sites known to be occupied for at least one year between 1993 and 2001.

Recovery Unit	Management Unit	Current Number of Known Territories	Minimum Number of Territories for Reclassification
Gila	Upper Gila	187	325
	San Francisco	3	25
	Middle Gila/San Pedro	120	150
	Santa Cruz	1	25
	Roosevelt[1]	140	50
	Verde	3	50
	Hassayampa/Agua Fria	0	25
	Lower Gila	0	0
	Recovery Unit Total	**454**	**625**
Rio Grande	San Luis Valley	34	50
	Upper Rio Grande	37	75
	Middle Rio Grande	51	100
	Lower Rio Grande	6	25
	Texas	0	0
	Pecos	0	0
	Recovery Unit Total	**128**	**250**
	Rangewide Total	***986***	***1,950***

[1] This net reduction in the number of territories in the Roosevelt Management Area is based on the expected inundation of habitat resulting from increasing the surface elevation of Roosevelt Reservoir. The target for minimum number of territories will be re-evaluated after 5 years.

Table 10. Specific river reaches, within Management Units, where recovery efforts should be focused. Substantial recovery value exists in these areas of currently or potentially suitable habitat. Additional reaches may also contribute toward recovery goals.

Recovery Unit	Management Unit	Reach
Coastal California	Santa Ynez	Santa Ynez River from headwaters and tributaries to Pacific Ocean (CA)
	Santa Clara	Santa Clara River from Bouquet Canyon Road to Pacific Ocean (CA)
		Ventura River from Matilaja Hot Springs to Pacific Ocean (CA)
		Piru Creek from headwaters to Santa Clara River (CA)
		San Francisquito Creek from 3 miles upstream of Drinkwater Reservoir to Drinkwater Reservoir (CA)
		Soledad Canyon from Soledad Campground to Agua Dulce (CA)
		Big Tujunga Creek (CA)
		San Gabriel River from San Gabriel Reservoir to Santa Fe Flood Control Basin (CA)
	Santa Ana	Santa Ana River and its tributaries from headwaters on the San Bernardino National Forest to Prado Flood Control Basin Dam, including Waterman Creek, City Creek, Thurman Flats, Bautista Creek, and Day Canyon (CA)
		Mill Creek, San Bernardino National Forest (CA)
		Bear Creek and its tributaries to Santa Ana River, San Bernardino National Forest, including Van Dusen Canyon – Caribou Creek, Big Bear Lake, and Metcalf Creek (CA)
		San Timoteo Creek and its tributaries on the San Bernardino National Forest to Santa Ana River (CA)
		San Gorgonio Creek at Sawmill Canyon (part of Banning Canyon) (CA)
		San Diego Creek from Interstate Route 405 to Lake Forest Drive, including Laguna Lakes (CA)

Table 10. Specific river reaches, within Management Units, where recovery efforts should be focused. Substantial recovery value exists in these areas of currently or potentially suitable habitat. Additional reaches may also contribute toward recovery goals.

Recovery Unit	Management Unit	Reach
	San Diego	San Juan Creek Watershed, including Canada Gobernadora and Trabuco Creek (CA)
		San Mateo Creek from San Mateo Road crossing to Pacific Ocean (CA)
		San Onofre Creek from below Camp Horno to Pacific Ocean (CA)
		Las Flores Creek from Basilone Road to Pacific Ocean (CA)
		Fallbrook Creek from the Naval Weapons Station boundary to Santa Margarita River (CA)
		Santa Margarita River from confluence with DeLuz Creek to Pacific Ocean (CA)
		DeLuz Creek from De Luz Road to Santa Margarita River (CA)
		Temecula Creek from Oak Grove to Dripping Springs (CA)
		Pilgrim Creek from Vandegrift Road to confluence with San Luis Rey River (CA)
		San Luis Rey from Lake Henshaw Dam to Interstate Route 5, including Whelan Lake and Guajome Lake (CA)
		Agua Hediodonda from State Route 11 to Pacific Ocean (CA)
		San Diego River from 1 km north of Cedar Creek (32.999925 N, 116.3097 W, WGS 84) to El Capitan Reservoir (CA)
		San Dieguito River from Battlefield State Historic Park to Interstate Route 15 (CA)
		San Diego River from Magnolia Avenue to Mission Trails (CA)
		Sweetwater River from Rancho San Diego Golf course to Sweetwater Reservoir (CA)
		Tijuana River from Dairy Mart Road to Tijuana River Estuary (CA)

Table 10. Specific river reaches, within Management Units, where recovery efforts should be focused. Substantial recovery value exists in these areas of currently or potentially suitable habitat. Additional reaches may also contribute toward recovery goals.

Recovery Unit	Management Unit	Reach
Basin & Mojave	Owens	Owens River and tributaries from below Pleasant Valley Reservoir to Owens Lake (CA)
	Kern	South Fork Kern River from Canebrake Ecological Preserve to Rabbit Island and south to T26 S R34 E NE 1/4 Section 19 (CA)
	Amargosa	Ash Meadows National Wildlife Refuge (NV)
		Amargosa River from Spanish Trail Highway to T19N R7E N ½ Section 10 (CA)
	Mojave	Deep Creek from its headwaters to Mojave Forks Dam (CA)
		Mojave River from Spring Valley Lake to Bryman (CA)
		West Fork of the Mojave River from its headwaters to Mojave Forks Dam (CA)
	Salton	San Felipe Creek from San Felipe to Hwy 78 (CA)
Upper Colorado	San Juan	Los Pinos River from Vallecito Reservoir to LaBoca (CO)
		Animas River from Bodo State Wildlife Area to Colorado/New Mexico State line (CO)
		San Juan River from Malpais Arroyo one mile upstream to one mile downstream, near Shiprock (NM)
		San Juan River from two river miles upstream from State Route 262 bridge at Montezuma Creek (T41S R24E Section 3) to Chinle Creek (UT)
		East Fork of the San Juan River from Silver Creek to Treasure Creek (CO)
		San Juan River from West Fork confluence to Navajo River (CO)
	Powell	Tributaries to the Sevier River on the Markagunt Plateau (UT)
		Paria River from confluence with Cottonwood Wash (T41S R1W Section 20) to Highway 89 (T43S R1W Section 4) (UT)

Table 10. Specific river reaches, within Management Units, where recovery efforts should be focused. Substantial recovery value exists in these areas of currently or potentially suitable habitat. Additional reaches may also contribute toward recovery goals.

Recovery Unit	Management Unit	Reach
Lower Colorado	Little Colorado	Rio Nutria from Nutria Diversion Dam to confluence with Zuni River (NM)
		Zuni River from confluence with Nutria River (NM) to Arizona / New Mexico State line
		Nutrioso Creek from T7N R30E Section 9 north to Apache-Sitgreaves National Forest boundary (AZ)
		Little Colorado River from the diversion ditch at T8N R28E Section 16 upstream to Forest Road 113 on the West Fork (T7N R27E Section 33), upstream to Forest Road 113 on the East Fork (T6N R27E Section 10), and upstream to Joe Baca Draw on the South Fork (T8N R28E Section 34) (AZ)
		Little Colorado River from Springerville to St. Johns (AZ)
		Chevelon Creek from Gauging Station in T18N R27E Section 23 to confluence with Little Colorado River, including Chevelon Creek Wildlife Area (AZ)
	Middle Colorado	Colorado River from Spencer Canyon (river mile 246) to Lake Mead delta (AZ)
		Kanab Creek from one river mile north of confluence with Red Canyon (T42S R2W Section 5) (UT) to Colorado River (AZ)
	Virgin	Santa Clara River from Pine Valley to Virgin River (UT)
		North Fork of the Virgin River from Telephone Canyon in Zion National Park (T40S R10W Section 34) to East Fork of the Virgin River (T42S R10W Section 5) (UT)
		Virgin River from Rockville to Beaver Dam Wilderness Area (T43S R16W Section 29) (UT)
		Virgin River from Littlefield (AZ) to Lake Mead delta (NV)
	Pahranagat	Pahranagat River from Key Pittman Wildlife Management Area through Pahranagat National Wildlife Refuge to Maynard Lake (NV)
		Meadow Valley Wash from Caliente to Lincoln / Clark County line (NV)
		Muddy River from headwaters to Interstate Route 15 (NV)

Table 10. Specific river reaches, within Management Units, where recovery efforts should be focused. Substantial recovery value exists in these areas of currently or potentially suitable habitat. Additional reaches may also contribute toward recovery goals.

Recovery Unit	Management Unit	Reach
	Pahranagat (cont.)	Muddy River from Overton Wildlife Management Area to Lake Mead (NV)
	Hoover - Parker	Waterwheel, Pot, and Cottonwood Valley coves on Lake Mojave (AZ, CA)
		Colorado River in Havasu National Wildlife Refuge from river mile 245 to 213, including Topock Marsh (AZ, CA)
	Bill Williams	Big Sandy River from Wikieup to 4 miles south of U.S. Route 93 bridge (AZ)
		Big Sandy River from 5 miles north of the confluence with the Santa Maria River to Alamo Lake (AZ)
		Santa Maria River at Palmerita Ranch (AZ)
		Santa Maria River from Date Creek to Alamo Lake (AZ)
		Bill Williams River from Centennial Wash to confluence with Colorado River (AZ)
	Parker - Southerly International Border	Colorado River from Headgate Dam to Southerly International Border, including Cibola and Imperial National Wildlife Refuges, agricultural districts, and agricultural leases (AZ, CA)
		Confluence of Gila and Colorado rivers (AZ)
		Wellton-Mohawk Irrigation and Drainage District on Gila River (AZ)
Gila	Upper Gila	Eagle Creek from Honeymoon to the boundary of Apache-Sitgreaves National Forest and San Carlos Indian Reservation (AZ)
		Gila River from Mogollon Creek (NM) to Duncan (AZ)
		Gila river from Bonita Creek to Coolidge Dam (AZ)
	San Francisco	San Francisco River from junction of Forest Road 249 and U.S. Route 191 (AZ) to the confluence of Centerfire (NM)
		San Francisco River from Deep Creek (upstream from U.S. Route 180 bridge) to San Francisco Hot Springs (NM)

Table 10. Specific river reaches, within Management Units, where recovery efforts should be focused. Substantial recovery value exists in these areas of currently or potentially suitable habitat. Additional reaches may also contribute toward recovery goals.

Recovery Unit	Management Unit	Reach
	San Francisco (cont.)	San Francisco River from the Arizona / New Mexico border in T2S R32E to west boundary of Apache-Sitgreaves National Forest T3S R30E (AZ)
		Blue River from Dry Blue Creek to San Francisco River (AZ)
		Tularosa River from Apache Creek to San Francisco River (NM)
	Middle Gila / San Pedro	San Pedro River from international border to St. David (AZ)
		San Pedro River from The Narrows (near Pomerene) to Winkelman (AZ)
		Gila River from Winkelman to Kelvin Bridge (AZ)
	Santa Cruz	Santa Cruz River from Nogales Wastewater Treatment Plant to Chavez Siding Road (AZ)
		Cienega Creek from Empire Ranch to Pantano Road (AZ)
	Roosevelt	West Fork of Black River from West Fork Campground east to crossing at Forest Road 25
		West Fork of Black River near Thompson Ranch, T6N R27E Sections 25, 26, 36
		East Fork of Black River from Deer Creek to Buffalo Crossing
		Tonto Creek from Gisela to Roosevelt Lake (AZ)
		Roosevelt Lake (AZ)
		Salt River from State Route 88 to Roosevelt Lake (AZ)
	Verde	Verde River from Sycamore Canyon to confluence with Salt River (AZ)
	Hassayampa / Agua Fria	Hassayampa River from State Route 60 bridge in Wickenburg to San Domingo Wash (AZ)
		Gila River from Salt River to Gillespe Dam (AZ)
	Lower Gila	No reaches identified due to upstream diversions.

Table 10. Specific river reaches, within Management Units, where recovery efforts should be focused. Substantial recovery value exists in these areas of currently or potentially suitable habitat. Additional reaches may also contribute toward recovery goals.

Recovery Unit	Management Unit	Reach
Rio Grande	San Luis Valley	Rio Grande and tributaries within the San Luis Valley from Baxterville (CO) to the Colorado/New Mexico State line, including Alamosa National Wildlife Refuge
		Conejos River from Fox Creek to the Rio Grande (CO)
	Upper Rio Grande	Chama River from U.S. Routes 64/84 (bridge below town of Chama) to El Vado Reservoir (NM)
		Rio Grande from Taos Canyon (Taos Junction bridge on State Route 520) to Otowi Bridge (State Route 502) (NM)
		Rio Grande del Rancho from confluence of Sarco Canyon to confluence of Arroyo Miranda (NM)
		Coyote Creek in the vicinity of Coyote Creek State Park (NM)
	Middle Rio Grande	Rio Grande from Interstate Route 25 bridge at Exit 213 – 215 to Elephant Butte Dam (NM)
		Bluewater Creek from headwaters to Bluewater Dam (NM)
	Lower Rio Grande	Rio Grande from Elephant Butte Dam (NM) to New Mexico / Texas State line
	Texas	No reaches identified
	Pecos	No reaches identified

C. Recovery Implementation Oversight

Continuing Duties of the Recovery Team

During the formulation of the Recovery Plan, the Recovery Team consisted of a Technical Subgroup, six regional Implementation Subgroups, and a Tribal Working Group (see Section I. C., page 3). The Technical Subgroup compiled and reviewed scientific information, and developed recovery goals, strategies, and recommended actions. The Implementation Subgroups and the Tribal Working Group met with the Technical Subgroup, reviewed the draft Recovery Plan, and advised the Technical Subgroup as to the feasibility of recovery strategies and actions.

The recovery of the southwestern willow flycatcher will require continued active participation by the Technical Subgroup, Implementation Subgroups, and Tribal Working Group. Each of these groups will play a crucial role in the implementation of this Recovery Plan, as outlined below.

1. Implementation Subgroups. During development of the Recovery Plan, the role of the six Implementation Subgroups of the Southwestern Willow Flycatcher Recovery Team, as discussed in meetings and reiterated in the website-based comment forum hosted by the USFWS' Southwest Region, was to review the species data and recovery needs described by the Technical Subgroup, including the proposed implementation schedule and task priorities, and expand on the implementation schedule to determine alternative methods to accomplish the needed tasks while minimizing costs. Following completion of the Recovery Plan, the Implementation Subgroups will help determine which participants will implement recovery tasks, when, and with what resources, and will work with the USFWS to coordinate accomplishment of these tasks based on their priority. Previous and continuing participation of Implementation Subgroup members in activities of the Southwestern Willow Flycatcher Recovery Team, either in meetings or within the website comment forum, is covered by the recovery team exemption to the Federal Advisory Committee Act.

