ACTION: Notice of 12-month petition finding and 5-year review.

SUMMARY: We, the U.S. Fish and Wildlife Service (USFWS), announce a 12-month finding on a petition to delist (remove from the List of Threatened and Endangered Species) the southwestern willow flycatcher (*Empidonax traillii extimus*) as an endangered species under the Endangered Species Act of 1973, as amended (Act). This finding also constitutes a 5-year review for the southwestern willow flycatcher. After review of the best available scientific and commercial information, we find that delisting the southwestern willow flycatcher is not warranted at this time. However, we ask the public to submit to us any new information that becomes available concerning the threats to the southwestern willow flycatcher, its status, taxonomy, or its habitat at any time.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Act (16 U.S.C. 1531 *et seq.*), requires that, for any petition to revise the Federal Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information that delisting the subspecies may be warranted, we make a finding within 12 months of the date of receipt of the petition. In this finding, we will determine that the petitioned action is: (1) Not warranted, (2) warranted, or (3) warranted, but the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are endangered or threatened, and expeditious progress is being made to add or remove qualified species from the Federal Lists of Endangered and Threatened Wildlife and Plants. We must publish these 12-month findings in the **Federal Register**.

Previous Federal Actions

The southwestern willow flycatcher (flycatcher) was listed as endangered under the Act (16 U.S.C.1531 et seq.) on February 27, 1995 (60 FR 10694). On July 22, 1997, we published a final critical habitat designation for the flycatcher along 964 river km (599 river mi) in Arizona (AZ), California (CA), and New Mexico (NM) (62 FR 39129). We published a correction notice on August 20, 1997, on the lateral extent of critical habitat (62 FR 44228). Following a 1998 lawsuit from the NM Cattle Growers' Association, critical habitat was vacated. On October 19, 2005 (70 FR 60886), we designated flycatcher critical habitat along river segments in AZ, CA, NM, Nevada (NV), and Utah (UT), totaling approximately 48,896 ha (120,824 ac) or 1,186 km (737 mi) in 15 of the 32 Management Units described in the Recovery Plan (USFWS 2002, p. 63). On July 13, 2010, as a result of litigation by the Center for Biological Diversity over our 2005 critical habitat rule, we agreed to redesignate critical habitat. On January 3, 2013 (78 FR 344), we finalized a revised flycatcher critical habitat designation in AZ, CA, NM, NV, UT, and Colorado (CO), totaling 1,975 kms (1,227 mi) and 84,569 ha (208,973 ac). Flycatcher critical habitat river segments occurred in 24 of the 32 Management

Units where there are numerical flycatcher territory and habitat goals (USFWS 2002, p. 63).

On August 20, 2015, we received a petition dated August 19, 2015, from The Pacific Legal Foundation (representing The Center for Environmental Science, Accuracy, and Reliability; Building Industry Legal Defense Fund; CA Building Industry Association; CA Cattlemen's Association; NM Business Coalition, NM Cattle Growers Association; NM Farm and Livestock Bureau; and NM Wool Growers Inc.), requesting that the southwestern willow flycatcher be delisted under the Act. Included in the petition was information arguing that the southwestern willow flycatcher is not a valid subspecies. This argument was based upon the conclusions reached in a 2015 commentary published in The Condor, by R.M. Zink titled, "Genetics, Morphology, and Ecological Niche Modeling Do Not Support The Subspecies Status of the Endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*)." The petition also included information about the threats to the flycatcher and its habitat and the adequacy of existing regulatory mechanisms. We concluded that the petition presented substantial information indicating that delisting may be warranted based on information related to taxonomic status. We also committed to evaluate all potential threats to the subspecies including the extent to which any protections or other conservation efforts have reduced those threats. This notice constitutes the 12-month finding on the August 19, 2015, petition to delist the flycatcher.

Additional Species Background Information

Additional background information on the flycatcher, beyond what is provided below, can be found in the Southwestern Willow Flycatcher Five-Year Review (USFWS 2014); the 2011 proposed (76 FR 50542) and 2013 final revision of flycatcher critical habitat (78 FR 344); the Southwestern Willow Flycatcher Recovery Plan (Recovery Plan) (USFWS 2002); the final flycatcher listing rule (60 FR 10694, February 27, 1995); the 10-year flycatcher study in central AZ (Paxton *et al*. 2007a); the 2007 rangewide status report (Durst *et al*. 2008); and a flycatcher survey protocol and natural history summary (Sogge *et al*. 2010). Other reports can be retrieved from the U.S. Geological Survey's (USGS) flycatcher site at http://sbsc.wr.usgs.gov/cprs/research/projects/swwf.

Taxonomy

The southwestern willow flycatcher (*Empidonax traillii extimus*), from the taxonomic order Passeriformes, is one of four subspecies (*E.t. adastus*, *E.t. brewsterii, E.t. traillii*) of the willow flycatcher currently recognized (Hubbard 1987, pp. 3–6; Unitt 1987, pp. 137–144), although Browning (1993, p. 248) suggests a possible fifth subspecies (*E. t. campestris*) in the central and midwestern United States that does not overlap the range of the southwestern willow flycatcher. The taxonomy of the southwestern willow flycatcher is challenged by the petition and is further explored in the body of this document.

Species Description

The flycatcher is a small, neotropical migrant bird that grows to about 15 centimeters (5.8 inches) in length (USFWS 2002, p. 26). It eats a wide range of invertebrate prey including flying, and ground- and vegetation-dwelling, insect species of terrestrial and aquatic origins (Drost *et al*. 2003, pp. 96–102). The flycatcher spends the winter in locations such as southern Mexico, Central America, and probably South America (Ridgely and Gwynne 1989, p. 303; Stiles and Skutch 1989, pp. 321–322; Howell and Webb 1995, pp. 496– 497; Unitt 1997, pp. 70–73; Koronkiewicz *et al*. 1998, p. 12; Unitt 1999, p. 14).

Distribution

The known geographical area historically occupied by breeding southwestern willow flycatchers includes southern CA, southern NV, southern UT, southern CO, AZ, NM, western Texas (TX), and extreme northwestern Mexico (Hubbard 1987, pp. 6–10; Unitt 1987, pp. 144–152; Browning 1993, pp. 248, 250). The extent of the flycatcher's current known breeding range is similar to the historical range, but the quantity and distribution of breeding habitat within that range is reduced (USFWS 2002, pp. 7–10). Flycatchers nest within the southwestern United States from about May to September (Sogge et al. 2010, p. 11).

The known distribution and abundance of nesting southwestern willow flycatchers has improved since the 1980s through increased survey effort. In the late 1980s, Unitt (1987, p. 156) estimated the entire population was ''well under a 1000 pairs, more likely 500.'' In the 1993 flycatcher listing proposal (58 FR 39498), 230 to 500 breeding territories (see definition below) were estimated to exist. At the time of listing in February 1995 (60 FR 10694), 359 breeding territories were known from CA, AZ, and NM. At the end of 2007, 1,299 flycatcher breeding territories were estimated to occur throughout southern CA, southern NV, southern UT, southern CO, AZ, and NM (Durst *et al*. 2008, p. 4). Some of the flycatcher breeding locations having the highest number of territories (see definition below) are found along the middle Rio Grande and upper Gila River in NM, and Roosevelt Lake and the San Pedro and Gila River confluence area in central AZ.

A flycatcher territory is defined as a discrete area defended by a single flycatcher or pair of flycatchers within a single breeding season (Sogge *et al*. 2010, p. 34). The territory is usually evidenced by the presence of a singing male, and possibly one or more mates (Sogge *et al*. 2010, p. 34). A breeding site is defined as simply a location (identified by elements such as habitat, land ownership, and survey practicality) where a flycatcher territory or collection of territories occurs (USFWS 2002, p. C4)

At the time of listing, flycatcher territory locations in CA, NV, UT, and CO described by Unitt (1987, pp. 149–152) were adopted as the subspecies' northern boundary. However, subsequent collection and analysis of genetic material across this part of the flycatcher's range refined this boundary (Paxton 2000, pp. 3, 18–20) and reduced the extent of the northern boundary of the southwestern subspecies in UT and

CO (USFWS 2002, Figure 3). Territories once believed to be held by southwestern willow flycatchers in UT and CO are now more accurately known to be occupied by a different, non-listed willow flycatcher subspecies (*E. t. adastus*). As a result, the southwestern subspecies' range only occurs in the southernmost portions of UT and CO. This genetic work also confirmed the identity of southwestern willow flycatcher subspecies throughout the rest of its range.

The USGS has continued to collect genetic information to help refine the northern boundary of the subspecies' range in UT, CO, and NM (Paxton *et al*. 2007b). They reconfirmed the genetic markers that identify differences among flycatcher subspecies, with breeding sites clustering into two groups separated approximately along the currently recognized boundary; however, they noted a distinct genetic boundary line between the subspecies does not exist (Paxton *et al*. 2007, p. 17). Instead of a distinct boundary, they suggested that the boundary should be thought of as a ''region of genetic overlap'' (Paxton *et al*. 2007b, p. 17). They also described that this genetic overlap region will likely widen and contract over time based upon habitat changes (Paxton *et al*. 2007b, p. 17). An additional complication in refining the subspecies' northern boundary is that this region is sparsely populated with breeding flycatchers, and therefore only minimal information is available that would help narrow down the location of a boundary (Paxton *et al*. 2007b, p.16).

All willow flycatcher subspecies spend time migrating in the United States from April to June and from July through September. Willow flycatchers, like most small, migratory, insect-eating birds, require food-rich stopover areas in order to replenish energy reserves and continue their northward or southward migration (Finch *et al*. 2000, pp. 71, 78, and 79; USFWS 2002, pp. E– 3, 42). Migrating southwestern willow flycatchers can be found within the southwestern United States in riparian areas (Sogge *et al.* 2010, pps. 2-4) and also in more unusual non-riparian habitats (Finch *et al*. 2000, p. 76). Migration stopover areas are likely critically important for flycatcher productivity and survival (Sogge *et al*. 1997a, p. 13; Yong and Finch 1997, p. 253; USFWS 2002, pp. E–3, 19).

The flycatcher currently breeds in areas from near sea level to over 2,600 meters (m) (8,500 feet (ft)) (Durst *et al*. 2008, p. 14) in vegetation alongside rivers, streams, or other wetlands (riparian habitat). It establishes nesting territories, builds nests, and forages where mosaics of relatively dense and expansive growths of trees and shrubs are established, near or adjacent to surface water or underlain by saturated soil (Sogge *et al*. 2010, p. 4). Habitat characteristics such as dominant plant species, size and shape of habitat patch, tree canopy structure, vegetation height, and vegetation density vary widely among breeding sites. Nests are typically placed in trees where the plant growth is most dense, where trees and shrubs have vegetation near ground level, and where there is a low-density canopy. Some of the more common tree and shrub species currently known to comprise nesting habitat include Gooddings willow (*Salix gooddingii*), coyote willow (*Salix exigua*), Geyer's willow (*Salix geyeriana*), arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), yewleaf willow (*Salix taxifolia*), boxelder (Acer *negundo*), tamarisk (also known as saltcedar, *Tamarix ramosissima*), and Russian olive (*Elaeagnus* *angustifolia*) (USFWS 2002, p. D–2). While there are exceptions, generally flycatchers are not found nesting in areas without willows, tamarisk, or both.

Use of riparian habitats along major drainages in the Southwest during migration has been documented (Sogge *et al*. 1997a, pp. 3–4; Yong and Finch 1997, p. 253; Johnson and O'Brien 1998, p. 2; McKernan and Braden 1999, p. 17; Koronkiewicz *et al*. 2004, pp. 9–11). Many of the willow flycatchers found migrating are detected in riparian habitats or patches (small areas of riparian vegetation) that would be unsuitable for nest placement (the vegetation structure is too short or sparse, or the patch of vegetation is too small). In these drainages, migrating flycatchers may use a variety of riparian habitats, including ones dominated by native or exotic plant species, or mixtures of both (USFWS 2002, p. E–3).

Life History

Flycatchers are believed to exist and interact as groups of metapopulations (USFWS 2002, p. 72). A metapopulation is a group of geographically separate flycatcher breeding populations connected to each other by immigration and emigration (USFWS 2002, p. 72). Flycatcher populations are most stable where many connected sites or large populations exist (USFWS 2002, p. 72). Metapopulation persistence or stability is more likely to improve by adding more breeding sites rather than adding more territories to existing sites (USFWS 2002, p. 72). This would distribute birds across a greater geographical range, minimize risk of simultaneous catastrophic population loss, and avoid genetic isolation (USFWS 2002, p. 72).

Flycatchers have higher site fidelity (to a local area) than nest fidelity (to a specific nest location) but can move among sites within stream drainages and between drainages (Kenwood and Paxton 2001, pp. 29–31). Within-drainage movements are more common than between-drainage movements (Kenwood and Paxton 2001, p. 18). Juvenile flycatchers moved (dispersed) the farthest to new and distant breeding sites from the area where they hatched (Paxton *et al*. 2007a, p. 74). The USGS's 10-year flycatcher study in central AZ (Paxton *et al*. 2007a) is the key study that has generated these conclusions about movement, augmented by other flycatcher banding and resighting studies (Sedgwick 2004, p. 1103; McLeod *et al.* 2008, p. 110). Banded flycatchers were recorded moving from 50 m (150 feet) to 444 km (275 mi) from season to season (and sometimes within season) to try to nest.

Petition History

On August, 20, 2015, we received a petition dated August 19, 2015, from The Pacific Legal Foundation (PLF 2015) (representing The Center for Environmental Science, Accuracy, and Reliability; Building Industry Legal Defense Fund; CA Building Industry Association; CA Cattlemen's Association; NM Business Coalition, NM Cattle Growers Association; NM Farm and Livestock Bureau; and NM Wool Growers Inc.), requesting that the southwestern willow flycatcher (*Empidonax traillii extimus*) be delisted. The petition clearly identified itself as such and included the requisite identification information for the petitioner, required at 50 CFR 424.14(a). Delisting may be warranted as a result of: (1) extinction; (2) recovery; or (3) a determination that the original scientific data used at the time the species was listed, or interpretation of those data, were in error 50 C.F.R. 424.11.