The Implementation Subgroups will be the focal points for the implementation of the Recovery Plan, and will take on an expanded and central role in flycatcher recovery. Ideally, each Implementation Subgroup will help plan, coordinate, and implement recovery actions within and among the Management Units within it's geographic area. Furthermore, the six Implementation Subgroups will communicate, and where possible coordinate, recovery actions rangewide. Representatives of the Implementation Subgroups will meet annually or biannually with the Technical Subgroup and/or the USFWS' southwestern willow flycatcher recovery coordinators (see below).

Specific functions of the Implementation Subgroups should include the following: (a) promote communication between various local interests within each Management and Recovery Unit; (b) work cooperatively to promote, plan, and

initiate recovery actions; (c) provide data to help monitor Recovery Plan implementation within each Recovery Unit, and report problems, successes, and general recovery progress to the USFWS and the Technical Subgroup; and (d) recommend to the Technical Subgroup recovery plan revisions. The Implementation Subgroups will remain active as long as the recovery plan is in place.

2. Tribal Working Group. The responsibilities of the Tribal Working Group will be to: (a) provide the Technical Subgroup with recommendations regarding flycatcher recovery on Tribal lands; (b) facilitate actions (including the development of Memorandums of Agreement or Statements of Relationship with the USFWS) that will contribute to the recovery of the flycatcher; and (c) facilitate flycatcher surveys and monitoring on participating Tribal lands. A Tribal Liaison will participate in all Technical Subgroup meetings and functions. This position will remain active as long as the recovery plan is in place.

3. Technical Subgroup. The Technical Subgroup should continue to meet on an annual basis, in order to: (a) review new survey, monitoring, and research results; (b) monitor the progress of recovery actions; (c) address or clarify scientific or technical issues relating to flycatcher recovery; (d) provide guidance and interpretation to Implementation Subgroups regarding recovery actions and recommendations; and (e) oversee the adaptive management aspects of the plan, including revision of recovery actions and recommendations. Furthermore, the Technical Subgroup will take the lead in updating and revising the Recovery Plan, within 5 years of its adoption. The Technical Subgroup will remain active as long as the recovery plan is in place.

4. Southwestern Willow Flycatcher Recovery Coordinators. Because the recovery of the flycatcher is dependent upon goals and actions across a wide geographic area, across many political boundaries, and involving many different agencies and partners, a southwestern willow flycatcher recovery coordinator should be appointed by each of the three affected USFWS Regions, with lead coordination responsibilities remaining in the Southwest Region. These coordinators would: (a) provide technical assistance to agencies and land owners on such issues as project designs, land owner grant proposals, flycatcher management plan development, and Recovery Plan implementation; (b) promote communication among the various Recovery Units and agencies; (c) monitor range-wide Recovery Plan implementation, and report problems, successes, and general recovery progress to the USFWS and the Technical Subgroup; (d) help coordinate the meetings of the Implementation and Technical Subgroups; and (e) serve as advocates for flycatcher recovery and conservation issues. These positions will remain active as long as the Recovery Plan is in place. At the discretion of USFWS's Regional Directors, coordinators may be appointed and the most appropriate ways to coordinate recovery will be determined.

Centralized Southwestern Willow Flycatcher Information Repository

In order to track recovery progress, it will be important to collect, synthesize, and analyze annual survey and monitoring information from across the flycatcher's range. This is best done as a coordinated effort, by (a) requiring standardized reporting of all southwestern willow flycatcher survey efforts, and (b) managing these data in a centralized database in conjunction with Geographical Information Systems. Such a system has been maintained by the USGS and the BOR, based on information provided by State and Federal agencies, Tribes, and non-governmental organizations. This system should be continued, and updated annually, by the USGS, BOR and/or the USFWS Southwest Region's southwestern willow flycatcher recovery coordinator. Furthermore, annual recovery progress reports should be prepared and made readily available to all interested parties, including dissemination via the USFWS web site.

Adaptive Management

The recovery goals and recommended actions contained in the Recovery Plan are based on the best available scientific data that provide the foundation of our current understanding of southwestern willow flycatcher biology and riparian ecology. Over time, new information and understandings will emerge that will reinforce or revise what we currently know. Also, this Recovery Plan includes certain sections that encourage well-designed studies to answer important questions regarding the response of flycatchers and/or their habitats to various land use practices and regimes, as well as a section specifically identifying needed research (Section IV. F., page 130). It will be important to use adaptive management practices to assure that recovery goals and actions are consistent with these new data, and with any new or improved management tools. Adaptive management is dependent upon timely collection and reporting of information; this is especially true for monitoring data. The Technical Subgroup, Implementation Subgroups, Tribal Working Group, and recovery coordinators will work together to assure that the necessary information is collected, analyzed, and disseminated so that the value and effectiveness of recovery actions can be evaluated and, where needed, goals, actions, and techniques modified.

D. Stepdown Outline of Recovery Actions

The stepdown outline of actions needed to recover the southwestern willow flycatcher is presented below. Individual actions are discussed in the Narrative Outline (Section IV. E.) and in Appendices E through N.

1. Increase and improve currently suitable and potentially suitable habitat.

1.1. Secure and enhance currently suitable and potentially suitable habitat on Federal lands, lands affected by federal actions, and cooperating non-Federal and Tribal lands.

1.1.1. Develop management plans to reduce threats and promote processes that secure, restore, and enhance currently suitable and potentially suitable habitat.

1.1.2. Manage physical elements and processes to reduce threats and promote processes that secure, restore, and enhance currently suitable and potentially suitable habitat.

1.1.2.1. Restore the diversity of fluvial processes.

1.1.2.1.1. Identify dams where modification of dam operating rules will benefit recovery of the flycatcher.

1.1.2.1.2. Identify dams where modification of dam operations will benefit recovery of the flycatcher by taking advantage of system flexibility and water surpluses/flood flows.

1.1.2.1.3. Determine feasibility of simulating the natural hydrograph to restore/enhance riparian systems.

1.1.2.1.4. Determine feasibility of managing reservoir levels to establish and maintain lake fringe and inflow habitat.

1.1.2.1.5. Determine feasibility of using surplus and/or flood flows to increase or add water to marsh areas between levees and on flood plains.

1.1.2.1.6. Determine feasibility of keeping daily ramping rates and daily fluctuations for dam releases as gradual as possible to prevent bank erosion and loss of riparian vegetation, except when mimicking flood flows.

1.1.2.1.7. Determine feasibility of augmenting sediment in sediment-depleted systems.

1.1.2.1.8. Implement 1.1.2.1.3. – 1.1.2.1.7., where determined feasible.

1.1.2.1.9. Monitor 1.1.2.1.3. – 1.1.2.1.7., and provide feedback to the Technical Subgroup.

1.1.2.2. Restore adequate hydrogeomorphic elements to expand habitat, favor native over exotic plants, and reduce fire potential.

1.1.2.2.1. Increase water available for recovery.

1.1.2.2.1.1. Increase efficiency of groundwater management to expand habitat, favor native over exotic plants, and reduce fire potential.

1.1.2.2.1.2. Use urban waste water outfall and rural irrigation delivery and tail waters for habitat restoration to expand habitat, favor native over exotic plants, and reduce fire potential.

1.1.2.2.1.3. Provide (reestablish) instream flows to expand habitat, favor native over exotic plants, and reduce fire potential.

1.1.2.2.2. Expand the active channel area that supports currently suitable and potentially suitable flycatcher habitat by increasing the width of levees and using available flows to mimic overbank flow.

1.1.2.2.3. Reactivate flood plains to expand native riparian forests.

1.1.2.2.4. Restore more natural channel geometry (width, depth, bank profiles) where the return of the natural hydrograph will be insufficient to improve habitat.

1.1.2.3. Manage fire to maintain and enhance habitat quality and quantity.

1.1.2.3.1. Develop fire risk and management plans.

1.1.2.3.2. Suppress fires.

1.1.2.3.3. Restore ground water, base flows, and flooding.

1.1.2.3.4. Reduce incidence of flammable exotics.

1.1.2.3.4.1. Manage/reduce exotic species that contribute to increased fire incidence.

1.1.2.3.4.2. Use water more efficiently and reduce fertilizer applications.

1.1.2.3.5. Reduce recreational fires.

1.1.3. Manage biotic elements and processes.

1.1.3.1. Restore biotic interactions, such as herbivory, within evolved tolerance ranges of the native riparian plant species.

1.1.3.1.1. Manage livestock grazing to restore desired processes and increase habitat quality and quantity.

1.1.3.1.1.1. If livestock grazing is a major stressor implement conservative livestock grazing guidelines. Implement general livestock grazing guidelines from Appendix G (see also Section IV. E.; Narrative Outline for Recovery Actions) in occupied, suitable, or potential habitat (potential habitats are riparian systems that have the appropriate hydrologic and ecologic setting to be suitable flycatcher habitat).

1.1.3.1.1.2. Determine appropriate use areas for grazing.

1.1. 3.1.1.3. Reconfigure grazing management units.

1.1.3.1.1.4. Improve documentation of grazing practices.

1.1.3.1.2. Manage wild ungulates.

1.1.3.1.3. Manage keystone species.

1.1.3.2. Manage exotic plant species.

1.1.3.2.1. Develop exotic species management plans.

1.1.3.2.2. Coordinate exotic species management efforts.

1.1.3.2.3. Restore ecosystem conditions that favor native plants.

1.1.3.2.3.1. Eliminate physical stresses, such as high salinity or reduced stream flows, that favor exotic plants.

1.1.3.2.3.2. Create or allow for a river hydrograph that restores the natural flood disturbance regime.

1.1.3.2.3.3. Restore ungulate herbivory to intensities and types under which native plant species are more competitive.

1.1.3.2.4. Retain native riparian vegetation in floodplains or channels.

1.1.3.2.5. Retain exotic species at sites dominated by native riparian vegetation.

1.1.3.2.5.1. At native dominated sites, retain tamarisk in occupied flycatcher habitat and, where appropriate, in suitable but unoccupied habitat, unless there is a trend for steady increase of tamarisk.

1.1.3.2.5.2. If needed, increase habitat quality within stands of exotic plants by implementing restorative actions such as seasonal flooding.

1.1.3.2.6. Remove exotics in occupied, suitable but unoccupied, and potentially suitable habitats dominated by exotics only if: 1) underlying causes for dominance of exotics have been addressed, 2) there is evidence that the exotic species will be replaced by vegetation of higher functional value, and 3) the action is part of an overall restoration plan.

1.1.3.2.6.1. In suitable and potential habitats where exotic species are to be removed through chemical or mechanical means, use a temporally staged approach to clear areas so some suitable or mature habitat remains throughout the restoration period for potential use by flycatchers.

1.1.3.2.6.2. Release habitat-targeted biocontrol agents only outside the occupied breeding range of the flycatcher.

1.1.3.3. Provide areas protected from recreation.

1.1.3.3.1. Reduce impacts from recreationists.

1.1.3.3.2. Confine camping areas.

1.1.3.3.3. Restore habitat impacted by recreation.

1.1.3.3.4. Place designated recreation shooting areas away from riparian areas.

1.1.3.3.5. Minimize attractants to scavengers, predators, and brown-headed cowbirds.

1.1.3.3.6. Provide on-site monitors where recreation conflicts exist.

1.2. Work with private landowners, State agencies, municipalities, and nongovernmental organizations to conserve and enhance habitat on non-Federal lands.

1.2.1. Evaluate and provide rangewide prioritization of non-Federal lands.

1.2.2. Achieve protection of occupied habitats.

1.2.3. Provide technical assistance to conserve and enhance occupied habitats on non-Federal lands.

1.2.4. Pursue joint ventures toward flycatcher conservation.

1.3. Work with Tribes to develop conservation plans and strategies to realize the potential for conservation and recovery on Tribal lands.

1.3.1. Work with Tribes to establish a regular system of surveys and monitoring, and train Tribal staff in the flycatcher survey protocol.

1.3.2. Determine protocols for information sharing.

1.3.3. Maintain an incumbent in the position of Tribal Liaison to the Technical Subgroup.

1.3.4. Provide technical assistance to Tribes that have flycatchers on their lands.

1.3.5. Support Tribal efforts to improve currently suitable and potentially suitable habitat.

1.3.6. Work with Tribes to determine the extent to which Tribal water rights might or might not be available to aid in conservation and recovery of the flycatcher.

1.3.7. Provide aid to Tribes for development of educational programs and opportunities that further flycatcher recovery.

2. Increase metapopulation stability.

2.1. Increase size, number, and distribution of populations and habitat within Recovery Units.

2.1.1. Conserve and manage all existing breeding sites.

2.1.2. Secure, maintain, and enhance largest populations.

2.1.3. Develop new habitat near extant populations.

2.1.3.1. Use existing habitat acquisition/conservation priorities.

2.1.4. Enhance connectivity to currently isolated occupied sites.

2.1.5. Facilitate establishment of new, large populations in areas where none exist, through habitat restoration.

2.1.6. Increase population sizes at small occupied sites.

3. Improve demographic parameters.

3.1. Increase reproductive success.

3.1.1. Manage brown-headed cowbird parasitism after collection of baseline data shows high rates of parasitism.

3.1.1.1. Increase the amount and quality of riparian habitat to increase habitat patch sizes and local flycatcher population sizes thereby minimizing levels and impacts of cowbird parasitism.

3.1.1.2. Develop cowbird management programs if warranted by baseline data on parasitism rates.

3.1.1.3. Implement cowbird management programs if warranted by baseline data on parasitism rates.

3.1.1.4. Pursue long-term landscape objectives for cowbird reduction.

3.1.2. Reduce direct impacts that topple or otherwise destroy nests.

3.1.3. Reconsider assessments of habitat quality or other threats if cowbird control and/or other measures increase reproductive output but not the number of breeding flycatchers.

4. Minimize threats to wintering and migration habitat.

    4.1. Identify, for purposes of protection, riparian habitats in the U.S. that provide essential migration and stopover habitat.

    4.2. Restore, protect, and expand riparian migration and stopover habitats in the U.S..

    4.3. Pursue international partnerships to identify migration and winter habitats and threats.

    4.4. Encourage programs that preserve habitats used by wintering and migrating flycatchers.

    4.5. Encourage programs that minimize threats to wintering and migrating flycatchers.

5. Survey and monitor.

    5.1. Facilitate and institute effective survey and monitoring programs.

        5.1.1. Adopt standardized protocols for surveying and monitoring.

        5.1.2. Institute appropriate monitoring of all reaches within management units.

        5.1.3. Integrate survey data at State and rangewide levels.

    5.2. Monitor effects of management and restoration practices.

        5.2.1. Review data to improve effectiveness of management and restoration practices.

    5.3. Survey to determine dispersal movements and colonization events.

    5.4. Expand survey efforts in wintering habitat.

6. Conduct research.

    6.1. Determine habitat characteristics that influence occupancy and reproductive success.

        6.1.1. Determine plant species / structure that determines occupancy and reproductive success.

        6.1.2. Determine habitat area needed for breeding birds.

        6.1.3. Determine effects of conspecifics on site occupancy and reproductive success.

        6.1.4. Determine use vs. availability of exotics in occupied sites.

        6.1.5. Determine long-term ecological productivity of native habitats vs. exotic habitats.

        6.1.6. Refine understanding of effects of physical microclimate on site occupancy and reproduction.

6.1.7. Determine influence of environmental toxins on breeding, survival, and prey base.

6.2. Investigate dam and reservoir management for maximizing downstream and delta habitat.

6.3. Investigate surface and groundwater management scenarios to determine thresholds for habitat suitability and to maximize habitat quality.

6.4. Investigate grazing systems, strategies, and intensities for riparian recovery and maintenance.

6.4.1. Investigate grazing systems, strategies, and intensities for riparian recovery and maintenance.

6.4.2. Investigate direct effects of livestock grazing on the flycatcher.

6.4.3. Investigate impacts of native ungulates on riparian recovery and maintenance.

6.5. Conduct research on cowbird parasitism and control.

6.5.1. Collect baseline data on cowbird parasitism.

6.5.2. Experimentally test the efficacy of cowbird trapping programs.

6.6. Determine the most successful techniques for creating or restoring suitable habitat to degraded or former riparian lands, such as abandoned agricultural fields in riparian corridors.

6.7. Refine methods for determining distribution and population status and trends.

6.7.1. Acquire demographic and dispersal information.

6.7.2. Conduct limiting factor analyses.

6.7.3. Explore new methods and data needs for population viability analyses.

6.7.4. Develop methodologies, which can be site specific if necessary, for determining year-to-year trends in population sizes at breeding sites.

6.7.5. Establish and refine protocols for addressing flycatcher distribution.

6.8. Determine present and historical distribution of the subspecies through genetic work.

6.9. Determine migration and wintering distribution, habitat, and threats.

6.9.1. Investigate migration ecology, habitat selection and use.

6.9.2. Investigate wintering distribution, status, ecology, and habitat selection.

6.9.3. Determine influence of environmental toxins on wintering flycatchers and their prey base.

6.10. Conduct research on means of increasing reproductive success by approaches other than, or in addition to, cowbird management, such as reducing losses of flycatcher eggs and nestlings to general nest predators.

6.11. Conduct research to determine why increases in reproductive success due to cowbird control or other measures may not lead to increases in numbers of breeding birds in populations experiencing improved reproductive success or in populations that could receive emigrants from such populations.

6.12. Investigate feasibility of reducing or eliminating habitat fire hazards.

6.12.1. Evaluate fuel reduction techniques in riparian habitats, especially tamarisk types.

6.12.2. Test modifying flammability for fuels to modify fire risks.

6.12.3. Test prescribed fire to achieve desired fire hazard reduction, habitat protection, and habitat improvement.

7. Provide public education and outreach.

7.1. Hold annual Implementation Subgroup meetings.

7.2. Maintain updated website.

7.3. Prepare brochures and make available to public.

7.3.1. Educate the public about landscaping with native plants.

7.3.2. Educate the public about recreational impacts, especially about fire hazards.

7.3.3. Educate the public that cowbird parasitism is a natural process but may require management efforts in some instances due to high levels or other stressors that have endangered flycatchers.

7.4. Post and maintain signs at some protected flycatcher breeding locations.

7.5. Conduct information exchange programs with foreign governments and publics.

7.6. Conduct symposia and workshops.

7.7. Continue survey training.

8. Assure implementation of laws, policies and agreements that benefit the flycatcher.

8.1. Fully implement §7(a)(1) of the ESA.

8.2. Fully implement all Biological Opinions resulting from ESA §7(a)(2) consultations.

8.3. Monitor, support, and evaluate compliance with laws, policies and agreements that provide conservation benefits.

8.3.1. Support compliance with ESA §7(a)(1) of the ESA.

8.3.2. Provide resource managers with training in conservation benefits.

8.3.3. Monitor compliance with ESA §7(a)(2) of the ESA.

8.3.4. Ensure consistency among ESA §7(a)(2) consultations.

8.3.5. Monitor compliance with existing Biological Opinions.

8.4. Integrate recovery efforts with those for other species.

8.5. Monitor compliance and effectiveness of agreements and other mechanisms used as delisting criteria.

8.6. Continue implementation of Secretarial Order 3206.

8.6.1. Effectively communicate with Tribes.

9. Track recovery progress.

9.1. Maintain collaborative structure of Recovery Team.

9.2. Annual review of survey and monitoring data.

9.3. Review and synthesis of current flycatcher research and other pertinent research.

9.4. Repeat Population Viability Analysis.

9.5. Develop recommendations for survey and monitoring strategies.

9.6. Update Recovery Plan every 5 years.

E. Narrative Outline for Recovery Actions

The southwestern willow flycatcher is endangered because of a variety of factors, the chief of which is loss and degradation of breeding habitat. Not only has extensive habitat loss severely reduced flycatcher populations, but it exacerbates other threats, such as cowbird parasitism and the demographic vulnerability inherent in a rare species that exists mainly in small, isolated populations. Recovery of the flycatcher will require preserving currently suitable and occupied habitat and substantially increasing the quantity of suitable nesting habitat. Loss and modification of flycatcher habitat has resulted from many negative influences. Recovery of this habitat would be most assured, and most quickly accomplished, by reversing all negative impacts rather than selective elimination or mitigation of just a few. But the negative impacts on riparian systems are formidable; they are the result of over 200 years' evolution of land-use practices, regional explosion in human population, physical re-engineering of whole river systems, and the complexities and restrictions of water-allocation law. Therefore the recovery actions outlined here attempt to steer a course through what is feasible, what is legal, and what will be effective. Because of the biological and logistical complexities of riparian habitat restoration, different locales and circumstances will require significantly different recovery approaches.

This outline categorizes recovery actions into nine types:

1. Increase and improve currently suitable and potentially suitable habitat.
2. Increase metapopulation stability.
3. Improve demographic parameters.
4. Minimize threats to wintering and migration habitat.
5. Survey and monitor.
6. Conduct research.
7. Provide public education and outreach.
8. Assure implementation of laws, policies, and agreements that benefit the flycatcher.
9. Track recovery progress.

1. Increase and improve currently suitable and potentially suitable habitat.

1.1. Secure and enhance currently suitable and potentially suitable habitat on Federal lands, lands affected by Federal actions, and cooperating non-Federal and Tribal lands. Secure and enhance all suitable and potential breeding habitat on Federal lands and/or on lands affected by Federal action, within the framework of recovery criteria identified in Section IV. B., above.

1.1.1. Develop management plans to reduce threats and promote processes that secure, restore, and enhance currently suitable and potentially suitable habitat. Recognizing that "an ounce of prevention is worth a pound of cure," management plans should focus on removing threats more than engineering elaborate cures, mitigation, or contrived restoration. Where feasible and effective, conserve and restore natural processes and elements by removing stressors or, secondarily, modify the stressors by naturalizing flow regimes, modifying grazing regimes, removing exotics, and/or removing barriers between channels and floodplains, to allow for natural recovery.

1.1.2. Manage physical elements and processes to reduce threats and promote processes that secure, restore, and enhance currently suitable and potentially suitable habitat. Reestablish physical integrity of rivers first, then proceed to biological integrity of flycatcher habitat. Physical integrity for rivers implies restoration and maintenance of their primary functions of water and sediment dynamics. The vegetation communities needed for flycatcher habitat require specific hydrologic and geomorphic conditions, primarily floods, sediments, and persistent water. Set reasonable restoration and maintenance targets for physical integrity, recognizing the restored system will be a combination of natural and artificial processes, designed to achieve or mimic pre-development conditions, although at a limited scale. Recognizing the amount of water presently available for habitat restoration and maintenance is far below the optimal amount, the primary objective is to use the least amount of water possible to restore a sustainable southwestern willow flycatcher population. See Appendices I and J for detailed discussions.

1.1.2.1. Restore the diversity of fluvial processes. Restore the natural diversity of fluvial processes such as movement of channels, deposition of alluvial sediments, and erosion of aggraded flood plains, that allow a diverse assemblage of native plants to establish.

1.1.2.1.1. Identify dams where modification of dam operating rules will benefit recovery of the flycatcher. Dam operations focus on direct economic goals, and treat rivers as water and power commodities, leaving little administrative space for endangered species and other broader objectives. Although legal and economic considerations limit operational flexibility, environmental restoration and maintenance are part of the operating strategies of many large, multi-purpose structures, and habitat considerations should be a part of decision-making for dam operating rules. Where

feasible, dam operating rules should be changed to treat rivers as landscapes and ecosystems functioning in support of diverse species including the southwestern willow flycatcher. Include these broadened objectives in revisions of the laws of the river, as well as interstate water compacts and administrative rule decisions. Include endangered species recovery as one of the multiple objectives in dam operating rules. An example of Congressionally mandated changes to the Law of the River for the Colorado River is the 1992 Grand Canyon Protection Act which brought about changes in the operation of Glen Canyon Dam to benefit downstream environmental resources.

1.1.2.1.2. Identify dams where modification of dam operating rules will benefit recovery of the flycatcher by taking advantage of system flexibility and water surpluses / flood flows. Dam operations have greatly simplified downstream geomorphic systems, resulting in loss of the ecological complexity needed for flycatcher habitat. To restore the complexity of hydrodiversity and geodiversity which will lead to biodiversity, dam operations should allow occasionally complex flow regimes with a wide range of discharge levels, and flood or spike flows. In many years, this new regime would not necessarily result in increased water releases, but rather releases on a schedule different from the present. Where feasible, high or spike flows should be released in months that will most benefit native vegetation and native fishes, taking advantage of system flexibility and water surpluses / flood flows to create and maintain flycatcher habitat.

1.1.2.1.3. Determine feasibility of simulating the natural hydrograph to restore / enhance riparian systems. For those structures that have operating rules that include environmental values, use the same analytic techniques for assessing options to maintain flycatcher habitat that are used for other water resource objectives. Operate dams systematically to attempt to mimic natural river processes at least occasionally. Consider distributing flood storage capacity differentially between dams in various years so the intervening watercourses will occasionally experience floods while the system's flood protection integrity is maintained. Release flows for purposes that will better simulate natural hydrology and/or specifically to enhance riparian systems, e.g., release water for recharge purposes along with peak flows to enhance the flood-like processes between the dam and point of diversion.

1.1.2.1.4. Determine feasibility of managing reservoir levels to establish and maintain lake fringe and inflow habitat. Sequences of flood inflows, sediment deposition, and subsequent exposure of sediments often create extensive riparian habitat

at reservoir inflows and margins. To the greatest extent feasible, reservoir levels should be managed to preserve this serendipitous "delta" habitat. Avoid desiccating drawdowns or extended, extreme inundation of these habitats. Because laws and regulations also control reservoir levels, this objective must be fit into existing operating rules and priorities, because it may conflict with water delivery or flood control responsibilities. The objective should be included in formal operating rules, however, and recognized as a benefit that dam operations provide.

1.1.2.1.5. Determine feasibility of using surplus and/or flood flows to increase or add water to marsh areas between levees and on flood plains. Additional flows above common allocations are of two types: 1) surplus flows that are formally declared as such and that are allocated to specific users, and 2) flood flows that represent spills or releases from storage and that are not allocated to specific users. Rather than conducting surpluses and/or flood flows through a system as quickly as possible, they should be used gradually, in part for habitat creation and maintenance. This should not conflict with other important uses of these flows such as hydrating downstream areas, e.g., hydrating the Colorado River delta in Mexico. Flood releases occur on an occasional basis which limits their usefulness, but they offer some opportunity for habitat maintenance which is not now fully exploited. Management of additional flows should be within a context of available habitat and suitable water chemistry. Pre-flood flow manipulations including lowering river banks, removing levees, and/or removing tamarisk may be necessary to achieve restoration at some sites.

1.1.2.1.6. Determine feasibility of keeping daily ramping rates and daily fluctuations for dam releases as gradual as possible to prevent bank erosion and loss of riparian vegetation, except when mimicking flood flows. Ramping rates, the rates at which releases are increased or decreased, should be kept as gradual as possible to prevent bank erosion and loss of riparian vegetation through mechanical processes at the margins of downstream channels.

1.1.2.1.7. Determine feasibility of augmenting sediment in sediment-depleted systems. Generally, dams trap sediments and release erosive clear-water discharges. As a result, downstream areas are both deprived of natural sediment input and stripped of what sediments remain. This process eliminates the native vegetation and habitats that were developed on the deposits, including flycatcher habitat. To help correct this trend, augment the sediment supply of river reaches downstream to replace the fine sediments artificially removed in upstream reservoirs, but insuring that sediments

containing hazardous levels of heavy metals, pesticides, and herbicides are not re-mobilized, and that downstream fish habitats are not adversely affected. Sediment augmentation should be undertaken with due regard for downstream navigation and water quality values. Sediment augmentation in some cases may relieve sedimentation problems in reservoirs by piping dredged sediment past the dam to points downstream for reintroduction. Adaptive management approaches should be in place to make adjustments or stop sediment augmentation if adverse results appear. Dams in areas with low sediment inflows to reservoirs probably do not have sedimentation problems, and they also probably have had lesser effects on downstream sediment loads.

1.1.2.1.8. Implement 1.1.2.1.3. – 1.1.2.1.7., where determined feasible.

1.1.2.1.9. Monitor 1.1.2.1.3. – 1.1.2.1.7., and provide feedback to the Technical Subgroup.

1.1.2.2. Restore adequate hydrogeomorphic elements to expand habitat, favor native over exotic plants, and reduce fire potential. Restore the necessary elements such as shallow water tables, surface water flow, movement of sediments and nutrients, consistent with the natural flow regime. This will aid expansion of habitat, favor native over exotic plants, and reduce fire potential.

1.1.2.2.1. Increase water available for recovery. Many solutions for improving flycatcher habitat require increased availability of water in active channels or in near-channel areas. This issue is important throughout the flycatcher's range (e.g., lower Colorado River near Yuma, lower San Pedro River, Gila River below Coolidge Dam, Middle Rio Grande). Water purchases or other acquisition procedures, as well as other water management strategies, are likely to be required in a comprehensive recovery of the species. In some areas construction of new projects to provide water for both agriculture and development threaten the limited remaining flycatcher habitat. Because agricultural withdrawals from rivers and groundwater are much larger than any other economic sector, the agricultural community must be part of any long-term solution. Engage agricultural interests in all major watersheds in the range of the flycatcher to consult with agencies and other parties to take proactive measures to provide more water in rivers throughout the range of the flycatcher.