The petition did not assert that the southwestern willow flycatcher is extinct, nor do we have information in our files indicating that it is extinct. The petition asserted that none of the threats identified in the original listing of the southwestern willow flycatcher exist to such an extent as to threaten the continued existence of the species in the foreseeable future (PLF 2015, p. 4).

The petition also asserted that the original scientific data used at the time the southwestern willow flycatcher subspecies was listed as federally endangered were in error and that the best available scientific data show no support for the taxonomic recognition of the southwestern willow flycatcher as a distinguishable subspecies (PLF 2015, p. 12). The petition relies primarily on the results of a commentary on the evaluation of flycatcher genetic, morphological, and ecological studies published in the scientific ornithological journal, The Condor (Zink 2015) (PLF 2015, p.4). The petition contends that, based on this new information, the Service cannot continue to rely on existing information to determine whether the southwestern willow flycatcher is a valid (distinguishable) subspecies (PLF 2015 p. 12).

Zink's (2015, p. 9) commentary concluded there was no genetic, morphological, or ecological differentiation between the federally endangered southwestern willow flycatcher and other willow flycatcher subspecies. No new data were collected for Zink's (2015) commentary, but the author reanalyzed existing quantitative data on plumage coloration (Paxton *et al*. 2010) and genetic variation in mitochondrial DNA and nuclear loci (Busch *et al*. 2000, Paxton 2000, Paxton *et al*. 2007b), and concluded there was no support for the distinctiveness of the southwestern willow flycatcher. Zink (2015, pp. 4&7) also conducted an Ecological Niche Model analysis (ENM) (Warren *et al*. 2008, 2010, 2011) to test niche divergence and concluded that *E. t. extimus* does not have a significantly different climatic niche from its nearest northern geographic neighbor, *E. t. adastus*. Additionally, the commentary (Zink 2015, p. 3) was critical of Sedgwick's (2001) conclusions comparing the songs that differentiate *E. t. extimus* and *E. t. adastus*. Zink (2015, p. 9) also commented that the exclusion of the southwestern willow flycatcher subspecies from the American Ornithological Union's (AOU) most recent list of North American bird subspecies (AOU 1957) was appropriate and supported the exclusion from their checklist. Susequent AOU lists have not addressed subspecies (discussed below).

Overall, Zink (2015, p.1) concluded that the willow flycatchers of the Southwest represent peripheral populations of an otherwise widespread species that do not merit subspecific recognition, and are therefore inappropriately listed as endangered under the Act.

On March 16, 2016, we published in the **Federal Register** a 90-day finding (81

FR 14058) that the petition presented substantial information indicating that delisting may be warranted. We concluded that the petition challenging the southwestern willow flycatcher's subspecies classification and listing as an endangered species presented substantial information indicating the petitioned action may be warranted based upon genetic, morphological, and ecological factors, and necessitated a 12-month status review. We also committed to evaluate all potential threats to the subspecies including the extent to which any protections or other conservation efforts have reduced those threats. With publication of the finding, we initiated a review of the status of the subspecies. We requested further information from the public on the southwestern willow flycatcher.

In response to our information request, we received 24,716 comments including 19 individual letters. Two letters expressed support for the petition and the conclusions reached by Zink (2015). With the exception of those two comments, 17 comment letters opposed delisting of the southwestern willow flycatcher, adding concern for the southwestern willow flycatcher's status and its habitat. A large proportion of the comments (24,698) were associated with a form letter in opposition to the flycatcher's delisting.

No new original southwestern willow flycatcher data was collected, analyzed, and submitted during our request for information; however we did receive a published peer-reviewed commentary on Zink's (2015) analysis (Theimer *et al*. 2016). Theimer *et al*.'s (2016) commentary published in The Condor titled, "Available data support protection of the Southwestern Willow Flycatcher under the Endangered Species Act," provided additional analyses of existing flycatcher information, including Zink's (2015) methods and results.

We received three comments from Zink following the close of the comment period. On July 1, 2016, we received a comment from Zink directly responding to Theimer *et al*. (2016). On November 7, 2016, we received another comment identifying that a response to Theimer *et al.* (2016) was now "in press" at the Open Ornithology Journal, however the attached copy could not be circulated or cited. We received a third electronic message on January 5, 2017, indicating that this information was now available at Open Ornithology. The comment letter and document from Open Ornithology are available on the Internet at *http://www.regulations.gov* at Docket Number FWS–R2–ES–2016–0039.

We reviewed Zink's 2017 letter in Open Ornithology while finalizing this notice and found that no new data were presented in this document. This document continued to reanalyze issues raised in his commentary published in The Condor (Zink 2015), and provided further opinions on topics and methods addressed in Theimer *et al*. (2016). Because there was no new information in this letter, it did not change our evaluation.

During our internal review, we provided Zink (2015), Theimer *et al*. (2016), and various background literature to the Service's Conservation Genetics Laboratory in Washington State for their review, analysis, and opinion. One reviewer at the

Conservation Genetics Laboratory concluded that the existing data supports genetic differences between *E.t. extimus* and *E.t. adastus* and Theimer *et al*.'s (2016) additional analyses addressed concerns raised by Zink (2015). Another reviewer expressed concern for analyses done without original data and hypothesis testing, and as a result, believed they weren't sufficient to resolve the evolutionary history of *E. t. extimus*.

In our response to the petition and status review below, we first examine whether the southwestern willow flycatcher is a valid subspecies, and thus a "species" as defined in section 3 of the Act. According to section 3(16) of the Act, we may list any of three categories of vertebrate animals: A species, subspecies, or a distinct population segment of a vertebrate species of wildlife. We refer to each of these categories as a "listable entity." If we determine that there is a "listable entity" for the purposes of the Act, our status review next evaluates whether it meets the definition of an "endangered species" or a "threatened species" under section 4(a)(1) of the Act.

Summary of Southwestern Willow Flycatcher Information and Evaluation of Petition Items Associated with Subspecies Classification

The willow flycatcher (*E. trailli*) and the southwestern willow flycatcher subspecies (*E.t. extimus*) information we are reviewing and evaluating includes a broad body of published literature and reports dating back to the 1940s when the southwestern willow flycatcher subspecies was first described (Phillips 1948). We are also focusing on the recently published commentary (Zink 2015) associated with the delisting petition (PLF 2015), the studies/reports evaluated within the commentary, subspecies related issues raised in the body of the petition, and a published rebuttal of Zink's commentary (Theimer *et al*. 2016). It is important to point out that no new information was collected by Zink (2015) or Theimer *et al*. (2016), but additional analyses of existing data were conducted by both authors. Both Zink (2015) and Theimer *et al*. (2016) evaluated the same information, but reached opposite conclusions on nearly every important issue. Our task is to assess overall what the best available scientific and commercial information reveals regarding the subspecies and threats it faces.

Our evaluation below includes a summary of southwestern willow flycatcher information and an evaluation of items identified in the petition associated with southwestern willow flycatcher subspecies classification. We first provide information on how a subspecies is defined under the Act along with the taxonomic history of the southwestern willow flycatcher. We present and address concerns raised in the petition about taxonomic citations from the 1995 listing rule and the subspecies breeding range and boundary. We summarize recent flycatcher genetic, behavioral, and morphological studies that reached conclusions supporting subspecies classification, which are the petition's focus. We then present results and evaluate issues raised primarily by the petition and Zink (2015) and Theimer *et al*. (2016). And finally, we provide our conclusions on these issues and southwestern willow flycatcher subspecies classification.

Subspecies and Endangered Species Act

Under the Act, a ‘‘species’’ is defined as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature (16 U.S.C. 1532(16)). A common way to distinguish organisms belonging to different subspecies (of the same species) is whether they are capable of interbreeding and producing fertile offspring, but usually do not interbreed in nature due to geographic isolation, sexual selection, or other factors.

Controversy over the utility and definition of subspecies has a long history, yet the category survives in almost all modern classifications of birds (Haig *et al*. 2006, pp. 1587-1588; Remsen 2010, p. 63). Various definitions or descriptions of subspecies exist (Haig *et al*. 2006, pp.1585-1586; Remsen 2010). The persistence of this category since the mid-1800s, as described by Remsen (2010, p. 63), is driven by a perception that the category that we term "species" can include within it named subpopulations to identify non-clinal geographic variation (a cline is a gradient of morphological or physiological change in a group of related organisms usually along a line of environmental or geographic transition). Some systematists recognize subspecies only if there is a narrow geographic region of rapid change in character (a step cline) (UTEP 2008). A zone of intergradation between subspecies that come into contact with one another geographically can be expected (UTEP 2008). The differences between subspecies are usually less distinct than the differences between species.

For nearly 70 years, scientists have strived to understand, evaluate, describe, and classify the willow flycatcher and its subspecies (with a more recent emphasis on the southwestern willow flycatcher) under the scrutiny of the peer review process. According to the National Research Council (NRC) (2004, p. 6), peer review is the most accepted and reliable process for assessing the quality of scientific information. The NRC (2004, p.6) describes its guidance on the value of peer-reviewed information toward determining the best scientific information. "Its use as a quality control measure enhances the confidence of the community (including scientists, managers, and stakeholders) in the findings presented in scientific reports. Peer review is not infallible, but it has proved valuable for uncovering errors and providing diverse perspectives on data collection, analysis, and interpretation (NRC 2004, p.6)."

Taxonomic History of Willow Flycatcher

Sedgwick (2000, pp. 3-7, 2001, pp. 376-377), Paxton (2000, pp. 3-7), and Zink (2015, pp. 2-3) offered literature summaries describing the history of scientists attempting to discern distinguishing features of the willow flycatcher and describe its taxonomic history. Before the alder flycatcher (*Empidonax alnorum*) and willow flycatcher (*E. traillii*) were each considered separate species, they were combined as the Traill's flycatcher (*E. traillii*). Behle (1985, pp. 54-55) described, ‘‘few species have had such a confused nomenclatural history with so many differences of opinion among systematists as to the validity of several proposed races as the willow or Traill's flycatcher.’’ Phillips (1948) was the first published account describing the southwestern willow flycatcher subspecies. Hubbard (1999, p. 586) commented, "some taxonomists maintain that no willow flycatcher subspecies should be recognized (e.g., Mayr and Short

1970, Traylor 1979), while others accept four to six as valid (e.g., Phillips 1948, Aldrich 1951, Wetmore 1972, Oberholser 1974, Unitt 1987, Browning 1993). Hubbard's (1999) published critique of willow flycatcher field identification by Yong and Finch (1997) is an example of the challenges of distinguishing *Empidonax* flycatchers. Sedgwick (2001, p. 376) concluded "there is consensus that the willow flycatcher is polytypic (consisting of two or more subspecies)." Until recently (Busch *et al*. 2000, Paxton 2000, Paxton *et al*. 2007), previous willow flycatcher genetic studies (Zink and Johnson 1984, Seutin and Simon 1988, Winker 1994) did not include *E. t. extimus* (Busch *et al*. 2000). Sedgwick (2001, p. 376) believed that "three factors have clouded willow flycatcher subspecific taxonomy: (a) throughout its range, morphological differences are minimal and plumage patterns are both subtle and complex; (b) it is closely similar to the alder flycatcher; and (c) there are relatively few breeding-season specimen records, especially in parts of the western and southwestern United States."

At the time of listing the southwestern willow flycatcher as federally endangered in 1995 (60 FR 10696), we concluded that *E.t. extimus* was a valid subspecies and included the following description

> The willow flycatcher subspecies are distinguished primarily by subtle differences in color and morphology. Unitt (1987) noted that these differences ''…are minor, but differ little in magnitude from those distinguishing the species *E. traillii* from *E. alnorum*. In the *Empidonax*, small differences in morphology may mask large differences in biology."
>
> The subspecies *E. t. extimus* was described by A.R. Phillips (1948) from a collection by G. Monson from the lower San Pedro River in southeastern Arizona. The taxonomy of *E. t. extimus* was critically reviewed by Hubbard (1987), Unitt (1987), and Browning (1993). Hubbard (1987) gave a qualified endorsement of the validity of *E. t. extimus*, recommending continued examination of the taxonomy. Unitt (1987) found that *E. t. extimus* was distinguishable from other willow flycatchers by color, being paler, and morphology (primarily wing formula) but not overall size. Browning (1993) also found that *E. t. extimus* was distinguishable as a more pale-colored subspecies. The song dialect of *E. t. extimus* may also be distinguishable from other willow flycatchers. Rather than the crisp, sneezy ''fitz-bew'' of the northerly subspecies, *E. t. extimus* sings a more protracted, slurred ''fit-za-bew,'' with a burry ''bew'' syllable (recordings by M. Sogge and J. Travis). The subspecies *E. t. extimus* is accepted by most authors (e.g., Aldrich 1951, Behle and Higgins 1959, Phillips *et al*. 1964, Bailey and Niedrach 1965, Oberholser 1974, Monson and Phillips 1981, Harris *et al*. 1987, Schlorff 1990, Harris 1991).

The following Issue and Response taken from the 1995 final rule listing the southwestern willow flycatcher as endangered clarified the AOU's position on subspecies and explains how we addressed different scientific opinions on flycatcher subspecies classification (60 FR 10697). These issues were also raised in the current petition.

Issue 1: The American Ornithologists' Union (AOU) did not list *E. t. extimus* in its latest Checklist of North American Birds; Unitt (1987) could not distinguish *E. t. extimus* by color or morphology; genetic analysis is necessary to distinguish subspecies; significant disagreement exists among scientists regarding taxonomy, for example, McCabe (1991) did not recognize *E. t. extimus*; the willow flycatcher subspecies, in fact the North American *Empidonax* flycatcher species are too difficult to distinguish to make it reasonable to list subspecies of those species; hybridization of the willow flycatcher subspecies occurs; subspecies are not worth listing; *E. t. extimus* is a subspecies of a very common species; *E.t. extimus* is not worth listing because it is one of nine common species in the genus *Empidonax*; this subspecies and subspecies in general are of minor ecological value; their loss would be unimportant; there is little value in preserving rare species/subspecies; and historical taxonomic questions may confuse population trend information.