1.1.2.2.1.1. Increase efficiency of groundwater management to expand habitat, favor native over exotic plants, and reduce fire potential. Integrated, watershed-based approaches to water management may suffice to

reverse some of the changes resulting from overdrafting ground water in some river reaches. All water users, whether municipal, agricultural, or industrial, need to work together and bear their share of water overdraft problems to achieve results. Approaches should focus on reducing withdrawals (e.g., xeriscaping, replacing high-water-use crops with high water-use-efficiency crops) and increasing recharge (e.g., recharge of aquifers with effluent). In cases of extreme dewatering, restoration of water tables may require importation of water from other basins.

1.1.2.2.1.2. Use urban waste water outfall and rural irrigation delivery and tail waters for habitat restoration to expand habitat, favor native over exotic plants, and reduce fire potential. These areas have the potential to support suitable flycatcher habitat (native willows) and often have open water surfaces. When using return flows to support or create flycatcher habitat, it may be necessary to periodically flush the soils to reduce the concentrations of salts below the levels that are toxic to willows. Success also will be enhanced if water level fluctuations do not exceed tolerance ranges of the plant species (see Appendix K). Restoration efforts in waste-water systems need to monitor water quality and contaminant levels to minimize risks.

1.1.2.2.1.3. Provide (reestablish) instream flows to expand habitat, favor native over exotic plants, and reduce fire potential. Maintain instream flow releases below dams at suitable levels to conserve or enhance instream values and public trust resources. For dams that are primarily flood control structures, release storage volumes to achieve both flood scouring processes and slower trickle flows over long periods to maximize groundwater recharge and maintain some surface flow downstream. Modify dam operations, diversions, and groundwater pumping to provide low level instream flows (enough merely to establish a wetted perimeter and a visible surface flow) during low flow periods downstream. Measure these flows at stream gages at the appropriate times to assure the water flows are of the magnitude and frequency intended to positively influence flycatcher habitat. Many gages do not provide resolution adequate for monitoring changes in base flows that are important for habitat. There is an ongoing effort in the Verde River basin to install additional gages to monitor changes to base flow. The sensitivity and sufficiency of the existing gage network should be considered, and modified to provide the necessary data

for management decisions. In those river reaches downstream from diversion structures that desiccate the channels, procure water rights for delivery at desired times to hydrate flycatcher habitat.

1.1.2.2.2. Expand the active channel area that supports currently suitable and potentially suitable flycatcher habitat by increasing the width of levees and using available flows to mimic overbank flow. Reservoir storage and diversions have caused river channels and their associated landscapes to become drastically more narrow. Levees with narrow spaces between them have stabilized the restricted widths. As a result, the original natural riparian forest and potential flycatcher habitat have also shrunk, and become discontinuous. To correct this trend, increase the distance between levees. This will result in both increased flood conveyance potential and more space for dense riparian vegetation outside the low flow channel. Flood conveyance channels should be designed to provide adequate flood-flow capacity with a large portion of the width in riparian vegetation. For example, doubling the width of a channel dedicated to flood conveyance could free half the width from the necessity of channel clearing or dredging. If channel clearing must be done, schedule activities in such a way that riparian habitat is continuously available in the area, e.g., do not mow or grade entire flood control systems simultaneously. Sizing the channel width using the "meanderbelt" concept has potential for yielding both flood control and aquatic/riparian values. Discourage other land-uses, e.g., cultivated agriculture, within flood conveyance facilities when they are detrimental to riparian vegetation growth. Improve the along-channel connectivity of rivers by insuring continuous instream flows and allowing occasional minor floods with peak flows large enough to expand channel systems.

1.1.2.2.3. Reactivate flood plains to expand native riparian forests. Flood plains, oxbows on single-thread channels, and secondary channels on braided streams have become inactive due to flood suppression by dams, entrenchment, isolation by levees, and elimination of beaver, all of which have reduced or eliminated native riparian forests. To reverse this effect, permit overbank flows in selected locations to expand wetlands and riparian forests by larger releases from dams when excess water is available, or manage conveyance to include peak flows. Install gates in levees and temporarily (permanently where possible) breach selected levees to reactivate flood plains and abandoned channels behind the structures. Pump, syphon, or divert water to flood plains abandoned by channel entrenchment. Along some channels where the flood plain marshes can be maintained, construct additional levees around them, and

install gates or valves to connect them through the main river levees to the channel to facilitate occasional diversions into them. Abandoned channels and oxbows can be excavated to remove sediment and can be reconnected to the main river channel through artificial channels with gates or valves to supply temporary flows.

1.1.2.2.4. Restore more natural channel geometry (width, depth, bank profiles) where the return of the natural hydrograph will be insufficient to improve habitat.

1.1.2..3. Manage fire to maintain and enhance habitat quality and quantity. See Appendix L (especially Table 2) for a complete discussion of fire issues and management.

1.1.2.3.1. Develop fire risk and management plans. Develop a fire plan for all current flycatcher breeding sites, and for sites where flycatcher-related riparian restoration is planned. A comprehensive fire evaluation and response plan should include these components: (1) Evaluation of the degree of fire threat for that particular site; (2) Identification of short-term preventative actions that will be taken to reduce the risk of fire; (3) Direction for quick response for fire suppression; (4) Post-fire remediation/restoration; (5) Identification of long-range efforts to reduce risk of fire; (6) Development of long-term monitoring of conditions in the riparian zone and watershed that maintain flood regimes and reduce fire susceptibility. This section of the fire plan should consider efforts such as monitoring regional water use patterns; water level trends in the regional and flood plain aquifers; fire-related recreational activities; and fuels loading (See Appendix L).

1.1.2.3.2. Suppress fires. Suppress fires in habitat and adjacent buffer zones. Fire suppression should make use of current, updated maps of occupied habitat and buffer zones that are part of each breeding site's fire plan.

1.1.2.3.3. Restore ground water, base flows, and flooding. Restoring water availability will reduce fire risks in several ways. Shallow ground water (i.e., no lower than 3 m below the flood plain surface for mature forests and within 0.5 to 1 m of the flood plain for younger forests measured during the peak water-demand periods) should restore or maintain native cottonwood-willow forests in non-water stressed, less flammable, condition. Shallow depth to ground water also will allow tamarisk stands to be more fire resistant than if water is deeper because they maintain higher internal water content. If a stream has become intermittent, perennial surface flows should be restored. In lieu of restoring the preferable option of natural hydrology, water in adequate amounts to raise plant water content and raise water tables could be supplied

through flood irrigation, sprinklers, or agricultural tail water. To reduce fire size and frequency, allow floods sufficiently large to remove accumulated forest floor debris and moisten the surface soils and tree bases. Ideally, floods should be released in a fashion that mimics the natural flow regime.

1.1.2.3.4. Reduce incidence of flammable exotics.

1.1.2.3.4.1. Manage/reduce exotic species that contribute to increased fire incidence. Some exotic plant species (e.g., tamarisk, red brome) are more flammable than the native species they replace. Altered hydrology and livestock grazing are significant factors that can favor exotic plants. Following the livestock grazing guidelines in Appendix G should also favor natives over exotics. Where the consequences of fire are high due to fine fuel loads, livestock grazing might be used as a tool to reduce the risks, as long as such grazing follows the grazing guidelines detailed in Appendix G.

1.1.2.3.4.2. Use water more efficiently and reduce fertilizer applications. Manage flood plains and watersheds to keep salinity levels within the tolerance ranges of the native plant species. Some agricultural practices amplify the amount of salt and its delivery into rivers, which contributes to favorable conditions for exotic plants like tamarisk, which are more fire-tolerant and fire-prone than natives like willows. More efficient use of water and less reliance on fertilizers will help reduce salt loads.

1.1.2.3.5. Reduce recreational fires. Prohibit fires and fire-prone recreation uses in habitat and in large buffer strips surrounding habitat during high fire-risk periods. Manage the numbers and/or distribution of recreationists to concentrate them into locations where fire suppression efforts can be most effectively deployed. Some areas may need to be closed to recreational use during high-risk periods, such as 4th of July weekends or drought periods. Increase patrolling by enforcement personnel to enforce restrictions.

1.1.3. Manage biotic elements and processes.

1.1.3.1. Restore biotic interactions, such as herbivory, within evolved tolerance ranges of the native riparian plant species. Like flood-driven regeneration, herbivory of vegetation is a process with which riparian ecosystems and flycatchers have evolved. However, like hydrological processes, herbivory now is outside the realm of the natural historical norm due to reductions of some native species (beaver), intensive management of others (deer, elk), and

introduction of non-natives (domestic livestock). As a result, riparian ecosystems have been altered in extent, composition, and fire potential. Please refer to Appendix G for discussion of domestic livestock.

1.1.3.1.1. Manage livestock grazing to restore desired processes and increase habitat quality and quantity.

1.1.3.1.1.1. If livestock grazing is a major stressor implement general livestock grazing guidelines from Appendix G in currently suitable or potentially suitable habitat (potentially suitable habitats are riparian systems that have the appropriate hydrological and ecological setting to be suitable flycatcher habitat). If a particular grazing system is not preventing the recovery of flycatcher habitat (e.g., regeneration of woody and herbaceous riparian vegetation), then that particular grazing system should be allowed to continue provided it is appropriately monitored and documented. Flexibility through adaptive management must be an integral component of the grazing system in order to continue to improve flycatcher habitat.

The following grazing recommendations, excerpted from Table 2 in Appendix G, should be interpreted as guidelines that must be applied according to site-specific conditions:

- During the **growing season** (of woody riparian vegetation), no livestock grazing in **taller stature** occupied flycatcher habitat (e.g., below 6,000 ft or 1,830 m) until research in comparable unoccupied habitats demonstrates no adverse impacts from grazing. If unoccupied habitat becomes occupied habitat, continue existing management (grazing should not exceed 35% of palatable, perennial grasses and grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%).

- During the **non-growing season** (of woody riparian vegetation) in **taller stature** occupied flycatcher habitat (e.g., below 6,000 ft or 1,830 m), there may be conservative grazing with average utilization not to exceed 35% (± 5%) of palatable, perennial grasses and grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%. Utilization of woody plants not to exceed an average of 40% (±10%) of current year's growth. Grazing must be

accompanied by monitoring to ensure allowable use guidelines for vegetation are not exceeded. Livestock use of annual plants indicates overuse of grasses and grass-like plants.

- During the **growing season** (of woody riparian vegetation) in **low stature** occupied flycatcher habitat (e.g., 3-4 m monotypic shrubby willow at elevations > 6,000 ft or 1,830 m), no livestock grazing.

- During the **non-growing season** (of woody riparian vegetation) in **low stature** occupied flycatcher habitat (e.g., 3-4 m monotypic shrubby willow at elevations > 6,000 ft or 1,830 m), no livestock grazing.

- During the **growing season** (of woody riparian vegetation) in unoccupied but suitable flycatcher habitat in **taller stature** habitats (e.g., below 6,000 ft or 1,830 m), no grazing. However, a limited number of small-scale, well-designed experiments may be initiated in some areas, at the discretion of the USFWS, to determine levels of pre-breeding season grazing (not to exceed 35% (±5%) of palatable perennial grass or grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%) that do not adversely affect flycatcher habitat attributes.

- During the **non-growing season** (of woody riparian vegetation) in unoccupied but suitable flycatcher habitat in **taller stature** habitats (e.g., below 6,000 ft or 1,830 m), conservative grazing with average utilization not to exceed 35% (±5%) of palatable perennial grass or grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%. Utilization of current year's growth on woody species not to exceed 40% (±10%). Grazing must be accompanied by monitoring to ensure that guidelines for allowable use of vegetation are not exceeded.

- During the **growing season** (of woody riparian vegetation) in unoccupied but suitable flycatcher habitat in **low stature** habitat (e.g., 3-4 m monotypic shrubby willow at elevations >6,000 ft or 1,830 m), no livestock grazing.

- During the **non-growing season** (of woody riaprian vegetation) in unoccupied but suitable flycatcher habitat in **low stature** habitat (e.g., 3-4 m

monotypic shrubby willow at elevations > 6,000 ft or 1,830 m), conservative grazing with average utilization not to exceed 35% (±5%) of palatable perennial grass or grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%. Utilization of current year's growth on woody species not to exceed 40% (±10%). Grazing must be accompanied by monitoring to ensure that guidelines for allowable use of vegetation are not exceeded.

- During the growing and non-growing season (of woody riparian vegetation) in restorable (or regenerating) habitat in tall and short stature flycatcher habitat, no grazing. However, provisional grazing in non-growing season (of woody riparian vegetation) is allowable in sites below 6,000 ft or 1,830 m if grazing is not a major stressor.

1.1.3.1.1.2. Determine appropriate use areas for grazing. Identify the most appropriate areas for permitting livestock grazing given the biodiversity concerns for the particular land management unit.

1.1. 3.1.1.3. Reconfigure grazing management units. Reconfigure grazing pasture boundaries and numbers of permitted livestock to reflect the true productivity of rangelands associated with important flycatcher recovery areas, and allow differential management of units of varying ecological sensitivity and significance. This reconfiguration should establish an adequate number of ungrazed areas at different elevations, habitat conditions, and geomorphic settings, to provide land management agencies and researchers with much-needed reference sites against which to compare the condition of grazed watersheds.

1.1.3.1.1.4. Improve documentation of grazing practices. Institute and/or improve record-keeping and documentation of grazing practices, retroactively where possible, so that the ecological effectiveness of various grazing practices can be monitored and scientifically evaluated.

1.1.3.1.2. Manage wild ungulates. Manage wild and feral ungulates to restore desired processes and increase habitat quality and quantity. Restore ungulate herbivory levels to those under which the native riparian species evolved, or at least under which the native plant species retain competitive dominance. Manage wild ungulates so that excessive utilization of herbaceous and woody vegetation does not occur and structure

and composition of flycatcher habitat is maintained.

1.1.3.1.3. Manage keystone species. Manage keystone species such as beaver, within their historic ranges, to restore desired processes, increase habitat quality and quantity, reduce fire potential, and favor native over exotic plants. Beaver activity creates still waters by impoundment and aids sediment storage. Reintroduce or supplement populations where appropriate. Several issues must be considered before releasing beavers as a habitat restoration tool. The site should be assessed to ensure that there is an adequate food base of preferred foods, so that the natural successional dynamics are in place that will allow these plant species to regenerate over time. Otherwise, beaver activity can reduce habitat quality by reducing densities of wetland herbs and riparian trees and shrubs below replacement levels. The site should also be assessed to determine whether beaver were historically present. Finally, the effects on other locally rare or endangered fish or amphibians should be considered. For example, beaver activity could provide favorable conditions (especially perennial ponds) for unwanted species, such as the introduced bullfrog (*Rana catesbeiana*).

1.1.3.2. Manage exotic plant species. Manage exotic species as summarized below and as explained in more detail in Appendix H. To a large extent, abundance of exotic plants is a symptom of the ways riparian lands and waters have been managed. The solution requires a shift of emphasis, away from demonizing exotics and toward: (1) reducing the conditions that have allowed the exotics to be so successful, and (2) re-establishing a functional semblance of the conditions that allow native plants to thrive. It is unlikely that exotics can be completely driven out of southwestern riparian systems. But it is also unlikely that simply removing exotics (mechanically, chemically, or through biocontrol) will allow natives to thrive if conditions of hydrology, soil chemistry, grazing, and disturbance regime no longer favor them.

1.1.3.2.1. Develop exotics species management plans. Develop exotic species management plans as part of site restoration plans as detailed in Appendix H. The plans should consider the need for action (e.g., is the exotic species dominating the canopy layer or is it subdominant?), address the root causes for the dominance of the exotics, and assess the feasibility and need for passive vs. active restoration measures. Where possible, remove stressors, restore natural process, and patiently allow for natural recovery.

1.1.3.2.2. Coordinate exotics management efforts. Because the spread of exotics in riparian systems is a drainage-wide issue, effective management requires coordination

among multiple landowners and users with diverse interests and management goals. In the absence of such coordination, management efforts are likely to fail as individual sites are reinvaded by exotics present elsewhere in the drainage.

1.1.3.2.3. Restore ecosystem conditions that favor native plants.

1.1.3.2.3.1. Eliminate physical stresses, such as high salinity or reduced stream flows, that favor exotic plants. Stresses such as dewatering and increased salinity favor a new assemblage of stress-tolerant exotic plant species. Tamarisks have high water-use efficiency, root deeply, and tolerate prolonged drought. Russian olive is drought tolerant at both the seedling and adult stages, relative to cottonwoods and willows. Tamarisks are adapted to salt levels that would stress or kill most native willows and Russian olive is more salt tolerant than many cottonwoods and willows.

To reduce drought stresses, reduce diversions and groundwater pumpage and otherwise increase instream flow and raise groundwater levels. If needed, remove aggraded sediments or excavate side channels to create cottonwood-willow seed beds that are within one meter of the ground water table. Reduce salt levels in floodplain soils by modifying agricultural practices and restoring periodic flushing flood flows.

1.1.3.2.3.2. Create or allow for a river hydrograph that restores the natural flood disturbance regime. Alteration of natural disturbance regimes or imposing new disturbances increases the chances that exotic plants will dominate a site. Some types of disturbance, e.g., soil disturbance from vehicles, livestock, and recreationists, have increased in riparian habitats. In contrast, flood disturbance has been reduced on many rivers. Natural flood regimes have been altered by dams, diversions, urbanization effects, and watershed degradation. As floods have decreased, fire disturbance has increased, which favors some exotics (e.g., tamarisk, giant reed) over natives. To counteract all these effects, restore flood regimes that are as close to natural as possible in timing, magnitude, and frequency; reduce livestock trampling and heavy recreational use; and reduce unnatural fire regimes by re-establishing natural floods where possible, or by intervention where this is not possible.

For below-dam reaches, release flood waters to coincide with the spring-season

seed dispersal of cottonwoods and willows, creating conditions that favor these species. When restoring off-channel sites, release flows onto bare soil in a fashion that mimics the natural spring flood pulse. For above-dam reaches, time reservoir drawdowns to coincide with the early spring seed dispersal of cottonwoods and willows; this will favor establishment of the native species if moist bare soil is present.

1.1.3.2.3.3. Restore ungulate herbivory to intensities and types under which the native riparian species are more competitive. Domestic livestock grazing has altered vegetation composition throughout the Southwest by favoring unpalatable or grazing-tolerant plant species, many of which are exotic. Among the riparian plant species that appear to increase under grazing are exotic bermuda grass, annual brome grasses, tamarisks and Russian olive, and native seep-willow. Livestock grazing should be managed so as to eliminate browsing on young, palatable riparian shrubs and trees (such as willows), consistent with the general livestock grazing guidelines provided in Appendix G.

1.1.3.2.4. Retain native riparian vegetation in flood plains and channels. Clearing channels for water salvage or increased flood water conveyance, plowing flood plain fields, and channel-narrowing caused by flow-regulation have all provided large-scale opportunities for establishment of exotics. Eliminating projects involving clearing of native riparian vegetation will help to ensure that the desired native species persist in the watershed.

1.1.3.2.5. Retain exotic species at sites dominated by native riparian vegetation.

1.1.3.2.5.1. At native dominated sites, retain tamarisk in occupied flycatcher habitat and, where appropriate, in suitable but unoccupied habitat, unless there is a trend for steady increase of tamarisk. Removing tamarisk and other species from occupied sites may harm the flycatchers, as may removing tamarisk from suitable unoccupied sites. For example, clearing the tamarisk understory from mixed stands of native and exotic trees and shrubs may reduce habitat quality. If habitat assessment reveals sustained increase in tamarisk abundance, conduct an evaluation of underlying causes and pursue restoration following the guidelines in Appendix H.

1.1.3.2.5.2. If needed, increase habitat quality within stands of exotic

plants by implementing restorative actions such as seasonal flooding. Seasonal inundation of tamarisk stands, for example, may improve habitat quality by improving the thermal environment or increasing the insect food base.

1.1.3.2.6. Remove exotics in occupied, suitable but unoccupied, and potentially suitable habitats dominated by exotics only if: 1) underlying causes for dominance of exotics have been addressed, 2) there is evidence that the exotic species will be replaced by vegetation of higher functional value, and 3) the action is part of an overall restoration plan. Before implementing control of exotic plants, correct the underlying causes for their dominance, such as changed flood regime, lowered groundwater level, or increased soil salinity. There are risks to the flycatcher if stands of exotic plants (such as tamarisk stands) are not replaced by plant species of equal or higher value, or if the stands lose quality (for example, by losing foliage density).

When clearing patches of undesirable exotics using fire, earth- and vegetation-moving equipment, or approved herbicides, make sure that the site conditions and timing of clearing are favorable for the establishment of the desired native species. If there is a high probability that replacement vegetation (e.g., younger stands of the same exotic, or facultative riparian species such as quailbrush, *Atriplex lentiformis*), will have lower habitat quality that the initial vegetation, then do not remove the exotic.

If exotic clearing is planned in areas near occupied territories, make sure that the areas targeted for clearing do not have any endangered species nest sites, and areas are at least 100m away from the closest nest site. This buffer zone should be enlarged if the method of clearing (e.g. herbicide drift, fire spread) is one that could have impacts well beyond the application area. Clearing activities (e.g. earthmoving) should be timed to avoid the breeding season of the flycatcher and other sensitive species (i.e., late March-September).

1.1.3.2.6.1. In suitable but unoccupied and potentially suitable habitats where exotic species are to be removed through chemical or mechanical means, use a temporally staged approach to clear areas so some mature habitat remains throughout the restoration period for potential use by flycatchers. This staggered approach will create a mosaic of different aged successional stands. In addition, it will allow the benefits of an adaptive management approach to be realized: if the restoration effort fails, one will be

able to learn from the mistakes and prevent failure on a grand scale.

1.1.3.2.6.2. Release habitat-targeted biocontrol agents only outside the occupied breeding range of the flycatcher. The U.S. Department of Agriculture (APHIS) has received approval for release of three biocontrol insects designed to reduce the abundance of tamarisk. However, in recognition of the functional role that tamarisk provides to flycatchers, the release was approved only for areas at least 200 miles from their occupied breeding range. This criteria should be adhered to for these approved biocontrol insects and similar criteria should be applied should new such biocontrol insects be submitted for approval.

1.1.3.3. Provide areas protected from recreation. Keep trails, campsites, and heavily used day use areas away from areas to be developed or maintained for flycatchers. Ensure protected areas are large enough to encompass breeding, foraging, and post-fledgling habitat. Direct vehicles, boating, swimming, tubing, and fishing away from occupied suitable habitat, especially during the breeding season, where impacts are likely to negatively impact habitat or flycatcher behavior. Where potentially suitable habitat has been identified as future flycatcher habitat, these incompatible recreation activities should be minimized to allow habitat to develop.

1.1.3.3.1. Reduce impacts from recreationists. Manage recreation by instituting recreation user control. Recreation control involves altering visitor behavior to minimize impacts, and ranges from complete restriction to some acceptable level of use. Recreation user control can be accomplished in a number of ways, including requiring permits, collecting user fees, limiting number of visitors, constraining visitor access or activities, instituting zoning or periodic closures, limiting the frequency and duration of use, providing visual barriers, and reducing motorboat impacts. See Appendix M for detailed discussion of recreation impacts.

1.1.3.3.2. Confine camping areas. Evaluate whether confining camping to a small concentrated number of campsites is less detrimental to wildlife and habitat than dispersal over a wide area. Institute fire bans when danger is high or where habitat is vulnerable. If campfires are authorized, confine them to fire boxes. Limit or prohibit fuelwood collecting in riparian areas.

1.1.3.3.3. Restore habitat impacted by recreation. Where needed, post signs that explain the importance of habitat restoration, fence habitat, and/or temporarily close trails and use areas.

1.1.3.3.4. Place designated recreation shooting areas away from riparian areas. Designated shooting areas used for target practice should be located away from riparian areas to minimize physical destruction of habitat and noise disturbance, and lead contamination.

1.1.3.3.5. Minimize attractants to scavengers, predators, and brown-headed cowbirds. Where recreation users congregate, provide adequate waste facilities (covered trash receptacles, restrooms) and regular collection service. Place horse stables away from the riparian area. Avoid use of bird seed feeders containing seeds preferred by cowbirds.

1.1.3.3.6. Provide on-site monitors where recreation conflicts exist. Where recreation conflicts exist and total closure is not practical, provide on-site monitors to educate users and control use.

1.2. Work with private landowners, State agencies, nongovernmental organizations, and municipalities to conserve and enhance habitat on non-Federal lands. Work toward conserving occupied, suitable but unoccupied, and potential flycatcher habitat on non-Federal lands.

1.2.1. Evaluate and provide rangewide prioritization of non-Federal lands. Evaluate and provide rangewide prioritization of non-Federal lands considered critical for conservation and recovery of the flycatcher, in cooperation with landowners (see USBR 1999c).

1.2.2. Achieve protection of occupied habitats. Achieve protection of occupied habitats through Habitat Conservation Plans, Safe Harbor Agreements, partnerships, cooperative agreements, conservation easements, or acquisition of sites from willing landowners.

1.2.3. Provide technical assistance to conserve and enhance occupied habitats on non-Federal lands. Make technical assistance and, where possible funding, available to non-Federal owners of occupied habitats, to conserve and enhance habitat.

1.2.4. Pursue joint ventures toward flycatcher conservation. Pursue joint ventures toward flycatcher conservation. For example, in 1999, the USFWS initiated its Sonoran Desert Joint Venture Program. This is a binational program with the primary goal of developing and maintaining a broad range of avian conservation efforts (e.g., research, habitat preservation and restoration, and education) throughout the Sonoran desert in the United States and Mexico. A priority project will be to initiate flycatcher surveys in the riparian habitats of Sonora, Mexico.

1.3. Work with Tribes to develop conservation plans and strategies to realize the considerable potential for conservation and recovery on Tribal lands. Develop partnerships between Tribes and Federal, State, and private agencies.

1.3.1. Work with Tribes to establish a regular system of surveys and monitoring, and train Tribal staff in the flycatcher survey protocol. Assist in securing funding, as available, to implement the survey and monitoring system, or assist Tribes with grant solicitation or grant writing to agencies that fund or manage watershed/wetland or riparian restoration initiatives.

1.3.2. Determine protocols for information sharing. All Tribes have serious concerns about what will happen with any information that is gathered concerning the location and numbers of endangered species, habitat, or water quantities. Protocols for information sharing must be collaboratively developed and agreed upon between Federal agencies and individual Tribes participating in flycatcher survey and recovery efforts.

1.3.3. Maintain an incumbent in the position of Tribal Liaison to the Technical Subgroup. The Tribal Liaison is necessary to effectively promote flycatcher survey and recovery efforts on Tribal lands. Support Tribal efforts to do surveys for flycatchers and monitor occupied sites. Provide technical assistance and funding as available.

1.3.4. Provide technical assistance to Tribes that have flycatchers on their lands. Assist Tribes in developing watershed management plans, securing funding, and grant solicitation or grant writing to agencies that fund or manage watershed/wetland or riparian restoration initiatives.

1.3.5. Support Tribal efforts to improve currently suitable and potentially suitable habitat. Assist in securing fencing, off-site livestock drinkers, scientific and technical assistance in developing fire plans, post-fire restoration plans, cowbird management plans, and habitat monitoring programs.

1.3.6. Work with Tribes to determine the extent to which Tribal water rights might or might not be available to aid in conservation and recovery of the flycatcher. In all but a few instances in the Southwest, Indian water rights are senior to those of nearly all other users. Proposing changes in water use requires thorough evaluation of Tribal water rights and water resources. Federal agencies should consult with Tribes to determine the extent to which Tribal water rights are available, or not, to aid flycatcher recovery efforts.

1.3.7. Provide aid to Tribes for development of educational programs and opportunities that further flycatcher recovery.

2. Increase metapopulation stability.

2.1. Increase size, number, and distribution of populations and habitat within Recovery Units.

2.1.1. Conserve and manage all existing breeding sites. Conservation of all existing breeding sites and occupied habitats is crucial to recovery.

2.1.2. Secure, maintain, and enhance largest populations. Conservation and enhancement of the largest local flycatcher populations, now and as the species recovers, are key elements of recovering the bird. These local populations will serve as source populations, providing emigrating individuals to colonize new habitat as it develops. Sites that have 10 or more nesting pairs, and/or are near other suitable habitats or smaller populations, are capable of serving this recovery function. Current sites that are of particular importance are:

Rio Grande in the San Marcial area (NM);

Gila River in the Cliff-Gila Valley (NM);

Gila River from Bonita Creek to San Carlos Reservoir and from Winkleman to Ashurst-Hayden Dam (AZ);

San Pedro River from Aravaipa Creek to Gila Confluence (AZ);

Roosevelt Lake, Tonto Creek and Salt River Inflows (AZ);

Colorado River at Topock Marsh (CA);

Alamo Lake, Brown's Crossing (headwaters of Bill Williams River), and lower Santa Maria River (AZ);

South Fork of the Kern River (CA);

Upper San Luis Rey River (CA);

Santa Ynez River (CA);

Santa Margarita River on Camp Pendleton (CA); and

Alamosa National Wildlife Refuge (CO).