Service Response: The Service has determined that *E. t. extimus* is a valid taxon. The Service relies on the most current and authoritative data available in making decisions regarding the validity of species, subspecies, or distinct vertebrate population segments. These data include articles published in professional journals, agency reports, and other unpublished data provided by researchers. For the southwestern willow flycatcher, the Service reviewed this information and found a majority opinion that *E. t. extimus* is a valid subspecies. Authorities who critically examined the taxonomy of *E. traillii* and recognized *E. t. extimus* include Phillips (1948), Aldrich (1951), Hubbard (1987), Unitt (1987), and Browning (1993).

Other authorities accepting the subspecies include Behle and Higgins (1959), Phillips *et al*. (1964), Bailey and Niedrach (1965), Oberholser (1974), Monson and Phillips (1981), Harris et al. (1987), Schlorff (1990), Whitfield (1990), Brown (1991), Harris (1991), Western Foundation for Vertebrate Zoology (in litt. 1993), University of California (in litt. 1993). The AOU did not list subspecies of any bird, including the willow flycatcher, in its 1983 Checklist of North America Birds. However, this does not indicate a lack of recognition of *E. t. extimus*, or for the concept of subspecies. The preface to the 1983 Checklist states ''The Committee strongly endorses the concept of the subspecies…and we wish to make it clear that the omission of separate listings of subspecies in this edition is not a rejection of the validity or utility of this systematic category...'

The Service noted McCabe's (1991) consideration of the willow and alder (*E. alnorum*) flycatchers as a single species, and his reluctance to recognize willow flycatcher subspecies. McCabe (1991) provides a thorough review of the history of *E. alnorum* and *E. traillii* taxonomy, and the questions of ecological, morphological, and song type distinction on which this taxonomic evaluation has been based. However, the Service agrees with Sedgwick's (1993) comments and McCabe's own observation that McCabe (1991) contrasts with the majority opinion regarding taxonomy of the willow and alder flycatchers.

After examining 305 study skins, Unitt (1987) found that while four subspecies (*E. t. traillii, E. t. adastus, E. t. brewsteri, and E. t. extimus*) could be tentatively separated by the ''75 percent rule'' using overall size (wing and tail lengths and their ratios to one another), these criteria were not satisfactorily conclusive. However, he found that the subspecies could be satisfactorily distinguished, under the ''75 percent rule,'' using color, wing formula (relative lengths of primary wing feathers), or both. Browning (1993) examined 270 specimens and found that all four subspecies, and a fifth (*E. t. campestris*) were distinguishable by color.

The Service acknowledges that taxonomy of *E. traillii* races continues to pose questions and may be revised in the future. The Service has determined that *E. t. extimus* is a sufficiently distinct entity to be listed under the Act at the very least as a distinct vertebrate population [50 CFR § 424.02(k)].

However, the Service accepts the majority opinion that *E. t. extimus* is a valid subspecies and lists it as such. The Service considers taxonomic distinctness in assigning priorities for species listings, but not in determining whether or not to list species. The Act authorizes listing of species, subspecies, or distinct population segments, all of which have ecological significance.

Scientists, institutions, wildlife agencies, universities, journals, and taxonomists associated with conducting, writing, evaluating, peer reviewing, and publishing studies have reached conclusions and published information supporting subspecies classification of the southwestern willow flycatcher since 1948 (Phillips 1948). While there was early debate about the number of willow flycatcher subspecies and their distribution (Zink 2015, pp. 2-3), a broader body of published peer-reviewed studies and current quantitative evaluations of the willow flycatcher have supported southwestern subspecies classification (Phillips 1948; Aldrich 1951; Phillips *et al*. 1964; Behle 1985; Hubbard 1987, 1999; Unitt 1987; USFWS 1995; Paxton 2000; Sedgwick 2000, 2001; Paxton 2000, Paxton *et al*. 2005, 2007, 2010, Theimer *et al*. 2016). The sources who completed and published reports evaluating and/or reaching a conclusion for a southwestern willow flycatcher subspecies include, but are not limited to ornithological peer-reviewed journals (The Auk, The Condor, Wilson Bulletin, Journal of Avian Biology, Birds of North America), state wildlife agencies (UT Division of Wildlife, NM Game and Fish Department), federal research and wildlife agencies (U.S. Geological Survey, U.S. Fish and Wildlife Service), environmental consulting firms (SWCA, Inc.), private institutions

(Southern Sierra Research Station, San Diego Natural History Museum), and universities (Northern AZ University). The conclusions over time (even as scientific methods and opinions evolve) from a wide variety of authors and institutions provide support for the recognition of the southwestern willow flycatcher subspecies.

Citation Accuracy

The petition contends that the southwestern willow flycatcher is not a valid subspecies because the Service mischaracterized Unitt's (1987), Hubbard's (1987), and Browning's (1993) support for *E.t.* extimus in the 1995 southwestern willow flycatcher listing rule (60 FR 10696) (PLF 2015, p. 13). With respect to plumage, the petition states "no such support exists" (PLF 2015, p. 13) for plumage-based difference for southwestern willow flycatchers. The petition states that Unitt (1987) could not distinguish *E.t. extimus* from other willow flycatcher subspecies. The petition asserts that because Browning (1993) used Munsell Color Charts, which are superseded today by color spectrometers (PLF 2015, p. 13), his results are invalid (as are studies using Smithe's 1975 Color Standard). Also, the petition contends Hubbard (1999) indicates color is not a reliable diagnostic to distinguish flycatchers, but provided qualified support for the southwestern willow flycatcher subspecies. The petition also believes the Service's southwestern willow flycatcher listing rule (60 FR 10696) erred by writing that Hubbard (1987) supported the existence of *E.t. extimus* by subtle difference in the willow flycatcher morphology (PLF 2015, p. 14). The petition (PLF 2015, p. 14) states that there are "no valid studies of the morphology of willow flycatchers, including the southwestern willow flycatcher…"

We find that Unitt (1987), Hubbard (1987), and Browning (1993) were clear about their positions and support for the southwestern willow flycatcher subspecies based upon plumage. All of these authors' information contributed to the large pool of information relied upon by the Service in 1995 to determine that the southwestern willow flycatcher is a subspecies. Unitt (1987, p. 144) wrote, "I conclude that the four races of *E. traillii* recognized by Aldrich (1951) are valid by the criteria of the 75% rule and may be distinguished from each other by color, wing formula, or both. Although *E.t. extimus* was omitted from the 1957 edition of the AOU Checklist of North American Birds, it has been recognized in all taxonomic studies of *E. traillii* since its original description." The Service specifically referenced Hubbard's (1987, p. 16) provisional support for the southwestern subspecies with further recommendations, as he concluded from his review of 71 New Mexico willow flycatcher study skins, "The most frequently identified race was *extimus* with 21 specimens at least provisionally identified… Given the degree of agreement among recent workers, I believe the most prudent course is to accept all of the above subspecies (*E.t. adastus, E.t. brewsteri, and E.t. extimus*) and *traillii* as valid, at least until more definitive studies are available." Browning (1993, p. 253) concluded, "Five subspecies of *E. traillii* are recognizable… Three breed west of the Rockies…*brewsteri* from the Pacific Northwest…*adastus* from the Rocky Mountains and intermountain regions, and pale grayish *extimus* from the Southwest."

The petition did not provide any specific scientific references describing why

Smithe 1975 Color Standard or Munsell Color Charts were invalid methods to evaluate plumages (PLF 2015, p. 13). While use of spectrometers and colorimeters may be the preferred methodology for measuring bird plumages today (Viquero-Alba *et al*. 2014, p. 3), Munsell Color Charts and Smithe 1975 Color Standard were appropriate in 1995 and are still being used today to evaluate bird plumages. Studies using Munsell Color Charts and Smithe 1975 Color Standard continue to be published today in peer-reviewed ornithological journals (Ralston *et al*. 2015, Holt *et al*. 2016, Fernando *et al*. 2016).

After further investigation, we conclude that the petition's interpretation of the citations in the 1995 final southwestern willow flycatcher rule is not supported, and they were accurate as initially cited. There are no references to flycatcher morphology attributed to Hubbard (1987) in the 1995 southwestern willow flycatcher listing rule (60 FR 10696). As noted earlier, Unitt (1987, p. 144) examined 305 study skins and described morphological differences among the races of *E. traillii* as similar in magnitude to those distinguishing the species *traillii* from *alnorum*, and further explained that, for the genus *Empidonax,* small differences in morphology may mask large differences in biology. Willow flycatcher wings and tail lengths vary between some subspecies and between males and females, but Unitt (1987, p. 140) believed these morphological differences are not enough to be diagnostic.

Subspecies Range

The petition contends that if willow flycatcher subspecies "…were morphologically distinctive (i.e. valid)…their ranges would be far better known (PLF 2015, p. 15)," and as a result, the bird's lack of distinctiveness precludes identification of their ranges.

While the early literature describing the southwestern willow flycatcher varies on the subspecies distribution, the improvement in science and information about the southwestern willow flycatcher has led to recognition of a relatively stable boundary since listing in 1995 (60 FR 10695, USFWS 2002, Fig. 3; 70 FR 60907; 78 FR 502; USFWS 2014, pp.7, 20-21). The *Empidonax* genus is one of the most challenging birds to distinguish visually in the field; therefore timing of detections, location, song/calls, and in-hand evaluations are methods that help to distinguish migrants from breeding birds, as well as subspecies (Sogge *et al*. 2010, pp. 2, 16-17). Since the early 1990s, thousands of southwestern willow flycatcher presence/absence surveys have been conducted throughout its range, and many natural history and ecology studies have been conducted that have greatly improved our understanding of flycatcher ecology (Sogge *et al*. 2010, p. 1).

Boundaries described by Unitt (1987) and Browning (1993) were the basis for the southwestern willow flycatcher range map included in the listing rule (60 FR 10695). New information from genetic studies (Paxton 2000) helped refine the northern boundary of the southwestern willow flycatcher, dropping the boundary further south in portions of southern UT and southern CO and adding a portion in CA along the Owens River on the eastern side of the Sierra Nevada Mountain Range (USFWS 2002, Fig. 3). The flycatcher's range boundary along the northern boundary has been shaped based upon improving science and without changes since 2002 (USFWS 2002, Fig. 3).

Due to improved information about flycatcher distribution and abundance through thousands of standardized protocol surveys, information from genetic studies, and improved knowledge about the bird's habitat and natural history, the breeding range of the flycatcher was refined in 2002, is well known, and has remained stable. Therefore we do not agree with the petitioner regarding the claim that the ranges of willow flycatcher ranges cannot be determined.

Post-listing Studies Evaluating Southwestern Willow Flycatcher Classification as a Subspecies

In order to prevent poorly defined or invalid subspecies, Haig *et al.* (2006, p. 1590) recommended that classifications be periodically re-evaluated as techniques evolve. In the case of flycatchers, McCabe (1991) described the *Empidonax* genus as, "the most difficult to clarify taxonomically in America, if not the world." Haig *et al*. (2006, p. 1591) also noted that while molecular genetics is useful for evaluating subspecies designations, it does not directly address adaptive divergence (i.e. new forms from a common ancestral form due to adaptation to different environmental conditions). Therefore, Haig *et al*. (2006, p. 1591) recommended that additional information beyond molecular markers can help to justify and reach greater confidence in a subspecies designation, than morphological, ecological, behavioral, and/or physiological characters alone.

Since the southwestern willow flycatcher's 1995 listing, more modern techniques have been applied to quantitatively evaluate the willow flycatcher's classification (with an emphasis on the southwestern subspecies) (Paxton 2000, Paxton *et al.* 2007, 2010), genetic variation (Busch *et al.* 2000), subspecies boundaries (Paxton 2000, Paxton *et al*. 2007, 2010), and uniqueness (Sedgwick 2001). Busch *et al.* (2000) collected and evaluated samples from 290 southwestern willow flycatchers across five states to assess the genetic variation within southwestern willow flycatcher populations, while Paxton (2000) examined 232 samples from adult willow flycatchers at 49 sites across 14 states to evaluate its broader molecular genetics. Sedgwick (2001) recorded songs from five states at 45 locations and grouped them into 16 populations/song groups to compare the entire range of latitudes and elevations where *E. t. adastus* and *E. t. extimus* are found. To seek greater clarity regarding the northern boundary of the southwestern willow flycatcher, Paxton *et al*. (2007) examined genetic information from 145 individual willow flycatchers from 25 sites in AZ, CO, NM, and UT. In 2004 and 2005, Paxton *et al.* (2010) captured and quantitatively measured the plumages of 374 willow flycatchers from 29 breeding sites across the species' breeding range with a colorimeter.

The conclusions from studies using modern techniques found differences in willow flycatcher behavior (song), morphology (plumage), and genetics, and reached determinations supporting a southwestern subspecies classification with a northern subspecies boundary across southern NV, UT, and CO, generally corresponding with what is currently described by the Service (2002). Paxton *et al*. (2010) concluded, "Plumage coloration as measured with a colorimeter was significantly different among the willow flycatcher subspecies, agreeing with taxonomic studies that largely relied on qualitative comparison of museum specimen plumage coloration." Sedgwick (2001) wrote, "Even though the overall form of the song of willow flycatchers varies little over thousands of kilometers… regional populations have statistically unique vocal identities… Despite the confused nomenclatural history of the races of the willow flycatcher, the geographical distribution of *adastus* and *extimus* inferred from vocal evidence is largely concordant with that provided by morphology... Unique vocal identities and slightly different ecological preferences suggest, however, that those subspecies are evolving independently of one another and clearly warrant, at least, subspecific status." And with respect to genetics, Paxton *et al.* (2007) summarized, "The geographic distribution of willow flycatcher mitochondrial and nuclear molecular genetic markers within the study region (northern boundary of the southwestern willow flycatcher) suggests two distinct groups (subspecies) based on strong frequency differences, with the two groups geographically separated by a region roughly overlapping the currently recognized boundary."