2.1.3. Develop new habitat near extant populations. Using the habitat restoration techniques described above, increase the extent, distribution, and quality of habitat close (≤15 km) to extant populations. This will increase the stability of local metapopulations by providing new habitat that will serve dual functions: (1) replacement habitat in the event of destruction of some habitat in the current population, and (2) new habitat for colonization, which once occupied will enhance connectivity between

sites.

2.1.3.1. Use existing habitat acquisition/conservation priorities. Use existing evaluations and priorities for acquiring, securing, and/or enhancing riparian habitat, whether for mitigation or pro-active conservation. The Bureau of Reclamation (USBR 1999c) has completed a range-wide assessment of flycatcher habitat for acquisition and conservation priorities.

2.1.4. Enhance connectivity to currently isolated occupied sites. Using the habitat restoration techniques described above, increase habitat near to and between currently isolated sites. This will create "stepping stones" of habitat to enhance connectivity as well as provide replacement habitat and colonization habitat.

2.1.5. Facilitate establishment of new, large populations in areas where none exist. Through habitat restoration, establish new populations of large size (≥25 territories) in areas where few or no flycatchers exist, but where there is a potential for habitat and establishing a population will increase metapopulation stability. This is particularly important in areas lacking such core populations, e.g., the lower Colorado River.

2.1.6. Increase population sizes at small occupied sites. Using the habitat restoration techniques described above, increase the number of breeding pairs at small sites (especially those with 10 or fewer territories) to improve stability and colonization potential.

3. Improve demographic parameters.

3.1. Increase reproductive success. A fundamental need for expanding flycatcher populations toward recovery are increases, locally and rangewide, in reproductive success. Increasing reproductive success will generate the increased numbers of new breeding birds needed to colonize restored habitats. Several stressors are at work that reduce reproductive success below adequate levels; these stressors must be relieved. Increasing the availability of suitable habitat, also fundamental to recovery, will remain unfulfilled without the new breeding birds to fill it.

3.1.1. Manage brown-headed cowbird parasitism after collection of baseline data show high rates of parasitism. Cowbird parasitism impacts flycatchers to varying degrees across the range of the bird. Local site situations, and management approaches, will differ because of many factors including habitat quality, flycatcher population size, and relative severity of other stressors on the flycatcher. For a complete discussion of cowbird effects and management, see Appendix F.

3.1.1.1. Increase the amount and quality of riparian habitat to increase habitat patch sizes and local flycatcher population sizes thereby minimizing levels and impacts of cowbird

parasitism. Enhancing habitat is likely to reduce the impact of cowbird parasitism, in several ways. Increased amounts of high quality habitat and increased patch sizes of such habitat will allow for larger flycatcher breeding populations. These larger populations are likely to experience reduced levels of cowbird parasitism by dispersing cowbird eggs over a larger number of nests. Larger populations are also less likely to suffer from stochastic demographic effects of parasitism such as total reproductive failure of all breeders. Also, due to their relatively larger amounts of interior habitat, large patches of riparian woodland are likely to further reduce cowbird parasitism and nest predation, both of which tend to be concentrated along habitat edges.

3.1.1.2. Develop cowbird management programs if warranted by baseline data on parasitism rates. Develop cowbird trapping programs that include the following elements: (1) a program of periodic reviews, every 3-5 years, by scientists who are not involved in the trapping program but who will assess its benefits to flycatcher breeding populations; (2) a statement of goals that define conditions that will end the trapping program (including local flycatcher population targets and delisting the bird); (3) a nest monitoring program for at least two years after trapping ceases to determine whether parasitism rates exceed acceptable levels; (4) assurance that funds will be available if cowbird trapping needs to be reinstated.

3.1.1.3. Implement cowbird management programs if warranted by baseline data on parasitism rates. Cowbird trapping should be instituted only after baseline data show that parasitism on a local population exceeds 20% - 30% for two or more successive years. See Appendix F for full discussion of important elements of trapping programs.

3.1.1.4. Pursue long-term landscape objectives for cowbird reduction. A long-term management objective should be to reduce cowbird numbers at landscape levels by reducing anthropogenic influences that provide foraging opportunities for them. These influences include bird feeders and other anthropogenic food sources such as livestock pastures. There should be no single distance over which livestock must be excluded from flycatcher populations, because the effectiveness of livestock exclusion depends on the availability of other food sources for cowbirds in the local landscape. In some landscapes there are so many potential food sources for cowbirds that the only limits on livestock should be exclusion from riparian habitat to protect the habitat itself.

3.1.2. Reduce direct impacts that topple or otherwise destroy nests. Reduce potential direct impacts on nests, by implementing grazing guidelines (see above and Appendix G) and measures to reduce recreation impacts (see above and Appendix M).

3.1.3. Reconsider assessments of habitat quality or other threats if cowbird control and/or other measures increase reproductive output but not the number of breeding flycatchers. Reconsider assessments of habitat quality or other threats if increases in flycatcher reproductive success due to cowbird control or other measures do not lead to increases in numbers of breeding birds in populations experiencing improved reproductive success or in populations that could receive emigrants from such populations.

4. Minimize threats to wintering and migration habitat. At this time, it is not possible to target management actions specifically for the endangered southwestern willow flycatcher subspecies, because the timing and areas of migration and wintering overlap for all subspecies. However, actions that benefit any one subspecies (or the species as a whole) are likely to benefit *E.t. extimus*.

4.1. Identify, for purposes of protection, riparian habitats in the U.S. that provide essential migration and stopover habitat. For a migrating flycatcher, almost any riparian vegetation is preferable to rip-rap banks, agricultural fields, or urban development. The presence of water can influence local insect abundance, a critical energy resource. Therefore, keeping water present in or adjacent to riparian habitats is desirable.

4.2. Restore, protect, and expand riparian migration and stopover habitats in the U.S. Expanding riparian habitats, and restoring those that are heavily damaged, will increase the distribution and amount of food (energy) resources available to migrating flycatchers. Pursue all opportunities for creating or restoring riparian vegetation, especially along portions of major river systems where riparian vegetation is rare or lacking. Prevent or minimize loss and degradation of existing riparian habitats. Protection should be afforded to a wide variety of habitats, not only those with the characteristics of flycatcher breeding sites. The presence of water can influence local insect abundance, and thus potential prey base and energy resources. Therefore, riparian restoration or creation projects should include the goal of maintaining water in or adjacent to these riparian habitats.

4.3. Pursue international partnerships to identify migration and winter habitats and threats. Almost nothing is known regarding migration patterns and stopover habitats, especially south of the U.S. border. Also, there is more information needed on winter status and distribution for much of the flycatcher's winter range, especially in northern South America. The USFWS, USGS, USFS, USBR, and State Game and Fish (SGF) agencies should pursue and support international partnerships that facilitate gathering this important information. Such partnerships may be governmental, private, or combinations of both. Much of the needed work could be conducted by local biologists in cooperation with experts from the U.S..

4.4. Encourage programs that preserve habitats used by wintering and migrating flycatchers. Once migration and winter habitats are identified, Federal agencies (including Agency for International Development) should work with other countries and existing private international conservation groups to develop programs to

protect these habitats. Such programs could involve the functional equivalents of conservation easements and agreements, land purchases, government agency policy directives, and/or similar programs. Successful programs will involve close cooperation between partners, and should incorporate extensive public outreach and education.

4.5. Encourage programs that minimize threats to wintering and migrating flycatchers. Migrating and wintering flycatchers face potential threats such as exposure to pesticides and other agrochemicals. This is especially true in parts of Central and South America, where many potent and injurious chemicals banned in the U.S. are still in widespread use. Federal agencies should work with other countries and existing private international conservation groups to develop and implement programs to alleviate or minimize these threats. Such programs could involve the functional equivalents of conservation easements and agreements, government agency policy directives, and/or similar programs. Successful programs will involve effective partnerships, and should incorporate extensive public outreach and education.

5. Survey and Monitor.

5.1. Facilitate and institute effective survey and monitoring programs.

5.1.1. Adopt standardized protocols for surveying and monitoring. Adopt standardized, rangewide protocols for surveying and monitoring to achieve rangewide comparable measures of occupancy, reproductive performance, and cowbird parasitism. These standardized protocols should also standardize and institutionalize annual reporting of data to appropriate State or Federal agencies, or other central data repository. Identify monitoring approach for downlisting: How often? What scale? What intensity (sampling, total census, etc.).

5.1.2. Institute appropriate monitoring of all reaches within management units.

5.1.3. Integrate survey data at State and rangewide levels. All survey and monitoring data should be reported annually and integrated at State and regional levels. This will allow annual monitoring of flycatcher status, particularly with respect to numerical recovery goals.

5.2. Monitor effects of management and restoration practices.

5.2.1. Review data for adaptive management purposes to improve effectiveness of management and restoration practices. The implementation and effectiveness of management and restoration practices should be monitored. Monitoring reports should be submitted to the USFWS to allow future practices to be modified and improved as warranted.

5.3. Survey to determine dispersal movements and colonization events. Suitable but unoccupied habitat should be surveyed to document dispersal movements, colonization events, and progression of habitat suitability.

5.4. Expand survey efforts in wintering habitat. With the consent of appropriate international authorities, perform surveys for wintering flycatchers in Central and South America. Provide technical and, where possible, financial support for local investigators to perform surveys.

6. Conduct Research.

6.1. Determine habitat characteristics that influence occupancy and reproductive success. Determine at local and landscape scales those habitat characteristics that influence occupancy of habitat by flycatchers, and reproductive success.

6.1.1. Determine plant species/structure that determines occupancy and reproductive success. The floristic characteristics of breeding habitat that contribute beneficially to site occupancy and reproductive success should be better defined. Characteristics requiring further definition include plant species composition and associations, structure, age classes, and patch size/configuration. These investigations should be done at both the patch and landscape scales using remote sensing and GIS technology.

6.1.2. Determine habitat area needed for breeding birds. The amount of habitat area needed for long-term conservation along dynamic ecosystems, as well as on managed, regulated rivers, should take into account the rate of riparian habitat succession, loss, and regeneration in different parts of the flycatcher's range; plant species composition; frequency of catastrophic events such as flood, fire, and drought; and factors identified in 6.1.1. above. These investigations should be done at both the patch and landscape scales using remote sensing and GIS technology.

6.1.3. Determine effects of conspecifics on site occupancy and reproductive success. The flycatcher is sometimes described as quasi-colonial, in that breeding pairs tend to occur in clusters. This tendency may affect annual occupancy of a habitat patch, and also reproductive success, due to effects on defense against (or attraction of) cowbirds and/or predators, opportunities for polygyny and re-pairing, etc. The presence of other willow flycatcher subspecies in *E. t. extimus* breeding habitat early in the breeding season may affect these phenomenon. These phenomena should be better understood, because of their potential effect on the fundamental demographic factors of site colonization, site occupancy, and reproductive success.

6.1.4. Determine use vs. availability of exotics in occupied sites. The use of exotic plant associations by flycatchers should be compared with availability of exotic associations, to better define any preferences and/or avoidances.

6.1.5. Determine long-term ecological productivity of native habitats vs. exotic habitats. The relative effects on long-term flycatcher productivity of native habitats (e.g., willows, boxelder) versus

exotics (e.g., tamarisk, Russian olive) and various mixed associations, should be determined.

6.1.6. Refine understanding of effects of physical microclimate on site occupancy and reproduction. Physical parameters of nest sites such as the temperature, humidity, and insolation of the habitat interior may significantly affect site occupancy and reproductive success. These parameters may substantially differ in habitats dominated by native vs. exotic plant associations. The significance of these parameters should be better defined.

6.1.7. Determine influence of environmental toxins on breeding, survival, and prey base. Environmental toxins are a potential impact on breeding flycatchers. The possible scope and influence of this factor should be determined, by blood/tissue sampling, soil and water analysis, and by conducting information surveys to determine what agents are being used in any given area.

6.2. Investigate dam and reservoir management for maximizing downstream and delta habitat. Research is needed to identify management opportunities for operating dams and reservoirs to maximize habitat downstream, and at river inflow delta areas. This research should not only identify ways to maximize habitat, but also ways to anticipate and manage the inevitable setbacks imposed by prolonged drought and large/extended precipitation events.

6.3. Investigate surface and groundwater management scenarios to determine thresholds for habitat suitability and to maximize habitat quality. Research is needed to identify management opportunities for managing surface and groundwater to maximize habitat. This research should not only identify ways to maximize habitat, but also ways to anticipate and manage the inevitable setbacks imposed by prolonged drought.

6.4. Investigate grazing systems, strategies, and intensities for riparian recovery and maintenance.

6.4.1. Investigate grazing systems, strategies, and intensities for riparian recovery and maintenance. Research on the effects and uses of livestock grazing on riparian ecosystem health and recovery should be increased and refined. It is imperative that such research include comparison of control versus treatment areas, better documentation of grazing intensities and systems, previous land uses, and other potentially complicating factors. Federal land management agencies should work with State universities, private colleges, and research institutions to fund and facilitate research that better defines the ecological and hydrological effects and sustainability of livestock grazing in southwestern riparian ecosystems.

6.4.2. Investigate direct effects of livestock grazing on the flycatcher. The direct effects of livestock grazing, such as physically damaging nests or nest trees, should be further investigated.

6.4.3 Investigate impacts of native ungulates on riparian recovery and maintenance.

6.5. Conduct research on cowbird parasitism and control.

6.5.1. Collect baseline data on cowbird parasitism. Before cowbird control is initiated at a site, collect at least two years of baseline data to determine whether cowbird control is warranted. See Appendix F for guidelines.

6.5.2. Experimentally test the efficacy of cowbird trapping programs. Trapping efforts should be designed in part as experiments that can determine whether cowbird trapping benefits flycatcher populations, by reducing declines or allowing increases in numbers. See Appendix F for guidelines for these experiments.

6.6. Determine the most successful techniques for creating or restoring suitable habitat to degraded or former riparian lands, such as abandoned agricultural fields in riparian corridors.

6.7. Refine methods for determining distribution and population status and trends.

6.7.1. Acquire demographic and dispersal information. Acquire data on demographics and dispersal, through color banding.

6.7.2. Conduct limiting factor analyses. Conduct analyses to identify factors that may be limiting population stability, including contaminants, predators, patch size, and habitat effects on reproductive success.