Genetic Sampling

Paxton (2000) and Paxton *et al*. (2007) conducted molecular genetic analysis (Amplified Fragment Length Polymorphism technique to magnify DNA fragments for analysis) of willow flycatchers, which included a focus on the southwestern subspecies. After collecting blood and examining the mitochondrial (mtDNA) (DNA found in mitochondria surrounding the nucleus of cells) and nuclear (nDNA) DNA (DNA found in the nucleus of cells) from 232 individual flycatchers from 14 states across their breeding range (Paxton 2000, p. 4), Paxton *et al*. (2007, p. 4) looked at 145 individuals to examine the northern boundary of *E.t. extimus* and *E.t. adastus* in the Four Corner States (AZ, NM, UT, and CO).

Paxton's (2000) genetic analysis included a variety of conclusions for support of the southwestern willow flycatcher subspecies classification. The mtDNA genetic structuring showed a "highly significant degree of separation between *E.t. extimus* and the three northern subspecies," indicating that "the distinctness of *E.t. extimus* suggests greater isolation from other subspecies, a different demographic history, or a combination of both" (Paxton 2000, p. 17). The geographic distribution of haplotypes (inherited genes from a single parent) followed the subspecies boundaries that were established by morphological (primarily plumage) traits (Paxton 2000, p. 19). Additionally, the C-group haplotype (a label given to a unique core haplotype group) was found to characterize *E.t. extimus* by being almost exclusively detected in high frequencies within southern CA, AZ, and NM breeding sites (Paxton 2000, pp. 9, 10 & 19). Paxton (2000, p. 20) concluded that, "The significant levels of genetic structuring within the willow flycatcher subspecies, evidence of limited gene flow across subspecies boundaries, and the general agreement of cytochrome-b haplotype distribution and subspecies boundaries, all support that the morphological characters used for the published taxonomy are primarily genetically derived."

Paxton *et al*.'s next analysis (2007) focused on trying to evaluate the boundary between *E.t. extimus* and *E.t. adastus* by examining the mtDNA and nDNA of willow flycatchers breeding in NM, CO, AZ, and UT. The analysis concluded that there were two clusters of genetic groups generally consistent with the recognized subspecies boundary (Paxton *et al*. 2007, p.1). However, three sites situated along the current subspecies boundary were the exception (Paxton *et al*. 2007, p. 1). The mixed results from these three boundary sites led Paxton *et al*. (2007, p. 1) to conclude that there was a region of genetic intergradation between the two subspecies. Paxton *et al*. (2007, p. 1) was unable to further investigate the border area because too few breeding flycatchers were known to occur in this boundary area. Based upon their results, Paxton *et al*. (2007, p. 1) concluded that there is no discrete line separating *E.t. extimus* and *E.t. adastus*, but rather a broader region of genetic intergradation.

Zink (2015) reanalyzed Paxton *et al*.'s (2007) genetic data and disagreed with their analysis and conclusions, ultimately determining there was "no support for the distinctiveness of the southwestern willow flycatcher (Zink 2015, p. 1)." A primary assertion by Zink (2015, p. 5) was that Paxton *et al*. (2007) graphed information incorrectly, invalidating Paxton *et al*.'s (2007, p. 9) conclusion that there was a sharp change of genetic frequencies at the subspecies boundary. Zink (2015, p. 5) re-plotted the data and concluded that the new information did not support a sharp genetic transition in C-group haplotypes between *E. t. extimus* and *E. t. adastus*, but rather a gradual transition. The implication from this conclusion is that sharp transitions in genetic frequencies at geographic boundaries are more indicative of a subspecies, while gradual transitions are not (Remsen 2010, pp. 65-66; McCormack and Maley 2015, p. 384; Theimer 2016, p. 290). Zink (2015, p. 7) further asserted that because Paxton *et al*. (2007) found a region of intergradation between the *E.t. adastus* and *E.t. extimus*, the best available data do not support two subspecies.

Theimer *et al*. (2016) evaluated Zink's (2015) critique of Paxton *et al*. (2007) and conducted additional analyses to evaluate whether the genetic information supported southwestern willow flycatcher subspecies classification. Theimer *et al*. (2015, p. 291) emphasized that in contrast to Zink's (2015, p. 5) conclusion that Paxton *et al.* (2007) incorrectly graphed the data, it was actually Zink (2015) who had graphed the data incorrectly. Theimer *et al*. (2016, p. 291) subsequently conducted a new analysis of the raw frequencies of mtDNA haplotype with the correct data to determine if there is a non-linear change in the frequency and if so, where it would occur. Theimer *et al*. (2016, p. 292) results found that, "these data indicate a break in haplotype frequency roughly concordant with the boundary between *E. t. extimus and E. t. adastus* and *E. t. brewsteri* as currently recognized by the USFWS (2002) and also indicate a transition in haplotype frequencies consistent with a step cline rather than the smooth cline suggested by Zink (2015)."

Both Zink (2015, p. 7) and the petition (PLF 2015, p. 16) expressed that a region of intergradation (or hybrid zone) provided evidence that invalidated the existence of a subspecies. Contrary to those interpretations, it is not unexpected to find some introgression along a shared boundary of two subspecies (Mayer 1982, p. 594, O'Brien and Mayr 1991, p. 1188). Subspecies are capable of interbreeding (which is why they are not species), but are not frequently expected to do so. Willow flycatchers are a good example; few breeding sites and territories are known within the *E.t. adastus*/*E.t. extimus* intergradation zone (USFWS 2002, Fig. 3; Paxton *et al*. 2007, p. 1). Examples of subspecies that were listed and evaluated for listing where intergradation zones exist are the red-legged frog (61 FR 25823) and Tucson shovel-nosed snake (79 FR 56732).

We find that the best available information currently still demonstrates that the genetic information supports separation of *E.t. extimus* from other willow flycatcher subspecies (*E.t. adastus*, *E.t. brewsterii*, and *E.t. traillii*). Paxton (2000, p. 19) found evidence of limited gene flow across subspecies boundaries and general agreement of haplotypes supporting willow flycatcher subspecies boundaries. In particular, the C-group haplotype was found to characterize *E.t. extimus* by being almost exclusively detected within its core breeding range. The discovery of an integradation zone between *E.t. adastus* and *E.t. extimus* (Paxton *et al*. 2007) does not invalidate subspecies classification, but simply identifies a challenge in describing the most appropriate boundary of where the subspecies is likely to be found. Zink's (2015, p. 5) conclusion that Paxton *et al*. (2007) graphed information incorrectly leading to invalid results was demonstrated by Theimer *et al*. (2016, p. 291) to be inaccurate. Additional analyses by Theimer *et al*. (2016, p. 291) supported Paxton's (2000, p. 20) conclusion that the genetic information supports a break in haplotype frequency at the same geographical boundaries previously established from morphological traits.

Application and Evaluation of Ecological Niche Modeling

Zink (2015, pp. 4-9) examined whether southwestern willow flycatchers demonstrate any ecological distinctiveness by constructing and running an Ecological Niche Model (ENM) (Warren *et al.* 2008). In other words, Zink (2015, p. 4) asked, might willow flycatchers occurring in the riparian areas of the arid southwestern U.S. have ecological distinctiveness from flycatchers breeding elsewhere that would be indicative of a subspecies? ENMs link geographic occurrence data of animals with GIS data layers (Theimer *et al.* 2016). Zink (2015, p. 4) used Breeding Bird Survey (BBS) willow flycatcher detection data found on the internet and 19 climatic variables describing temperature and precipitation at the 0.62 miles^2 (1 km^2) scale to compare the niches of *E.t. adastus* and *E.t. extimus*. Zink (2015, p.7) concluded that both willow flycatcher subspecies (*E.t. adastus* and *E.t. extimus*) are using common environmental features with a broad ecological (climatic) tolerance and do not show significant ecological divergence in climate niche dimensions.

Theimer *et al*. (2016, p. 293) explained that Zink (2015, p. 4) used coarse flycatcher occurrence and climate data that affected the model's results. The species occurrence locations used by Zink (2015) were not the actual spots where willow flycatchers were detected, but represented the beginning of a 24.5-mile (39.4 km) BBS survey route (Theimer *et al*. 2016, p. 293). As a result, flycatcher locations used in Zink's (2015) ENM model could differ by as much as 24.5 miles (39.4 km) from their actual location (Theimer *et al*. 2016, p. 293). Similarly, at 0.62 miles^2 (1 km^2), the climate variables Zink used were unlikely to reflect the actual environment used by willow flycatchers because the bird's riparian zones are a relatively small proportion and different (wetter, shaded, more vegetated, etc.) than the broader landscape (Theimer *et al*. 2016, p. 293). The results of ENM models are sensitive to both the accuracy of occurrence points as well as the scale of climatic variables (Theimer *et al*. 2016, p. 292).

To demonstrate how the quality of the data can influence the strength or weakness of an ENM and its results, Theimer *et al*. (2016) constructed the ENM model with refined willow flycatcher species occurrence information (but the same coarse climatic variables) and also compared yellow warbler (occurring in the range of *E.t. adastus*) and southwestern willow flycatcher niches. Following the reasoning of Zink (2015), Theimer *et al*. (2016) concluded, "our results would indicate weak evidence of niche partitioning between flycatcher subspecies, but there is no evidence of niche partitioning between *E. t. extimus* and yellow warblers." Theimer *et al*.'s (2016) exercise duplicated Zink's (2015, p. 4) test to demonstrate the inherent weakness of ENM, and stated "that if the test is too weak to detect differences among species (yellow warbler vs. willow flycatcher), it should not be used as a standard by which to measure distinctness of subspecies."

Song Comparison between Willow Flycatcher Subspecies

Zink (2015, p. 3) disagreed with Sedgwick (2001), who quantitatively found that *E. t. extimus* songs are longer (total song, note, inter-note) and frequencies at maximum amplitude are lower than those of *E.t. adastus*. Zink (2015, p. 3) expressed concern about the choices made on how song characters and song locations were grouped for further study, explaining that clusters were not grouped entirely by subspecies.

Theimer *et al*. (2016, pp. 294-295) responded to Zink's (2015) critique by further clarifying choices and conclusions made by Sedgwick (2001). Theimer *et al*. (2016, pp. 294-295) described how Sedgwick clustered all individuals from the *E. t. extimus* sites and two individuals from a northern New Mexico unknown-affinity site, and another included all *E. t. adastus* individuals and all other individuals from the unknown affinity sites. As a result, Theimer *et al*. (2016, p. 295) concluded, "we fail to see how Zink's (2015) contention that the analysis ''did not group samples entirely by subspecies'' can be supported."

Zink (2015, p. 3) and Theimer *et al*. (2016, pp. 294-295) reached different conclusions about Sedgwick's (2001) song analysis, yet both described challenges conducting further analysis from the published information. Theimer *et al.* (2016, p. 295) explained that because not all of the raw individual information about each population sampled were displayed, and the means and standard errors for measured song variables were absent from the final journal publication, some of the additional analyses they could accomplish were limited. Zink (2015, p.3) also identified the inability to examine Sedgwick's (2001) raw data.

As a result of the limitations in the available published data described above, there is some uncertainty to what extent these reviews of Sedgwick's song data could contribute toward the best scientific information. As a result of the uncertainty in both

Zink's (2015) and Theimer *et al.'s* (2016) review, we defer to Sedgwick's (2001) original published conclusions as contributing to the best available commercial and scientific information.

Plumage Coloration Analysis

Bird plumage color and patterns have been important qualitative tools to identify, group, and classify avian species (Mayr 1963, pp.16-19; Remsen 2010, p. 65) and have played an important role in the history of willow flycatcher classification (60 FR 10696).

Due to the development of electronic measuring devices (colorimeters) that can quantify plumage coloration as levels of lightness, saturation, and hue, Paxton *et al*. (2010, p. 128) evaluated the degree to which willow flycatcher plumage coloration differs among the four subspecies. Paxton *et al*. (2010) used a colorimeter to measure 374 adult willow flycatcher plumages from 29 locations across its breeding range. Plumage coloration measured with a colorimeter showed strong statistical differences among the willow flycatcher subspecies, consistent with qualitative comparison of museum specimens (Paxton *et al*. 2010, p. 133). In general, *E.t. extimus* had the lightest plumage, while *E.t. brewsteri* showed the darkest coloration; the other two subspecies (*E.t. adastus* and *E.t. traillii*) were intermediate (Paxton *et al*. 2010, p. 133). Additionally, willow flycatchers breeding at sites along subspecies boundaries showed evidence of intergradation and intermediate coloration patterns (Paxton *et al*. 2010, p. 133), consistent with genetic information (Paxton *et al*. 2007).

Zink (2015, p. 8) challenged Paxton *et al*.'s (2010) analysis and conclusions about willow flycatcher plumages. Zink (2015, p. 8) was critical that individual flycatchers from boundary sites were not included in some analyses. Subsequently, Zink (2015) re-evaluated data using all willow flycatchers (including those from boundary populations) to demonstrate that there was increased overlap in plumage characteristics. Zink (2015, pp. 6&8) also described a linear relationship consistent with a smooth cline in plumage variation from north to south. Similar to our previous descriptions, a gradual transition in traits is less suggestive of subspecies than a more fractured separation (Remsen 2010, pp. 63-66; McCormack and Maley 2015, p. 384; Theimer 2016, p. 290).

Theimer *et al*. (2016, p. 296) further examined the hue of willow flycatcher crowns after independently evaluating six willow flycatcher plumage color variables (on the crown and the back). Similar to methods applied to examining flycatcher genetics, Theimer *et al.* (2016, p. 296) applied HZAR (Hybrid Zone Analysis using program R) to examine the cline of willow flycatcher crown hues (this program evaluates the clines of genetic and morphological features across hybrid zones [Derryberry *et al*. 2014]). Theimer *et al*.'s (2016, pp. 295- 296) analysis also addressed concerns raised by Zink (2015, p.8) by including boundary samples and found evidence for a step-cline along the subspecies boundary between *E.t. adastus* and *E.t. extimus* for willow flycatcher crown hues .

Both Zink (2015, pp. 6&8) and Theimer *et al.* (2016, pp. 295-296) provided reasonable opinions and analysis on the willow flycatcher plumage data originally collected and analyzed by Paxton *et al*. (2010). The methods and analyses used to quantify willow flycatcher plumage differences demonstrate application of innovative techniques and technological advances beyond the qualitative study skin evaluation used in the past for many avian subspecies (Remsen 2010, p.73). We find that by addressing concerns raised by Zink (2015, p. 8) and using methods specific to the evaluation of morphology, clines, and hybrid zones, Theimer *et al*.'s (2016) additional analysis added further rigor to the original plumage information collected by Paxton *et al*. (2010) to contribute to the best available information that there are statistical differences in plumage coloration that are separated by the subspecies geographic boundaries.

American Ornithologists Union and Subspecies Classification

The American Ornithologists' Union (AOU) Committee on Classification and Nomenclature has, up until recently, been the scientific body responsible for standardizing avian taxonomy in North America. The committee has published seven editions of its Checklist of North American Birds since 1896, with the most recent one occurring in 1957. In 2016, the AOU and Cooper Ornithological Society merged to form the American Ornithological Society (AOS).

Since 1957, the AOU has not made a decision on the subspecies classification of any bird species (either adding or removing), regardless of any further collection of information, including information pertaining to the willow flycatcher. Subspecies were included in the first four editions, but have not been included since 1957 due to committee time (Haig *et al.* 2006, pp. 1587-1588), practical grounds (for example, space limitations), and because the validity (in the sense of their distinguishability) of many described avian subspecies still needs to be evaluated, as does the potential for unrecognized subspecies (AOU 1983, p. 284; AOU 1998, pp. 1–19).

Unitt (1987, p. 144) concluded that, "Although *E.t. extimus* was omitted from the 1957 edition of the AOU Checklist of North American Birds, it has been recognized in all taxonomic studies of *E. traillii* since its original description. Its existence has been generally underappreciated probably because migrants of other subspecies occur commonly in its range during most of its breeding season, because of the dearth of original research on subspecies over the last 30 years, and because fear of confusion of *E. traillii* with the sibling species *E. alnorum*, which does not occur in the southwestern states."

The AOS's website directs readers who are interested in more current treatments of avian subspecies to seek other sources (http://www.americanornithology.org/content/north-american-classification-committee accessed 8/28/2017). The AOS's website states, "Although a complete revision of North American avian subspecies has not been done, we refer readers to Avibase and the Birds of North America Online for more up-to-date treatments of subspecies." In both Avibase and Birds of North America Online, as well as other ornithological taxonomic sources we explored (Clements, eBird, Howard and Moore, Handbook of the Birds of the World, International Ornithological Committee [IOC] World Bird Names, Zoonomen, and Integrated Taxonomic Information System [ITIS]), the southwestern willow flycatcher subspecies classification is recognized.

The ornithological organizations identified above track the latest science, employ expert staff, and collaborate with one another to maintain and update their taxonomic lists. Clements Checklist, maintained by the Cornell Lab of Ornithology (and used by E-Bird and Avibase), includes taxonomists and other wildlife professionals and academics that track scientific findings and peer-reviewed technical journals. The IOC World Bird List uses Howard and Moore's as support for their checklist (IOC web site, accessed 8/2/2016, http://www.worldbirdnames.org/ioc-lists/subspecies/). The IOC currently includes *E.t. extimus*, but as an example of its continued and updated literature tracking efforts, includes a reference citing Zink's (2015) recent commentary. The Integrated Taxonomic Information System (ITIS), another authoritative taxonomic source for North America (and the world), also recognizes *E.t. extimus*. ITIS establishes its list based upon various sources, including scientific journals, in order to track overall scientific consensus (ITIS web site accessed 8/2/2016 http://www.itis.gov/servlet/).

We find the review and recognition of the southwestern willow flycatcher subspecies (*E.t. extimus*) by ornithological sources evaluating and tracking avian taxonomy, with the AOS's recommendation, provides support for what constitutes the best available scientific information that the southwestern willow flycatcher remains recognized as a subspecies. While the AOU has not conducted any evaluations of subspecies since 1957, the sources it recommends to seek out (and other respected sources) recognize the southwestern willow flycatcher subspecies.

Methodology Critique

Zink (2015) questioned the methods and goals of southwestern willow flycatcher studies evaluating subspecies classification. For example, Zink (2015, p. 8) expressed concern that Paxton *et al*. (2010) obtained plumage information from 374 living wild willow flycatchers and subsequently released the birds following capture/measurement, therefore "eliminating the possibility of others verifying their measurements." Also, Zink (2015, p. 3) identified that Sedgwick (2001) did not collect flycatcher songs in areas that corresponded to areas of geographic division, commenting that songs from other willow flycatcher subspecies (*E.t. brewsteri* or *E.t. traillii*) were excluded from comparison. Furthermore, Zink (2015, p. 7) believed Paxton *et al.*'s (2007) "exclusion" of genetic comparisons of *E. t. extimus* with *E. t. brewsteri* and *E. t. traillii* was a "serious omission" because the validity of *E. t. extimus* cannot be established without testing whether it is distinctive from its other geographically adjacent neighbors.

Based upon the methods described and goals identified in Sedgwick (2001) and Paxton *et al*. (2007, 2010) and typical conservation ethics associated with endangered species management, we determined these authors, institutions, and publishers represented their work accurately. Paxton *et al.* (2010) adhered to professional conservation ethics, as well as state and federal permits, by safely capturing, measuring, and releasing hundreds of federally endangered birds. Sedgwick (2001) and Paxton *et al*. (2007) did not exclude information from either of their studies. Sedgwick (2001) specifically recorded and evaluated *E.t. extimus* and *E.t. adastus* songs, and appropriately titled the study. Similarly, Paxton *et al*. (2007) titled their document as specific to the Four Corner states (CO, UT, AZ, and NM) with the purpose of seeking to further clarify the northern boundary of the southwestern willow flycatcher

Summary/Conclusions of Taxonomic Analyses

Based upon our review of the best available scientific and commercial information available, we conclude that the petitioned action to determine the southwestern willow flycatcher is not a valid subspecies and therefore not eligible for listing under the Act, is not warranted. Our "not warranted" conclusion is based upon our examination of the reports and literature evaluating willow flycatcher subspecies (including more recent quantitative data) based on morphology, song, habitat and niche preferences, and genetics; recognition of the southwestern subspecies from a broad group of professional ornithological organizations; examination of the issues raised in the petition (PLF 2015) and Zink (2015, 2016); additional analyses of recent flycatcher studies evaluating diagnostic subspecies characteristics (Theimer *et al*. 2016); and information received in response to our 90-day and request for additional information.

We reviewed and evaluated the petition's concerns about inaccurate citations in the 1995 flycatcher listing and the subspecies boundary and were unable to find information that supported the petition's claims. In contrast to these concerns, various authors' (Unitt 1987, Hubbard 1987, and Browning 1993) conclusions about southwestern subspecies recognition based upon plumage were accurately cited. The subspecies boundary was well described in the listing and only adjusted during completion of the recovery plan due to new information (USFWS 2002, fig. 3). Additionally, as noted above, intergradation zones commonly occur with subspecies, so we consider the petition's assertion that the existence of such a zone disqualifies recognition as a subspecies to be invalid.

Zink (2015) and Theimer *et al.*'s (2016) reliance on flycatcher data and information collected and published by others limited the strength of their analyses and conclusions. As a result, errors, incorrect analyses, and limitations were revealed. As described in this notice and by Theimer *et al.* (2016, p. 291-293), Zink's (2015, pp. 4-5) use of coarse flycatcher locations and weather data acquired from the internet weakened the ENM model results. Zink (2015, pp. 3-5) also made graphing and data interpretation errors from material collected by Paxton et al. (2007). Both Zink (2015, p. 3) and Theimer *et al*. (2016, p. 295) commented that the types of information published in Sedgwick's (2001) article affected their ability for re-analysis. The inaccuracies, limitations, and questions that these commentaries generate should not be unexpected because original data were not collected specifically for these additional analyses. Due to these inaccuracies and errors, there are reasonable doubts about the quality and validity of the analyses found in the petition, in particular those conclusions associated with the ENM analysis, and disputes with the original genetic (Paxton 2000, Paxton *et al*. 2007) and behavioral analyses (Sedgwick 2001).

Theimer *et al.'s* (2016) HZAR analyses provided compelling information about step-clines associated with willow flycatcher subspecies genetics and morphology (plumage). By using the HZAR tool, Theimer *et al*. (2016 pp. 296-297) determined that there were step-clines with these features that coincided with the current geographic boundary (USFWS 2002, Fig. 3). Using independently collected data sets, they demonstrated a marked discontinuity in quantitative genetic and morphological features that generally coincides with the current described willow flycatcher subspecies boundary and that supports a subspecies classification.

Both Zink (2015) and Theimer *et al*. (2016) did raise legitimate questions, and we agree with both Zink (2015, p. 9) and Theimer *et al.* (2016, p. 297) that scientific methods continue to improve and additional information can be collected to further understand/clarify the taxonomic classification of the willow flycatcher and its subspecies. For example, conducting more breeding site and territory surveys in key areas such as intergradation zones could help to either identify sites where additional flycatcher information can be retrieved or confirm the current paucity of sites and territories in these areas (USFWS 2002, figure 3, Paxton *et al*. 2007, p. 1). Theimer *et al*. (2016, p. 297) described that simultaneously examining willow flycatcher song, plumage, and genetics at the same sites over its entire breeding range would improve our understanding of the variability patterns among and within the currently recognized subspecies. Also, Theimer *et al.* (2016, p. 297) believed an improved ENM conducted at appropriate spatial scales with site-specific locations could improve our understanding about the subspecies. With improvements in genomic studies, better understanding, precision, and resolution of the willow flycatcher's adaptive evolution, divergence, genetic isolation, etc. that were previously economically prohibitive may be achieved (Oyler-McCance *et al*. 2016, p. 626). In general, studies where original information is collected specific to the analyses being conducted, along with rigorous hypothesis testing, can lead to stronger conclusions.

The long history of willow flycatcher peer-reviewed studies/reports and conclusions by taxonomists is an important component to consider when addressing potential taxonomic changes. There is a large body of literature developed by the scientific community that has shaped willow flycatcher and subspecies classification. These studies have originated, been reviewed, and withstood debate among independent, university, and state and federal scientists, and their results have been reviewed, reported, and also published in ornithological scientific journals. These materials have subsequently been evaluated by the various sources that track, evaluate, and make taxonomic decisions that currently support the recognition of *E. traillii* subspecies. Not only were the petition's critiques of other scientist's work comprised of questionable analyses, but the petition reached the inaccurate conclusion that not only was *E.t. extimus* not a subspecies, but only one widespread species, *E. traillii,* exists. We find that the commentary by Zink (2015) and the petition (PLF 2015) raised questions about previous research, but they do not represent the best available scientific information sufficient to restructure the taxonomy of *E. traillii* and negate recognition of the southwestern subspecies *E. t. extimus*, nor the other recognized subspecies *(E.t adastus, E.t. brewsterii,* and *E.t. traillii).*

Factors Pertaining to the Endangered Status of the Subspecies

Section 4 of the Act (16 U.S.C. 1533) and implementing regulations (50 CFR 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be endangered or threatened based on any of the following five factors acting alone or in combination:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

We consider these same five factors in delisting a species. We may delist a species according to 50 CFR 424.11(d) if the best available scientific and commercial data indicate that the species is neither endangered nor threatened for the following reasons:

(1) The species is extinct;

(2) The species has recovered and is no longer endangered or threatened; or

(3) The original scientific data used at the time the species was classified were in error.

In making this finding, information pertaining to the southwestern willow flycatcher in relation to the five factors provided in section 4(a)(1) of the Act is discussed below. In considering what factors might constitute threats, we look beyond the mere exposure of the species to the factor to determine whether the species responds to the factor in a way that causes actual impacts to the species. If there is exposure to a factor, but no response, or only a positive response, that factor is not a threat. If there is exposure and the species responds negatively, the factor may be a threat and we then attempt to determine if that factor rises to the level of a threat, meaning that it may drive or contribute to the risk of extinction of the species such that the species warrants listing as an endangered or threatened species as those terms are defined by the Act. This does not necessarily require empirical proof of a threat. The combination of exposure and some corroborating evidence of how the species is likely impacted could suffice. The mere identification of factors that could impact a species negatively is not sufficient to compel a finding that listing is appropriate; we require evidence that these factors are operative threats that act on the species to the point that the species meets the definition of an endangered or threatened species under the Act.

In making our 12-month finding on the petition we considered and evaluated the best available scientific and commercial information, as explained below**.**

Introduction

This analysis of the threats to continued existence of the southwestern willow flycatcher includes an overview of our most recent threats analysis from the 2014 five-year review (which we are including by reference) (USFWS 2014); our 90-day finding on this petition (81 FR 14058); new information received during comment periods on the 90-day finding (81 FR 14058); and a new five-factor threats analysis that includes ongoing threats identified in our 2014 five-year review and new items identified since 2014. We did not receive any new information about threats to the flycatcher during our comment periods. We include much of the threats-related information presented in our 2014 flycatcher five-year review because the issues are recent, relevant, and the impacts of many threats are ongoing (i.e. impact of dams). As a result, much of the threats information described in our 2014 flycatcher five-year review will also be found in this analysis, where appropriate.