6.7.3. Explore new methods and data needs for population viability analyses. As data on the flycatcher accumulate and the science of population viability analysis evolves, managers should evaluate which methods are most appropriate for the flycatcher, and assure that the necessary data are being collected.

6.7.4. Develop methodologies, which can be site specific if necessary, for determining year-to-year trends in population sizes at breeding sites. As various management strategies are applied at sites over periods of several years or more, it will be essential to accurately determine whether targeted populations respond in a favorable manner with increased population sizes. Methodologies developed to achieve this goal will have to control for survey intensity and frequency, amount of area surveyed, development of additional habitat (if the management action of interest is not dealing with the generation of new habitat) and year-to-year within site movements of flycatchers. To achieve success in this regard, methodologies need not result in complete counts of local populations but should generate reliable yearly indicators of the population size at a particular site.

6.7.5. Establish and refine protocols for addressing flycatcher distribution. To accurately determine changes in distribution and status, methodologies should be developed to monitor sites with suitable habitat but lacking flycatchers, so as to establish data on absence and on years when the sites become occupied.

6.8. Determine present and historical distribution of the subspecies through genetic work. The taxonomic status and distribution of the willow flycatcher subspecies should continue to be refined, through genetic research.

6.9. Determine migration and wintering distribution, habitat, and threats.

6.9.1. Investigate migration ecology, habitat selection and use. Although recent work has shed some light on migration timing and habitat use within some major southwestern rivers, little is known about migration, especially south of the U.S. border. Migration routes and stopover habitats/areas should be determined. This will require continued banding on the breeding grounds, in combination with netting/banding during migration periods, in all potential migration regions and habitats. Because most of the distance flycatchers travel during migration is outside of the U.S., research should focus on the types, locations, and extent of habitats used in those areas. This could identify geographic areas of habitats of particular concern, and allow development of specific management actions. Additional research is also needed to document important migratory behaviors, pathways, and survival in the U.S., including the relative value of different riparian habitats.

6.9.2. Investigate wintering distribution, status, ecology, and habitat selection. Recent work has provided valuable information on flycatcher wintering distribution, status, and ecology. However, these data are limited to Mexico, Costa Rica, El Salvador, and Panama, and do not include a substantial part of the willow flycatcher's winter range. Knowledge of winter distribution, habitat use, survival, and threats is needed for other areas. Additional research on winter survival, site fidelity, habitat selection, and habitat quality are also needed to properly assess habitat characteristics, quality, and availability. Remote sensing and GIS technologies should be used to determine landscape-level habitat distribution and availability.

6.9.3. Determine influence of environmental toxins on wintering flycatchers and their prey base. As in the breeding range, environmental toxins are a potential impact on the wintering grounds. The possible scope and influence of this factor should be determined, by blood/tissue sampling and by conducting information surveys to determine what agents are being used in any given area.

6.10. Conduct research on means of increasing reproductive success by approaches other than, or in addition to, cowbird management. Evaluate feasibility and effectiveness of reproductive manipulations such as reducing losses of flycatcher eggs and nestlings to general nest predators.

6.11. Conduct research to determine why increases in reproductive success due to cowbird control, or other measures, may not lead to increases in numbers of breeding birds. Determine for populations experiencing reproductive success and for populations that could receive emigrants from such populations, why numbers of breeding birds do not increase.

6.12. Investigate feasibility of reducing or eliminating habitat fire hazards. Without impacting flycatcher habitat, investigate methods for reducing or eliminating flammability of riparian habitat, e.g., reducing ignition sources. There has been little, if any, experimentation with fuel reduction in riparian habitats, especially tamarisk, and there are no standard guidelines on how best to accomplish this. Experimental riparian fuel reduction and flammability modification should be tested, conducted only in unoccupied habitats until the success and ramifications are better understood. Efficacy of these actions as a fire management tool, and effects on flycatcher habitat, should be tested in a scientific, controlled fashion.

6.12.1. Evaluate fuel reduction techniques in riparian habitats, especially tamarisk types. There has been little, if any, experimentation with fuel reduction in riparian habitats, especially tamarisk, and there are no standard guidelines on how best to accomplish this.

6.12.2. Test modifying flammability for fuels to modify fire risks. Evaluate whether managing for high water content in tamarisk by providing shallow depth to ground water allows tamarisk stands to be more fire resistant than if water is deeper.

6.12.3. Test the ability of prescribed fires to achieve desired fire hazard reduction, habitat protection, and habitat improvement. To better manage the controlled burns in tamarisk stands, one may wish to limit efforts to the rainy season, inundate the stand before burning, or reduce the fuel loads mechanically before burning.

7. Provide public education and outreach.

7.1. Hold annual Implementation Subgroup meetings. Convene annual meetings to report progress, review data, evaluate ongoing actions, and to plan and coordinate future work.

7.2. Maintain updated website. Maintain updated flycatcher website to disseminate new information on the flycatcher, current and developing habitat restoration technologies, problem-solving forums relating to implementing recovery actions, and other information relevant to flycatcher recovery.

7.3. Prepare brochures and make available to public.

7.3.1. Educate public about landscaping with native plants. Educate agencies and public about the benefits of landscaping and revegetating with native plants, and discourage use of exotics.

7.3.2. Educate public about other recreational impacts, especially fire hazards. Develop brochures, signs, and other interpretive materials to educate river and riparian recreationists about the ecological roles of fires and floods, and the potential dangers of accidental fires. In the long-term, this should help to reduce accidental fires and garner public support for the implementation of ecological restoration

approaches. Inform maintenance and utility workers about the importance of protecting habitat. Educate equestrians about the value of overhanging branches to nesting birds and encourage them to avoid trimming overhanging branches.

7.3.3. Educate public about cowbird control. Inform public about cowbird ecology, impacts on other bird species, and approaches to cowbird control (See Appendix F). Inform the public of factors that enhance cowbird abundance, and measures that can be taken to reduce their abundance.

7.4. Post and maintain signs at some protected flycatcher breeding locations. At flycatcher breeding locations that are exposed to substantial levels of public use, signs should be posted and maintained that inform the public about necessary protective measures, and the overall ecological and economic goals and benefits of riparian restoration.

7.5. Conduct information exchange programs with foreign governments and publics. Inform the foreign governments and public about the flycatcher, the importance of migration stopover and winter habitats, and the threats the flycatcher faces during these periods. Work with local biologists, government officials, and private landowners to identify specific actions that can be undertaken, at particular sites, that will benefit wintering and migrating flycatchers.

7.6. Conduct symposia and workshops. As information accumulates regarding flycatcher ecology, restoration ecology and techniques, and ancillary issues of riparian and aquatic recovery, it will be important to share information in the interactive forum of symposia and workshops. These should be organized and sponsored by State and Federal agencies, and target private stakeholders, academic, independent researchers, and government regulatory and resource biologists.

7.7. Continue survey training. Survey training provided by State wildlife agencies, the USFWS, and/or Partners In Flight programs should be continued. These training sessions are crucial for assuring consistency in survey methods and minimizing disturbance of flycatchers. Training sessions also serve as important information-sharing meetings. While written survey protocols largely achieve the goals of standardizing surveys, annual survey training allows valuable opportunities for clarifying questions, exploring issues, and sharing accumulated experiences in an interactive setting.

8. Assure implementation of laws, policies and agreements that benefit the flycatcher.

8.1. Fully implement §7(a)(1) of the ESA. Section 7(a)(1) of the ESA requires all Federal agencies to use their authorities to further the conservation of the flycatcher and all other listed species. Federal agencies should meet this obligation to promote recovery of the flycatcher proactively, not simply as an outcome of consultation under ESA §7(a)(2).

8.2. Fully implement all Biological Opinions resulting from ESA §7(a)(2) consultations. Federal agencies can accomplish significant recovery efforts by fully implementing all Reasonable and Prudent Measures, Alternatives, and Conservation Recommendations resulting from consultation with the USFWS under the authority of ESA §7(a)(2). For example, the Lower Colorado River Biological Opinion obligates significant habitat acquisition that will substantially promote flycatcher recovery.

8.3. Monitor, support, and evaluate compliance with laws, policies and agreements that provide conservation benefits to the flycatcher.

8.3.1. Support compliance with ESA §7(a)(1) of the ESA. Section 7(a)(1) requires Federal agencies to use their authorities to further the conservation of the southwestern willow flycatcher and all other listed species.

8.3.2. Provide resource managers with training in conservation benefits. Provide resource managers with training in the ecological and economic benefits of riparian protection and enhancement, for species and resources other than the flycatcher.

8.3.3. Monitor compliance with ESA §7(a)(2) of the ESA. Section 7(a)(2) requires Federal agencies to consult with the Service to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat.

8.3.4. Ensure consistency among ESA §7(a)(2) consultations. Consultations and resultant Biological Opinions should use consistent approaches, criteria, and data with regard to environmental baselines, effects of actions, take, jeopardy/non-jeopardy thresholds, incidental take allowed, reasonable and prudent measures, and conservation recommendations.

8.3.5. Monitor compliance with existing Biological Opinions. All Federal agencies should assure compliance with Biological Opinions, including reporting implementation of conservation recommendations and reasonable and prudent measures and alternatives. Determining the actual effects of Federal actions, to compare with the anticipated effects, will provide an important feedback loop to continually refine conservation and recovery measures.

8.4. Integrate recovery efforts with those for other species. Planning flycatcher recovery is directly related to planning for other endangered riparian birds, native fishes, reptiles, amphibians, invertebrates, and plants because they all are dependent on the same hydrologic, geomorphic, and vegetation systems. Decisions that affect one species will inevitably affect all of them, yet recovery planning and implementation efforts are not formally connected. Therefore, formally connect planning and decision making for flycatcher recovery with the recovery of other imperiled aquatic and riparian species, e.g., Rio Grande silvery minnow, woundfin, Virgin River chub,

Moapa dace, Pahranagat roundtail chub, and others (see Table 6). Determine likely interaction effects of implementing a plan for one species on the others. Integrate management into State and regional Partners In Flight Bird Conservation Plans.

8.5. Monitor compliance and effectiveness of agreements and other mechanisms used as delisting criteria.

8.6. Continue implementation of Secretarial Order 3206.

8.6.1. Effectively communicate with Tribes. Appropriate agencies should meet annually with Tribes to report progress on conservation measures, review data, plan future efforts, and coordinate joint activities.

9. Track recovery progress.

9.1. Maintain collaborative structure of Recovery Team. Maintain a Recovery Team structure that retains the Technical and Implementation Subgroups, and the Tribal Working Group. Appoint a USFWS southwestern willow flycatcher recovery coordinator in each USFWS region, with lead coordination through USFWS Region 2.

9.2. Annual review of survey and monitoring data. The Technical Subgroup and recovery coordinators should have access to, acquire, and review all annual survey and monitoring data; these data should be shared with the Implementation Subgroups and Tribal Working Group. Data and interpretations provided by compiling entities (e.g., State wildlife agencies, Partners In Flight programs) should be reviewed and included in an annually updated comprehensive assessment of the population status of the flycatcher.

9.3. Review and synthesis of current flycatcher research and other pertinent research. The Technical Subgroup and recovery coordinators should keep aware of current research on the flycatcher and other pertinent research (e.g., restoration ecology), to maintain a comprehensive synthesis of the current body of knowledge relevant to flycatcher recovery. New research data should be shared with the Implementation Subgroups and Tribal Working Group.

9.4. Repeat Population Viability Analysis. After adequate new monitoring data have accumulated, repeat a Population Viability Analysis to re-examine the flycatcher's status and conservation priorities.

9.5. Develop recommendations for survey and monitoring strategies. The Technical Subgroup and recovery coordinators should, with the assistance of State wildlife agencies and Partners In Flight groups, periodically review survey and monitoring strategies and methods to evaluate their efficacy in maintaining an effective view of the flycatcher's status. Methodologies and strategies should be revised as appropriate, and this information communicated to the Implementation Subgroups and Tribal Working Group.

9.6. Update Recovery Plan every 5 years. Modify this recovery plan in response to management, monitoring, and research data, at 5-year intervals.

F. Minimization of Threats to the Southwestern Willow Flycatcher Through Implementation of Recovery Actions

A species may be determined to be an endangered or threatened species due to one or more of the five factors described in Section 4(a)(1) of the ESA. The final rule listing the southwestern willow flycatcher evaluated threats to the species in terms of three listing factors (USFWS 1995). The three listing factors included: the present or threatened destruction, modification, or curtailment of the flycatcher's habitat or range; the inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting the flycatcher's continued existence. At the time of listing, the USFWS was unaware of threats resulting from overutilization for commercial, recreational, scientific, or educational purposes. The USFWS was also unaware of any disease that constitutes a significant threat to the flycatcher, but did recognize that predation of southwestern willow flycatchers may constitute a significant threat that may be increasing with habitat fragmentation. Implementation of the recovery actions described in Section IV. D. and E. above would minimize these threats as follows:

Listing Factor 1: The present or threatened destruction, modification, or curtailment of its habitat or range. Loss and modification of southwestern riparian habitats have occurred from urban and agricultural development, water diversion and impoundment, channelization, livestock grazing, off-road vehicle and other recreational uses, and hydrological changes resulting from these and other land uses (USFWS 1995). The final rule also recognizes invasion by the exotic tamarisk as another likely factor in the loss and modification of southwestern willow flycatcher habitat. Recommended recovery actions that would minimize these threats are: 1. Increase and improve currently suitable and potentially suitable habitat; 1.1. Secure and enhance currently suitable and potentially suitable habitat on Federal lands, lands affected by Federal actions, and cooperating non-Federal and Tribal lands; 1.1.1. Develop management plans to reduce threats and promote processes that secure, restore, and enhance currently suitable and potentially suitable habitat; 1.1.2. Manage physical elements and processes to reduce threats and promote processes that secure, restore, and enhance currently suitable and potentially suitable habitat; 1.1.2.1. Restore the diversity of fluvial processes; 1.1.2.1.1. Identify dams where modification of dam operating rules will benefit recovery of the flycatcher; 1.1.2.1.2. Identify dams where modification of dam operations will benefit recovery of the flycatcher by taking advantage of system flexibility and water surpluses/flood flows; 1.1.2.1.3. Determine feasibility of simulating the natural hydrograph to restore/enhance riparian systems; 1.1.2.1.4. Determine feasibility of managing reservoir levels to establish and maintain lake fringe and inflow habitat; 1.1.2.1.5. Determine feasibility of using surplus and/or flood flows to increase or add water to marsh areas between levees and on flood plains; 1.1.2.1.6. Determine feasibility of keeping daily ramping rates and daily fluctuations for dam releases as gradual as possible to prevent bank erosion and loss of riparian vegetation, except when mimicking flood flows; 1.1.2.1.7. Determine feasibility of augmenting sediment in sediment-depleted systems; 1.1.2.1.8. Implement 1.1.2.1.3. – 1.1.2.1.7., where determined feasible; 1.1.2.1.9. Monitor 1.1.2.1.3. – 1.1.2.1.7., and provide feedback to the Technical Subgroup; 1.1.2.2.