Summary of Threats Analysis from 2014 Flycatcher Five-Year Review

Our 2014 flycatcher five-year review included a five-factor threats analysis (USFWS 2014, pp. 34-67) that included new and updated items about flycatcher conservation, population status, and natural history since completion of the Recovery Plan (USFWS 2014, p. 3). None of the new flycatcher natural history information changed our basic overall understanding of the bird. We presented new items about flycatcher demographics, movements, and breeding site` colonization (Paxton *et al*. 2007, Ellis *et al*. 2008, MacLeod *et al*. 2008, 2009). We also addressed information about willow flycatcher genetics and the northern boundary of the southwestern subspecies across CO, UT, and NM (Paxton 2000, Paxton *et al.* 2007b). There was new information about threats to flycatchers and its habitat from introduced biocontrol for tamarisk (salt cedar) leaf beetles (*Diorahbda carninulata*, formerly known as *D. elongata*), and predictions about future water availability and impacts from the effects of climate change. We discussed and evaluated the present or threatened destruction, modification or curtailment of its habitat or range by addressing the following topics: dams and reservoirs; water diversions and groundwater pumping; channelization and bank stabilization; tamarisk leaf beetle; urbanization; agricultural development; livestock grazing and management; fire; recreation; phreatophyte (shallow groundwater-supported trees) control; impacts to migration and winter range habitat; and changes in the abundance of other species (tamarisk, Russian olive, giant reed, and cowbirds). We explicitly clarified, based upon new information and a better understanding of why tamarisk persists and flourishes, that tamarisk, in and of itself, is not a threat to the flycatcher. Tamarisk proliferation is a product of threats caused by land and water management actions (i.e. river flow regulation, groundwater extraction, surface water diversion, etc.) that have altered the landscape and created conditions that have favored tamarisk and at the same time reduced the ability of native riparian vegetation to germinate, grow, and be recycled. There was no information about overutilization of flycatchers for commercial, recreational, scientific, or educational purposes. We evaluated the impacts of nest predation and disease and the adequacy of existing regulatory mechanisms. When considering other natural or manmade factors affecting the flycatcher's continued existence, we considered the effects of climate change, the vulnerability of small and/or isolated populations, and genetic effects. We recognized the southwestern willow flycatcher as a subspecies and concluded that, based upon the threats, its endangered status is still accurate.

The synthesis of our flycatcher five-year review concluded that the flycatcher's status has improved (due to an overall increase in known estimated territories) since the 1995 listing, but its classification as "endangered" is still accurate (USFWS 2014, p. 81). Ongoing threats associated with land and water management combined with the introduction and spread of the tamarisk leaf beetle create significant challenges toward downlisting or delisting and are likely to cause future population declines (USFWS 2014, pp. 77-78). Much of the initial increase in known territories following listing was likely attributed to improved survey effort (Durst *et al*. 2008, p. 4) combined with habitat recovery and conservation efforts. There was an immediate initial increase in known flycatcher breeding sites/territories following listing, but growth has been more modest since the early 2000s (Durst *et al.* 2008, p. 6). While some specific known flycatcher populations have grown (i.e. Elephant Butte Reservoir along the Rio Grande, NM, and San Pedro/Gila River confluence, AZ), populations within other broad geographic areas, such as the Coastal CA and Basin and Mohave Recovery Units and along the Lower Colorado River have declined. Survey effort has also declined, reducing our ability to more precisely track known breeding sites and detect new or developing breeding sites. Plus, the introduced leaf beetle has entered the flycatcher's breeding range, threatening to impact vegetation that is an important part of about 50% of all known territories. As a result, in 2014 we concluded that the flycatcher should remain classified as endangered primarily because of ongoing threats from land and water management; population declines in large portions of the rangewide distribution; the anticipated future adverse effects to its habitat and population from the tamarisk leaf beetle; and the potential impacts associated with the effects of climate change.

The entire 2014 flycatcher five-year review, which includes a five-factor threats analysis, can be retrieved from the AZ Ecological Services website at https://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/SWWF/SWWF_5-YrReview_2014%20-%20FINAL.pdf and the Service's national website at https://ecos.fws.gov/docs/five_year_review/doc4437.pdf. We will provide information from the 2014 five-factor threats analysis below in the appropriate sections, where appropriate.

Summary of Response to Petition Issues on Threats, Status, and Regulatory Mechanisms

The delisting petition asserted that the following issues supported the removal of the southwestern willow flycatcher subspecies from the list of endangered species: 1) the increase in number of flycatcher territories; 2) the status of riparian habitat in the Southwest; 3) cowbird parasitism; 4) livestock grazing; 5) tamarisk; and 6) regulatory mechanisms (PLF 2015, p. 20-21). All of these issues have previously been identified and addressed in documents dating as far back as the 1995 flycatcher listing rule, and more recently in the Recovery Plan (USFWS 2002) and five-year review (USFWS 2014). Below, we recap each of these arguments and explain why we continue to conclude that the subspecies is endangered.

Number of Flycatcher Territories

The petition accurately identifies that the known southwestern willow flycatcher breeding population has increased over the last 20 years. The petition does not provide any new information about the flycatcher's distribution and abundance. Since its listing as an endangered species in 1995, we have described and referenced reports with known and estimated population numbers in documents such as the final listing rule (60 FR 10694), Recovery Plan (USFWS 2002), critical habitat proposals and final rules (69 FR 60706), and five-year review (USFWS 2014). In 1995, we estimated the total southwestern willow flycatcher population to be 300 to 500 nesting pairs (60 FR 10711). By 2001, the population was estimated to be at 986 territories (USFWS 2002, p. 29). Much of the improvement in the number of known territories was attributed to increased survey effort, but also growth was detected following habitat recovery from flooding impacts (Durst *et al*. 2008, p. 4). We reported that following the 2002 breeding season, 1,153 territories were estimated to occur throughout its breeding range (69 FR 60708). In both the 2013 final critical habitat rule (78 FR 345) and five-year review (USFWS 2014, p. 16), we identified the number of rangewide territories (1,299) found in the most recent 2007 rangewide estimate (Durst *et al*. 2008).

Although a finalized flycatcher rangewide territory estimate has not been completed since 2007, a recent draft report provides an estimate for the 2012 breeding season (USFWS 2014, p. 20), and raw survey results exist from more recent surveys. The draft number of territories estimated rangewide as of the end of the 2012 breeding season was 1,629 (Durst. S., USFWS, pers. comm. 2014). Compared to 2008, the increase in territories was mostly elevated by the 333-territory growth in known breeding sites along the Middle Rio Grande near Elephant Butte Reservoir, along the upper Gila River in AZ and NM, and near the San Pedro and Gila River confluence in AZ. The raw rangewide results (not an estimate of the entire range) from survey efforts in 2014 and 2015 are 1,074 and 1,037 territories, respectively. Again, these results are largely supported by territories within the Middle Rio Grande in NM, Upper Gila River in NM and AZ, and Gila River and San Pedro confluence in AZ.

The increase in known flycatcher territories across its breeding range since the 1995 listing has improved the bird's overall status, but established downlisting (and delisting) criteria focused on distribution and abundance have not been met (USFWS 2002, pp. 84-85). The most current estimated number of flycatcher territories rangewide is 1,299 (Durst *et al.* 2008, pp.12-13), fewer than the minimum 1,500 territories needed for downlisting and 1,950 for delisting (USFWS 2002, p.84-85). More importantly, the 1,299 territories are not geographically distributed appropriately to meet downlisting or delisting criteria, nor have other habitat and associated conservation plans been assessed and/or completed. Even when considering the draft increased rangewide territory numbers from 2012, the improvements in territory numbers occurring in the already robust Management Units (Middle Rio Grande, Upper Gila, Middle Gila/San Pedro) has not affected the lack of improvement in the distribution of territories across the flycatcher's range, especially the decline in status within the Lower Colorado, Basin and Range, Upper Colorado River, and Coastal California Recovery Units (USFWS 2014, p. 16).

Status of Riparian Habitat

The petition argued that the Service was incorrect in its listing documents, which claimed there has been extensive loss of riparian habitat in AZ and the Southwest. The petition concludes that riparian habitat has been increasing during the past 70 years across the flycatcher's range. However, the petition incorrectly quoted the Service's text and focused on the quantity of riparian habitat through time, whereas the Service was not only describing quantity, but also the quality and location of riparian vegetation for nesting flycatchers.

The actual text and meaning of our language in the 1995 final flycatcher listing rule were different than what was described in the petition; we reported that "…as much as 90 percent of major lowland riparian habitat has been lost or modified in Arizona (60 FR 10698)." This text is much different in scope and meaning compared to the petitioners' depiction of the text in the listing rule that "Arizona has lost 90% of its riparian habitat" (PLF 2015, pp. 7-8). Our scope focused on major lowland riparian habitats, which in AZ are comprised of the lower sections of larger streams like the Colorado, Gila, Verde, and Salt rivers. We further clarified in the 1995 final listing rule (60 FR 10698) what we believe this quote means by describing that:

> ...the actual percentage lost or modified is not expected to be consistent across the region, but should vary with elevation, rainfall, geographic area, relative size of drainage system, and severity of impacts. Loss and modification may be lesser at higher elevations, where precipitation is greater and evaporation less. In most major lower elevation desert riparian systems, loss or modification may in fact be near 100 percent, (e.g., the lower Colorado, lower Gila, lower Rio Grande, and lower Salt rivers). Because ''modification'' includes alterations in flow regimes, channel confinement, changes in water quality, and floristic makeup of riparian systems, the Service believes it is not a misrepresentation to state that up to 90 percent of southwestern riparian ecosystems have been lost or modified (60 FR 10698)…The Service determined that the documentation of loss and modification of southwestern riparian habitats, cited in the final rule, is adequate (60 FR 10698).

Smith and Finch (2016, p. 1) summarized the broader historical context of river alteration across the southwestern U.S. and estimated future conditions:

> Hydrological patterns have deviated substantially from historical conditions at many streams in the southwestern United States. Changes have occurred in large part due to regulation of streams for agricultural, industrial, and municipal purposes. Water has been diverted in the Southwest since the establishment of pre-Columbian societies, but changes accelerated during the 20th century when demand for irrigation and municipal water increased with the rapid expansion of agricultural and urban areas (Phillips *et al*. 2011; Summitt 2013). To meet these demands,

> federal agencies and local irrigation districts conducted a series of largescale water projects from the early 1900s to the 1970s. These projects included the construction of increasingly large dams and reservoirs and trans-basin diversions. Because of these projects, discharge is now reduced from historical levels at many streams and some sections that once had perennial flows now run dry, apart from periods of heavy runoff (White and Stromberg 2009). Other sections are inundated by dams while, below dams, magnitude and timing of peak discharges are altered when releases are scheduled for irrigation and power generation (Finch *et al*. 2014).

These historical changes, along with anticipated impacts from increases in carbon dioxide, will likely decrease rates of reproduction and survival of the plant species the flycatcher relies upon for nest placement (cottonwood, willow, boxelder). These effects may also be exacerbated by demands of expanding urban areas and agricultural operations (Smith and Finch 2016, p. 1).

The abundance of dams across the southwestern U.S. within the flycatcher's breeding range helps to highlight the degree of impact caused to riparian vegetation from the alteration and modification to the rivers and processes. Throughout the flycatcher's breeding range, 4,659 dams (structures that are generally 2 m/6 ft high or higher or with reservoirs of 18,000 m^3/15 ac-ft or more) were known to exist (Graf *et al*. 2002, p. 178). From just nine dams on four of the larger rivers throughout the flycatcher's breeding range (lower Colorado, Gila, Verde, and Rio Grande), over 37,000,000 acre-feet of water (an acre-foot equals almost 326,000 gallons of water) can be stored at any one time (USFWS 2002, pp. J-6 – J17). Dams have caused the most significant change to rivers and riparian vegetation because they are widespread and alter the flows of water, energy, and sediment throughout the region (USFWS 2002, I-8, Graf *et al*. 2002, p. 178). Floods of varying size and timing are needed to maintain a diversity of riparian plant species (Poff *et al*. 2007, p.775), and the disruption of those processes alters both gross-and fine-scale geomorphic features that constitute habitat for aquatic and riparian species (Poff *et al*. 2007, p. 772). Poff *et al*. (2007, p. 1) described that streamfow, which is strongly correlated with critical river characteristics, can be considered a "master variable" that limits the distribution and abundance of riverine species and regulates the ecological integrity of flowing water systems. The dynamic component of rivers is central to sustaining and conserving native species diversity and the ecological integrity of rivers (Poff *et al*. 1997, p. 2). As a result of the impacts from dams and other land and water uses, the southwestern desert rivers are described as the most severely altered across the United States (Fitzhugh and Vogel 2010, p. 5).

Some of the more obvious impacts to rivers and riparian vegetation from dams and diversion have occurred along the lower Salt and Gila rivers in central AZ, where about 300 miles (483 km) of streams, stream processes, and riparian vegetation have been altered (Graf *et al*. 2002, p. 179). The broad flat floodplains of the lower Salt and Gila rivers are the types of locations where, in more pristine times, flycatcher breeding habitat would likely occur. However, since the flycatcher was listed, only a few flycatcher territories have been detected within these sections of the Salt and Gila rivers. Below Roosevelt Dam to the Granite Reef diversion dam, the Salt River has been changed to a series of deep lakes (approximately 31 miles/50 km) followed by a 10-mile (16 km) section of regulated river that is diverted by Granite Reef Dam. After the Salt River is diverted, there is an approximate 38-mile (61 km) section of largely dewatered river (aside from Tempe Town Lake) before the Salt River meets its confluence with the Gila River. Between Coolidge Dam and the greater Phoenix metropolitan area near Florence, the regulated Gila River is diverted by the Ashurst-Hayden diversion dam. After the diversion dam, the Gila River extends for about 238 miles (383 km) before it reaches the Colorado River. Unless there is a very large volume of floodwater that Coolidge Dam is unable to hold back, surface water along this long section of the Gila River is mostly intermittent, sometimes supported by elevated groundwater, agriculture return flow, and wastewater return flow.

As a result of the Hoover Dam construction and river regulation, the U.S. Bureau of Reclamation (USBR) quantified changes to flycatcher habitat quality and quantity along the lower Colorado River from Pierce Ferry to the Southern International Border (USBR 1999). Aerial photos from the 1930s, flood patterns, etc. were used to evaluate changes (USBR 1999, p. 14-15). Reclamation concluded that about 89,000 acres of potentially suitable flycatcher breeding habitat existed in the 1930s prior to Hoover Dam construction and operation (USBR 1999, p. 30). About 60 years later, only about 17,000 acres of occupied and potentially suitable flycatcher habitat existed along the lower Colorado River as a result of river regulation (from Pierce Ferry to the Southern International Border) (USBR 1999, p. 44). In 2016, just three flycatcher territories were detected along this 300+ mile (483 km) long section of the Colorado River (Pelligrini, A., pers. comm. 2016).

The broad historical consensus is that alteration of southwestern streams has led to an overall rangewide decrease in flycatcher riparian vegetation occurrence, abundance, and quality (Poff *et al.* 1997, Smith and Finch 2016, USFWS 2002, Appendix I&J, Graf *et al*. 2002), yet there are some regulated and free-flowing sections of river where disturbance factors (i.e. flood, fire, drought, leaf beetle) and serendipitous man-made situations cause fluctuations in remaining amount of flycatcher habitat. These disturbance factors can lead to the dynamic benefits that are necessary to recycle riparian habitat and create mid-seral stage habitat that breeding flycatchers prefer, where others can continue to degrade habitat quality. Hatten (2016) evaluated flycatcher habitat quality across its breeding range from 2013 to 2015. For this time period, Hatten (2016, p. 47) concluded that overall flycatcher habitat quality increased substantially in NM and TX, while in AZ, UT, and NV habitat both increased and decreased, and habitat in CA largely decreased. Hatten (2016, p. 61) was able to demonstrate over a longer period of time (1986-2015) along the upper Gila River how the dynamic nature of free-flowing streams influence flycatcher habitat quality. For example, along the upper Gila River in 2002, the least amount of predicted habitat occurred (684 ha), whereas in 2008, the greatest amount of predicted flycatcher habitat occurred (1,850 ha). Hatten's (2016, p. 61) leaf beetle impact simulation predicts that this 71 km section of the upper Gila River will result in a 53.1 % loss in flycatcher habitat.

In addition to the historical, widespread, and ongoing alteration of southwestern streams from dams, there are additional ongoing impacts to streams and flycatcher habitat from land and water management (USFWS 2014, pp. 30-80). In our listing rule (60 FR 10694), recovery plan (USFWS 2002), and 2014 five-year review (USFWS 2014, pp. 30-80), we elaborated on additional stressors such as river diversion and groundwater pumping; river channelization and bank stabilization; tamarisk leaf beetle; urbanization; agricultural development; livestock grazing and management; fire; recreation, and the effects of climate change that affect flycatcher habitat and further evaluate them below in our five-factor analysis.

Cowbird Parasitism

The petition highlighted cowbird parasitism as a primary issue. Brood parasitism by brown-headed cowbirds (*Molothrus ater*) (a bird species native to North America, but increasing in range to new areas) can negatively affect flycatchers and populations by reducing reproductive performance. The cowbird lays its eggs in the nests of other species, such as the flycatcher. The "host" species then incubate the cowbird's eggs and raise the young. Because cowbird eggs hatch after relatively short incubation and hatchlings develop quickly, they often out-compete the hosts' own young for parental care. Cowbirds may also remove eggs and nestlings of host species from nests (or injure nestlings in nests), thereby acting as nest predators.

The petition claimed that the Service has determined brood parasitism is not a threat to flycatchers (PLF 2015, p. 20) and later, that the Service no longer viewed brood parasitism as a significant threat (PLF 2015, p. 35). However, other than an additional quote in the petition (PLF 2015, p. 35), we could find little other description, information, or explanation about cowbird parasitism. Text in the petition (PLF 2015, p. 35) about cowbird parasitism included the following quote; "Although brood parasitism negatively impacts some…flycatcher populations, especially at small and isolated breeding sites, it is highly variable and no longer considered among the primary rangewide threats to flycatcher conservation (Sogge *et al*. 2010, p. 15)."

In our most recent five-year review, we evaluated the threat of cowbird parasitism and the variety of recent research and concluded that, "due to the rangewide occurrence of cowbird parasitism, the results of long-term flycatcher nest monitoring studies, and the overall distribution of flycatcher territories, we conclude that parasitism is currently a moderate threat, but also recommend caution in the future" (USFWS 2014, p. 66). We clarified that with 84% of the 288 known flycatcher breeding sites either having no flycatchers (50%) or fewer than five territories (34%) (Durst *et al*. 2008, p. 8), a large proportion of flycatcher breeding sites are established where riparian habitat is less expansive and potentially more susceptible to the impacts of parasitism, in contrast to the large populations with greater abundance of habitat. Additionally, future vegetation impacts from defoliating tamarisk leaf beetles may create more opportunities for brood parasites to find and lay eggs in flycatcher nests, similar to the increased parasitism rates detected at Roosevelt Lake in 2002 as a result of decreased plant vigor from drought conditions.

The petition provided no new and overall little information on cowbird parasitism, and we reject the petition's claim that we have identified that brood parasitism is not a threat. Based upon the collection of new information and the best scientific information, we have continued to evaluate the impacts of cowbird parasitism and concluded that the level of threat is lower than when the flycatcher was initially listed, but is still a moderate threat (USFWS 2014, p. 66).

Livestock Grazing

The petition asserts that flycatcher populations in areas of historic and habitual livestock grazing have increased. The petition uses the example of the Cliff-Gila Valley in western New Mexico where a large population of breeding flycatchers occurs in the midst of a working cattle ranch, without significant cowbird parasitism or population declines (PLF 2015, p. 9). The petition concludes that as a result of what occurs at this location in New Mexico, the primary threats to the flycatcher from livestock grazing are largely nonexistent (PLF 2015, p. 9).

The petition does not provide any new information about cattle grazing and flycatcher habitat. Our understanding of the impact of livestock grazing on flycatchers and their habitat has been identified, evaluated, and addressed in the listing rule (60 FR 10699), recovery plan (2002, Appendix G), and five-year review (USFWS 2014, p. 49-53). The Recovery Plan included a literature review on the impact of livestock grazing on riparian habitat across the Southwest, and an examination and description of the location within the Cliff-Gila Valley in New Mexico highlighted by the petition (USFWS 2002, Appendix G). Our evaluations have consistently identified that excessive grazing of riparian habitat is a threat to the flycatcher and its habitat, yet there are likely grazing regimes and settings, like that which occurs in the Cliff-Gila Valley, compatible with maintenance of flycatcher habitat (60 FR 10699; USFWS 2002, Appendix G; and USFWS 2014, p. 49-53). For example, because of the development, completion, and implementation of actions described in Freeport McMoRan's Flycatcher Management Plan in the Cliff-Gila Valley, New Mexico, we excluded a 13.8 km (8.6 mi) Gila River segment from the final critical habitat designation under section 4(b)(2) of the Act due to our conservation partnership and the implementation of a plan specific to managing and conserving flycatcher habitat (78 FR 377, 432-434). We have cited numerous examples of improved grazing management that have helped to improve riparian habitat and the abundance and distribution of flycatcher territories (USFWS 2014, p. 51), yet not all grazing operations have the flexibility or unique setting to implement similar grazing strategies, such as the Cliff-Gila Valley ranch example highlighted by the petition.

Flycatcher populations are abundant on the working cattle ranch in the Cliff-Gila Valley as identified in the petition, but in contrast to the petition's claim (PLF 2015, p. 9), recent territory numbers are not quite as abundant as some previous seasons and have not increased (Shook 2016, p. 6). Between 2010 and 2015, the number of flycatcher territories per year at this location has varied between about 200 and 125 (Shook 2016, p. 6). In 2010, the number of flycatcher territories nearly reached 200 (Shook 2016, p. 6). In 2013 and 2014, territory numbers were about 160 territories for each season, and in 2015, territory numbers dipped just below 150 (near the 22-year average of 149 territories) (Shook 2016, p. 6). Regardless of these expected fluctuations, abundant flycatcher territories have persisted since their discovery in 1994, with a high of 215 territories detected in 1999 (Shook 2016, p. 8-9).

The specific Cliff-Gila Valley ranch identified in the petition contains a unique combination of natural and manmade factors influencing the distribution, abundance, and persistence of riparian habitat (USFWS 2002, pp. G 19-21). Some streamflow is diverted onto the floodplain to irrigate pastures, and ranch operators have allowed extensive riparian vegetation to develop along field edges, irrigation ditches, and return flow courses (USFWS 2002, pp. G 19-21). Those practices, combined with the unique mid-elevation location and flat broad river valley floodplain help to generate dense mature groves of boxelders that benefit nesting flycatchers.

No place else throughout the flycatcher's breeding range can flycatchers be found nesting high above the ground in the canopy of mature boxelder trees. In 1999, 70% of the detected flycatcher nests at the Cliff-Gila Valley Ranch were disproportionately located in boxelders (Stoleson and Finch 2000, p. 8). Flycatchers placed nests in the boxelder's canopy about 9 m (30 feet) above ground on average, with the highest nest placed near 19 m (62 feet) above the ground (Stoleson and Finch 2000, p. 10-11). Unlike canopies of mature willows or cottonwood, mature boxelder canopies retain the vegetation structure and density preferred by nesting flycatchers. However, because boxelder occurs mostly in the mid-elevations from 3,500 to 8,000 feet (Kearney *et al*. 1960, p. 527) where large flat broad floodplains are not common throughout the Southwest, it is a plant species not commonly available for nesting flycatchers. This is in contrast to tamarisk and willow, two of the most common trees flycatchers use for nesting in their mid-seral stage, where nests are placed 3-5 m (7-15 feet) off the ground on average (Stoleson and Finch 2000, p. 10). Cliff-Gila Valley Ranch irrigation ditches adjacent to boxelders appeared to positively influence the density of territories, likely improving habitat vigor and possibly moisture-influenced microhabitat conditions (Stolseson and Finch 2000, p. 14).

Boxelders on the ranch in the Cliff-Gila Valley provide a unique advantageous situation for nesting flycatchers compared to other riparian trees and locations where flycatchers typically nest (78 FR 432-433). By nesting in boxelder canopies, flycatchers and flycatcher habitat are largely protected from immediate impacts from cattle herbivory and disturbance (78 FR 433). However, because the development and maintenance of these boxelders has been greatly influenced by man-made factors (USFWS 2002, p. G-19), there is some concern for the long-term persistence of this type of habitat (USFWS 2002, p. G-20).

Based upon an expansive literature search and expertise within the Flycatcher Recovery Technical Team, the team concluded that improper livestock grazing has been a significant factor in the degradation of riparian habitats in arid western North America (USFWS 2002, Appendix G). Excessive grazing can change watershed hydrology, water quality, aquatic and riparian ecology, and structure and composition of riparian plant communities (Fleischner 1994, Belsky *et al*. 1999). In general, excessive grazing results in general drying of riparian areas, reduction in vegetation structure and volume, changes in vegetation composition, soil compaction, increases in sedimentation and water temperature, and other effects (USFWS 2002, G-5).

Livestock over-consumption of riparian vegetation reduces the abundance, diversity, density, distribution, growth, and germination of vegetation that flycatchers and other open cup riparian nesting birds rely upon for nesting, foraging, and cover (Krueper *et al*. 2003). Livestock consumption of riparian vegetation can reduce the overall density of vegetation, which is one of the primary attributes of flycatcher breeding habitat (Taylor 1986, pp. 254-257). Palatable broadleaf plants like willow and cottonwood saplings may also be preferred by livestock, as are grasses and forbs comprising the understory, depending on season and the availability of upland forage. Flycatchers typically nesting in lower stature habitats, such as those found in high-elevation short-stature willows, may be more vulnerable to livestock that physically contact and destroy nests as they move through flycatcher habitat (Sanders and Flett 1989, p. 263). In order to seek shade, livestock may also degrade and fragment nesting habitat by trampling vegetation and creating trails that nest predators and people may use (USFWS 2002, pp. G 4-7). Furthermore, improper livestock grazing in watershed uplands above riparian systems can cause bank destabilization, increased runoff, increased sedimentation, increased erosion, and reduced capacity of soils to hold water (USFWS 2002, p. G-5).

Tamarisk (or Salt Cedar) Vegetation

The petition accurately describes that in the original listing document we identified tamarisk as a threat to the flycatcher along with Russian olive and other exotic plant species (PLF 2015, p. 8). The petition stated that it provided new information that tamarisk is not a threat to the flycatcher (PLF 2015, p. 10). However, we were unable to find any new information about tamarisk and flycatchers within the petition that we have not already addressed in the recent five-year review (USFWS 2014, 60-64) and other documents.

We evaluated the complex issue of tamarisk and flycatchers in the 1995 listing rule (60 FR 10708), 2002 Recovery Plan (USFWS 2002, pp. H1-H24, K1-K19), and 2014 five-year review (USFWS 2014, 60-64). We described in the 1995 listing rule that "more extensive comparative studies are needed to determine the overall impact on the southwestern willow flycatcher of the conversion of native broadleaf dominated riparian habitat to tamarisk dominated habitat (60 FR 10708)." Further study of the issue occurred and concluded that flycatchers were found to use tamarisk extensively and reproduce successfully when habitat conditions are appropriate (Sogge *et al*. 2005). "When habitat conditions are appropriate" is an important phrase; in most instances tamarisk does not persist in adequate density or abundance, along with the appropriate moisture content, for nesting flycatchers. In our recent five-year review, we concluded, "After examining why tamarisk flourishes, how flycatchers take advantage of tamarisk, and combining that improved understanding with the knowledge that flycatchers are abundant and reproduce successfully in tamarisk; our overall conclusion is that tamarisk, in and of itself, does not pose a threat to the flycatcher."