Restore adequate hydrogeomorphic elements to expand habitat, favor native over exotic plants, and reduce fire potential; 1.1.2.2.1. Increase water available for recovery; 1.1.2.2.1.1. Increase efficiency of groundwater management to expand habitat, favor native over exotic plants, and reduce fire potential; 1.1.2.2.1.2. Use urban waste water outfall and rural irrigation delivery and tail waters for habitat restoration to expand habitat, favor native over exotic plants, and reduce fire potential; 1.1.2.2.1.3. Provide (reestablish) instream flows to expand habitat, favor native over exotic plants, and reduce fire potential; 1.1.2.2.2. Expand the active channel area that supports currently suitable and potentially suitable flycatcher habitat by increasing the width of levees and using available flows to mimic overbank flow; 1.1.2.2.3. Reactivate flood plains to expand native riparian forests; 1.1.2.2.4. Restore more natural channel geometry (width, depth, bank profiles) where the return of the natural hydrograph will be insufficient to improve habitat; 1.1.2.3. Manage fire to maintain and enhance habitat quality and quantity; 1.1.2.3.1. Develop fire risk and management plans; 1.1.2.3.2. Suppress fires; 1.1.2.3.3. Restore ground water, base flows, and flooding; 1.1.2.3.4. Reduce incidence of flammable exotics; 1.1.2.3.4.1. Manage/reduce exotic species that contribute to increased fire incidence; 1.1.2.3.4.2. Use water more efficiently and reduce fertilizer applications; 1.1.2.3.5. Reduce recreational fires; 1.1.3. Manage biotic elements and processes; 1.1.3.1. Restore biotic interactions, such as herbivory, within evolved tolerance ranges of the native riparian plant species; 1.1.3.1.1. Manage livestock grazing to restore desired processes and increase habitat quality and quantity; 1.1.3.1.1.1. If livestock grazing is a major stressor implement conservative livestock grazing guidelines. Implement general livestock grazing guidelines from Appendix G (see also Section IV. F.; Narrative Outline for Recovery Actions) in occupied, suitable, or restorable habitat (restorable habitats are riparian systems that have the appropriate hydrologic and ecologic setting to be suitable flycatcher habitat); 1.1.3.1.1.2. Determine appropriate use areas for grazing; 1.1. 3.1.1.3. Reconfigure grazing management units; 1.1.3.1.1.4. Improve documentation of grazing practices; 1.1.3.1.2. Manage wild ungulates; 1.1.3.1.3. Manage keystone species; 1.1.3.2. Manage exotic plant species; 1.1.3.2.1. Develop exotic species management plans; 1.1.3.2.2. Coordinate exotic species management efforts; 1.1.3.2.3. Restore ecosystem conditions that favor native plants; 1.1.3.2.3.1. Eliminate physical stresses, such as high salinity or reduced stream flows, that favor exotic plants; 1.1.3.2.3.2. Create or allow for a river hydrograph that restores the natural flood disturbance regime; 1.1.3.2.3.3. Restore ungulate herbivory to intensities and types under which native plant species are more competitive; 1.1.3.2.4. Retain native riparian vegetation in floodplains or channels; 1.1.3.2.5. Retain exotic species at sites dominated by native riparian vegetation.; 1.1.3.2.5.1. At native dominated sites, retain tamarisk in occupied flycatcher habitat and, where appropriate, in suitable but unoccupied habitat, unless there is a trend for steady increase of tamarisk; 1.1.3.2.5.2. If needed, increase habitat quality within stands of exotic plants by implementing restorative actions such as seasonal flooding; 1.1.3.2.6. Remove exotics in occupied, suitable but unoccupied, and potentially suitable habitats dominated by exotics only if: 1) underlying causes for dominance of exotics have been addressed, 2) there is evidence that the exotic species will be replaced by vegetation of higher functional value, and 3) the action is part of an overall restoration plan; 1.1.3.2.6.1. In suitable and potential habitats where exotic species are to be removed through chemical or mechanical means, use a temporally staged approach to clear areas so some mature habitat remains throughout the restoration period for potential use by flycatchers; 1.1.3.2.6.2. Release habitat-targeted biocontrol agents only outside the breeding range of the flycatcher; 1.1.3.3. Provide areas protected from

recreation; 1.1.3.3.1. Reduce impacts from recreationists; 1.1.3.3.2. Confine camping areas; 1.1.3.3.3. Restore habitat impacted by recreation; 1.1.3.3.4. Place designated recreation shooting areas away from riparian areas; 1.1.3.3.5. Minimize attractants to scavengers, predators, and brown-headed cowbirds; 1.1.3.3.6. Provide on-site monitors where recreation conflicts exist; 1.2. Work with private landowners, State agencies, municipalities, and nongovernmental organizations to conserve and enhance habitat on non-Federal lands; 1.2.1. Evaluate and provide rangewide prioritization of non-Federal lands; 1.2.2. Achieve protection of occupied habitats; 1.2.3. Provide technical assistance to conserve and enhance occupied habitats on non-Federal lands; 1.2.4. Pursue joint ventures toward flycatcher conservation; 1.3. Work with Tribes to develop conservation plans and strategies to realize the considerable potential for conservation and recovery on Tribal lands; 1.3.1. Work with Tribes to establish a regular system of surveys and monitoring, and train Tribal staff in the flycatcher survey protocol; 1.3.2. Determine protocols for information sharing; 1.3.3. Maintain an incumbent in the position of Tribal Liaison to the Technical Subgroup; 1.3.4. Provide technical assistance to Tribes that have flycatchers on their lands; 1.3.5. Support Tribal efforts to improve currently suitable and potentially suitable habitat; 1.3.6. Work with Tribes to determine the extent to which Tribal water rights might or might not be available to aid in conservation and recovery of the flycatcher; 1.3.7. Provide aid in developing educational programs and opportunities that further flycatcher recovery; 2. Increase metapopulation stability; 2.1. Increase size, number, and distribution of populations and habitat within Recovery Units; 2.1.1. Conserve and manage all existing breeding sites; 2.1.2. Secure, maintain, and enhance largest populations; 2.1.3. Develop new habitat near extant populations; 2.1.3.1. Use existing habitat acquisition/conservation priorities; 2.1.4. Enhance connectivity to currently isolated occupied sites; 2.1.5. Facilitate establishment of new, large populations in areas where none exist, through habitat restoration; 2.1.6. Increase population sizes at small occupied sites; 4.1. Identify, for purposes of protection, riparian habitats in the U.S. that provide essential migration and stopover habitat; 4.2. Restore, protect, and expand riparian migration and stopover habitats in the U.S.; 4.3. Pursue international partnerships to identify migration and winter habitats and threats; 4.4. Encourage programs that preserve habitats used by wintering and migrating flycatchers; 4.5. Encourage programs that minimize threats to wintering and migrating flycatchers. 5.4. Expand survey efforts in wintering habitat; 6.1. Determine habitat characteristics that influence occupancy and reproductive success; 6.1.1. Determine plant species / structure that determines occupancy and reproductive success; 6.1.2. Determine habitat area needed for breeding birds; 6.1.3. Determine effects of conspecifics on site occupancy and reproductive success; 6.1.4. Determine use vs. availability of exotics in occupied sites; 6.1.5. Determine long-term ecological productivity of native habitats vs. exotic habitats; 6.1.6. Refine understanding of effects of physical microclimate on site occupancy and reproduction; 6.2. Investigate dam and reservoir management for maximizing downstream and delta habitat; 6.3. Investigate surface and groundwater management scenarios to determine thresholds for habitat suitability and to maximize habitat quality; 6.4. Investigate grazing systems, strategies, and intensities for riparian recovery and maintenance; 6.4.1. Investigate grazing systems, strategies, and intensities for riparian recovery and maintenance; 6.4.2. Investigate direct effects of livestock grazing on the flycatcher; 6.4.3 Investigate impacts of native ungulates on riparian recovery and maintenance; 6.6. Determine the most successful techniques for creating or restoring suitable habitat to degraded or former riparian lands, such as abandoned agricultural fields in riparian corridors; 6.9.

Determine migration and wintering distribution, habitat, and threats; 6.9.1. Investigate migration ecology, habitat selection and use; 6.9.2. Investigate wintering distribution, status, ecology , and habitat selection; 6.12. Investigate feasibility of reducing or eliminating habitat fire hazards; 6.12.1. Evaluate fuel reduction techniques in riparian habitats, especially tamarisk types; 6.12.2. Test modifying flammability for fuels to modify fire risks; 6.12.3. Test prescribed fire to achieve desired fire hazard reduction, habitat protection, and habitat improvement; 7.3.1. Educate the public about landscaping with native plants; 7.3.2. Educate the public about recreational impacts, especially about fire hazards; and 7.4. Post and maintain signs at some protected flycatcher breeding locations.

Listing Factor 2: Overutilization for commercial, recreational, scientific, or educational purposes. The USFWS is unaware of threats resulting from overutilization.

Listing Factor 3: Disease or predation. The USFWS is unaware of any disease that constitutes a significant threat to the southwestern willow flycatcher. However, predation may constitute a significant threat and may be increasing with habitat fragmentation. This threat is addressed by recovery actions 1.1.3.3.5. Minimize attractants to scavengers, predators, and brown-headed cowbirds; and 6.10. Conduct research on means of increasing reproductive success by approaches other than, or in addition to, cowbird management, such as reducing losses of flycatcher eggs and nestlings to general nest predators.

Listing Factor 4: The inadequacy of existing regulatory mechanisms. Prior to listing, the Migratory Bird Treaty Act (MBTA) (16 U.S.C. § 703-712) was the only Federal protection provided for the southwestern willow flycatcher. Unlike the ESA, there are no provisions in the MBTA preventing habitat destruction unless direct mortality or destruction of active nests occurs. State listings of the flycatcher in New Mexico and Arizona do not convey habitat protection or protection of individuals beyond existing regulations on capture, handling, transportation, and take of native wildlife. In California, the California Endangered Species Act (CESA) prohibits unpermitted possession, purchase, sale, or take of listed species, but the CESA definition of take does not include harm, which under the ESA can include destruction of habitat that actually kills or injures wildlife by significantly impairing essential behavioral patterns (although CESA requires consultation between the CDFG and other State agencies to ensure that activities of State agencies will not jeopardize the continued existence of State-listed species). As a consequence, the USFWS determined additional protections under the ESA to be necessary. Threats associated with the inadequacy of existing regulatory mechanisms are addressed by the following recommended recovery actions: 4. Minimize threats to wintering and migration habitat; 4.1. Identify, for purposes of protection, riparian habitats in the U.S. that provide essential migration and stopover habitat; 4.2. Restore, protect, and expand riparian migration and stopover habitats in the U.S; 4.3. Pursue international partnerships to identify migration and winter habitats and threats; 4.4. Encourage programs that preserve habitats used by wintering and migrating flycatchers; 4.5.

Encourage programs that minimize threats to wintering and migrating flycatchers; 7.5. Conduct information exchange programs with foreign governments and publics; 8. Assure implementation of laws, policies and agreements that benefit the flycatcher; 8.1. Fully implement §7(a)(1) of the ESA; 8.2. Fully implement all Biological Opinions resulting from ESA §7(a)(2) consultations; 8.3. Monitor, support, and evaluate compliance with laws, policies and agreements that provide conservation benefits; 8.3.1. Support compliance with ESA §7(a)(1) of the ESA; 8.3.3. Monitor compliance with ESA §7(a)(2) of the ESA; 8.3.4. Ensure consistency among ESA §7(a)(2) consultations; 8.3.5. Monitor compliance with existing Biological Opinions; 8.5. Monitor compliance and effectiveness of agreements and other mechanisms used as delisting criteria; 8.6. Continue implementation of Secretarial Order 3206; and 8.6.1. Effectively communicate with Tribes.

Listing Factor 5: Other natural or manmade factors affecting its continued existence. The final rule recognizes threats associated with the susceptibility of small, isolated populations, threats from brood parasitism by the brown-headed cowbird, and potential threats from pesticides as a result of the flycatcher's preference for floodplain areas that are now largely agricultural. Recommended recovery actions that address these threats include: 2. Increase metapopulation stability; 2.1. Increase size, number, and distribution of populations and habitat within Recovery Units; 2.1.1. Conserve and protect all existing breeding sites; 2.1.2. Secure, maintain, and enhance largest populations; 2.1.3. Develop new habitat near extant populations; 2.1.3.1. Use existing habitat acquisition/conservation priorities; 2.1.4. Enhance connectivity to currently isolated occupied sites; 2.1.5. Facilitate establishment of new, large populations in areas where none exist, through habitat restoration; 2.1.6. Increase population sizes at small occupied sites; 3.1.1.1. Increase the amount and quality of riparian habitat to increase habitat patch sizes and local flycatcher population sizes thereby minimizing levels and impacts of cowbird parasitism; 3. Improve demographic parameters; 3.1. Increase reproductive success; 3.1.1. Manage brown-headed cowbird parasitism after collection of baseline data shows high rates of parasitism; 3.1.1.1. Increase the amount and quality of riparian habitat to increase habitat patch sizes and local flycatcher population sizes thereby minimizing levels and impacts of cowbird parasitism; 3.1.1.2. Develop cowbird management programs if warranted by baseline data on parasitism rates; 3.1.1.3. Implement cowbird management programs if warranted by baseline data on parasitism rates; 3.1.1.4. Pursue long-term landscape objectives for cowbird reduction; 3.1.2. Reduce direct impacts that topple or otherwise destroy nests; 3.1.3. Reconsider assessments of habitat quality or other threats if cowbird control measures do not increase numbers of breeding flycatchers; 6.1.7. Determine influence of environmental toxins on breeding, survival, and prey base; 6.5. Conduct research on cowbird parasitism and control; 6.5.1. Collect baseline data on cowbird parasitism; 6.5.2. Experimentally test the efficacy of cowbird trapping programs; 6.9.3. Determine influence of environmental toxins on wintering flycatchers and their prey base; 6.11. Conduct research to determine why increases in reproductive success due to cowbird control or other measures may not lead to increases in numbers of breeding birds in populations experiencing improved reproductive success or in populations that could receive emigrants from such populations; and 7.3.3. Educate the public that cowbird parasitism is a natural process but may require management efforts in some instances due to high levels or other stressors that have endangered flycatchers.