Our conclusions about tamarisk and flycatcher have evolved with the continued collection of new information, shifting the focus from the plant itself to the root cause (stressors caused by land and water management) of why tamarisk has flourished along southwestern streams (USFWS 2014, p. 60-64). In our five-year review we wrote, "Based upon the collection of new information, our understanding of whether tamarisk is actually a threat, or even a benefit to the flycatcher, has evolved since its listing in 1995. Our current understanding is that the spread of tamarisk and the loss of native riparian vegetation is primarily a product of land and water management actions." We were able to be more definitive in concluding that "human actions have facilitated the dispersal of tamarisk to new locales, and created opportunities for its establishment by clearing vegetation, modifying physical site conditions, altering natural river processes, and disrupting biotic interactions (USFWS 2002, p. H-11, USFWS 2014, p. 61)." In other words, the spread and proliferation of tamarisk across the Southwest and decline of native riparian vegetation has not been caused by the introduction of tamarisk into North America, but has been caused by the alteration of streams from water and land management actions (i.e. dams, groundwater pumping, river diversion) that have changed the landscape to favor tamarisk and create conditions that do not favor native riparian plants.

<u>Inadequacy of Existing Regulatory Mechanisms</u>

The petition also argues that existing regulatory mechanisms are adequate and available to protect the southwestern willow flycatcher and its habitat in the absence of protections of the Act (PLF 2015, pp. 7&9). The petition specifically lists the Clean Water Act, Migratory Bird Treaty Act (MBTA), National Forest Management Act, and Federal Land Policy Management Act as sufficient applicable laws to protect watersheds, riparian areas, and threats to the species, and explores these and other measures (PLF 2015, pp. 32-34). The petition does not provide us any new information about the various laws, regulations, and their protection for the flycatcher. We addressed the inadequacy of existing regulatory mechanisms in the 1995 listing decision (60 FR 10711), within the Recovery Plan (USFWS 2002, pp. 43-60), and most recently within the 5-year review (USFWS 2014 pp. 69-71).

Our conclusion through the listing decision (60 FR 10711) and also during the most recent five-year review (USFWS 2014, pp. 69-71) is that if the flycatcher was not listed under the Act, existing Federal and State regulatory mechanisms would be inadequate for its protection. There continue to be ongoing significant threats and anticipated future threats to the flycatcher, its habitat, and recovery that require continued protection under the Act. Without the habitat protections associated with the Act, existing Federal regulations, such as the MBTA (16 U.S.C. § 703–712), and state regulations are inadequate.

Various land management laws can provide some local or serendipitous benefits to the flycatcher, but these are not focused enough on the flycatcher and its habitat to reduce the threats facing the subspecies. For example, the Federal Land Policy and Management Act of 1976 requires that "…the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that … will preserve and protect certain public lands in their natural condition; (and) that will provide food and habitat for fish and wildlife …" Additionally, the National Forest Management Act of 1976 directs that the National Forest System "…where appropriate and to the extent practicable, will preserve and enhance the diversity of plant and animal communities." The Clean Water Act of 1977 provides for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's lakes, streams, and coastal waters. All of these can provide some potential improvement or long-term protection to flycatcher habitat in some portions of its range, but none are specific enough to provide adequate protection for the flycatcher and its recovery.

Likewise, the MBTA does not provide adequate protection against threats to the subspecies. The MBTA prohibits ''take'' of any migratory bird, which is defined as: ''…to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect…'' However, there are no provisions in the MBTA preventing habitat destruction unless direct mortality or destruction of active nests occurs. Because the reason for the flycatcher's endangerment is so closely connected to habitat impacts, the MBTA does not provide adequate regulatory assurances for protection and recovery.

State regulations address the flycatcher where it occurs in AZ, CA, CO, NM, NV, and UT, but are limited in the degree of habitat protection and more closely mirror protections associated with MBTA. Within AZ, the flycatcher is considered a "species of greatest conservation need" in the state Wildlife Action Plan. All other states in the flycatcher's breeding range classify the flycatcher as "endangered." State designations in AZ, CO, NV, NM, and UT do not convey habitat protection or protection of individuals beyond existing regulations on capture, handling, transportation, and take of native wildlife. Protections for state endangered species in CA are similar as other southwestern states, but the CA Endangered Species Act (CESA) and CA Environmental Quality Act (CEQA) add some additional considerations. CESA (which identifies the southwestern willow flycatcher as a state endangered species) requires consultation between the CA Department of Fish and Wildlife and other state agencies to ensure that activities of state agencies will not jeopardize the continued existence of state-listed species. CEQA, which is similar to the National Environmental Policy Act, has three primary purposes: 1) minimizing impacts on the environment by identifying impacts and then applying mitigation measures; 2) disclosing to decision-makers and the public the potential impacts of a proposed action and associated mitigation measures; and 3) disclosing the rationale behind decision makers' determinations to the public.

Existing federal and state regulatory mechanisms are inadequate to ensure the continued existence of the southwestern willow flycatcher, largely because of their inability to establish a process to address impacts and conservation of its unique habitat.

Summary of Information Received During Comment Period about Threats

During the March to May 2016, comment period for the flycatcher delisting petition review, we did not receive any new information about the status of the flycatcher or its threats. We received nearly 25,000 comments from the public; however none of those comments represented new information about threats to the flycatcher or its habitat. Rather, nearly all of the comments included opinions about the listing or delisting of the flycatcher, the known threats affecting the bird, and its associated taxonomic status.

Listing decisions are made following an assessment of the best available scientific information of the five factors. Below we address Factors A through E: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) Overutilization for commercial, recreational, scientific, or educational purposes; (C) Disease or predation; (D) The inadequacy of existing regulatory mechanisms; and (E) Other natural or manmade factors affecting its continued existence.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Below we identify threats/stressors to the flycatcher's habitat and explain how they are affecting flycatcher habitat, abundance, and consequent effects to the flycatcher. Because of the diversity of items included in this section, we also include under each subheading discussion about non-regulatory conservation efforts, such as Habitat Conservation Plans (HCP) and Safe Harbor Agreements (SHA), and other voluntary actions that are not legally required but which may reduce the threats the species faces. Within each section and at the end, we balance the impacts of the stressor with the effects of existing conservation efforts to consider the net impact on the species currently and in the future.

New or updated issues addressed in our threats analysis below include, but are not limited to, further leaf beetle movement into AZ and NM flycatcher habitat; public interest in moving leaf beetles to southern CA; an introduced public law to eradicate tamarisk; riparian habitat impacts from exotic shot hole borer beetles in southern CA; and continued efforts toward developing a water diversion from the upper Gila River in western NM.

Habitat Loss and Modification

Dams and Reservoirs

Most of the larger and many of the smaller southwestern streams that likely supported flycatcher habitat are now dammed. Operation of dams modifies, reduces, destroys, or (in some specific instances) increases riparian habitats that flycatchers rely upon for nesting, shelter, and foraging both downstream and upstream of the dam site. Below dams, changing the amplitude, magnitude, frequency, duration, timing, and rate of change of hydrologic conditions strongly influences the structure and function of riparian ecosystems (Poff *et al.* 1997, pp. 269-274). As a result of the operation of dams, maximum and minimum flow events can both be altered; base flows can be increased or decreased; and flood flows are reduced in size and frequency. Below dams managed for downstream water supply, high flows are often reduced or shifted from that of the natural hydrograph. Daily water fluctuations can be very high below dams operated for hydroelectric power. The more or less annual cycle of base flow punctuated by short duration floods is frequently lost. In altering these downstream flows, dams inhibit the natural cycles of flood induced sediment transport and deposition, floodplain hydration and flushing, groundwater aquifer replenishment, and timing of seed dispersal necessary for germination and maintenance of native riparian habitats. Lack of flooding also allows a buildup of debris, resulting in less substrate available for seed germination and an increase in fire frequency. Because of the lack of flushing flood flows, natural levels of salt and other minerals are often artificially elevated in downstream alluvial soils. Changes in soil and water chemistry (as well as overall stream flow) can affect plant community makeup, often preventing native plants and trees from flourishing, but favoring more adaptable exotic vegetation, such as tamarisk.

Immediately upstream of dam sites, riparian habitats are inundated by water within the conservation space of the reservoir. In some areas, the effect to riparian habitat and flycatchers is partially reduced by large fluctuations in lake size. Reservoir fluctuations can mimic the dynamics occurring along rivers, causing development of riparian habitat on the newly exposed wetted floodplain as the lake's shoreline recedes. The development of riparian areas within the conservation space of reservoirs can result in flycatcher breeding populations that can be even more dynamic in habitat availability and number of flycatcher territories than those occurring along streams. As a result, these habitats and populations tend to be vulnerable, with riparian habitat often inundated or desiccated as dam management raises and lowers the water level. Some reservoir locations where these volatile flycatcher populations occur are Elephant Butte Reservoir in NM; Roosevelt, Horseshoe, and Alamo lakes in AZ; Lake Mead on the Colorado River; and Lake Isabella on the Kern River in CA.

Although large flycatcher populations can occur in habitat created within the conservation space of reservoirs, those territories are likely not as stable, geographically dispersed, or persistent as those that occurred along miles of pre-dammed rivers. Some dam operations reduce water storage during the late spring and summer, exposing a wet floodplain during the portion of the year when few native riparian plant species are still producing seeds but when tamarisk seeds are being produced and are able to become established (Chew 2009, pp. 17-18). As a result, tamarisk can be a significant portion of the flycatcher habitat located within some reservoirs. With the release of the tamarisk leaf beetle, these volatile lake populations may become even less stable and abundant in the future should the beetles reach these areas and reduce habitat quality.

Since listing, the impact from the operations of some dams on existing flycatcher populations has been evaluated under the Act and resulted in the completion of section 7 consultations and HCPs. This has resulted in reducing some of the impacts of dam operations to known flycatcher populations in many places within the flycatcher's range, such as at Roosevelt (SRP 2002), Horseshoe (ERO and SRP 2008), and Isabella (USFWS 1996, 2000) lakes. In these three instances, the primary measure to reduce impacts was to acquire and manage riparian habitat along streams away from the dam's impact (although this was not the lone conservation measure). Along the lower Colorado River, impacts associated with Hoover Dam and other lower Colorado River (LCR) dam operations and water diversions resulted in the development of a broad multi-species HCP, where a portion of the plan targets the acquisition and creation of riparian habitat on stream side agricultural fields downstream of Hoover Dam (LCR MSCP 2004). Most recently, Lower Colorado River Multi-Species Conservation Plan (LCR MSCP) efforts have acquired Planet Ranch land along the Bill Williams River, which is expected to reduce water withdrawals and conserve about 550 acres of riparian vegetation that includes flycatcher habitat (USBR 2016, pp. 274-277). While not specific to the evaluation of dam operations, along the lower Rio Grande below Elephant Butte Dam, actions are proposed to improve the abundance and quality of flycatcher habitat by reducing land and water use stressors associated with river management (78 FR 444-447). While these examples are limited in their geographic scope, they show that regulatory mechanisms can help reduce the overall threat from the ongoing operation of dams and reservoirs throughout the flycatcher's range.

However, we note that while conservation measures associated with HCPs and other mechanisms can be beneficial, there are limitations. Due to the water demands of society in the southwestern United States and legal contracts, there is little flexibility to address the broader impact of dams and their operations on southwestern streams and riparian habitat. At Horseshoe Dam in central AZ, where water storage is limited, minor changes were implemented to help protect and prolong flycatcher habitat persistence within the lake's conservation space (ERO and SRP 2008, pp. 169-170). Changes to dam operations have been considered and evaluated at Alamo Dam along the Bill Williams River in western AZ (Hickey *et al*. 2016, p. ix). Because Alamo Dam is primarily a flood control structure, there is some, but limited, flexibility in the storage and timing of below-dam river flow. Overall, the option to significantly alter dam operations on large southwestern rivers appears to be rare.

The development of major dams throughout the western United States occurred throughout much of the 20th Century, but the future development of abundant large dams on major streams does not appear likely (Billington *et al*. 2005, pp. 411-412). The reliance of society on these existing structures reinforces the importance of their ongoing persistence and operation. By 1996, the major water resource regions that include the flycatcher contained 4,659 dams of all sizes and 173 dams with storage capacity greater than 100,000 acre-feet (USFWS 2002, p. J-1). Overall, human populations in the arid southwestern United States continue to be the fastest growing in the country (Mackun and Wilson 2011, p. 2). More than 20 million people in the region depend directly on water from the dams and delivery structures, and as many as 50 million receive at least indirect benefits such as electricity from the regional power grid and recreation opportunities afforded by the rivers and reservoirs (USFWS 2002, p. J- 1). Thus, the ongoing presence and operation of dams remain the greatest threat to flycatchers and their habitat now and into the future; we expect it will be the most challenging to overcome in the species' recovery.

Diversions and Groundwater Pumping

Surface water diversions and groundwater pumping of rivers for agricultural, industrial, and municipal uses are key factors in the deterioration of flycatcher habitat (USFWS 2002, p. 34). "Depth to groundwater exerts strong influence on the composition of arid region floodplain vegetation, in large part, due to between-species differences in rooting depth combined with the fact that shallow groundwater often supplies a more permanent water source than does periodic overbank flooding (Stromberg *et al*. 1996, p. 123)." Southwestern river flow and groundwater are appropriated, meaning that many different individuals, corporations, tribes, and government entities own the rights to withdraw and use the water within a specific set of allocations and priorities. The current state of depleted groundwater resources combined with the anticipated future human growth and water demands lead to ongoing concern for the density and abundance of shallow-rooted riparian plants the flycatcher relies upon.

The adverse impacts from the groundwater use of an estimated 140 million people and 60% of irrigation users across the United States has been evaluated at various scales (Stromberg *et al*. 1996; Leake *et al.* 2000; Bartolino and Cunningham 2004; Marshall *et al*. 2010; Konikow 2013; Russo *et al*. 2014). Konikow (2013, pp. 50-51) concluded that across the United States, the cumulative total groundwater depletion from 1900-2008 is about 1,000 km^3, or about twice that of the volume of water contained in Lake Erie (about 480 km^3). Russo *et al*. (2014, p. 8-9) concluded that long-term groundwater level trends (1949-2009) from nearly 25,000 wells varied in magnitude and direction across the country, but large regions with generally contiguous groundwater declines include the Southwest (southern CA, NV, AZ, and UT). Leake *et al.* (2000) determined that "ground-water resources in the Southwest are among the most overused in the United States." As an example, groundwater pumping to support the Phoenix-Tucson metropolitan area led to declines in water level of 300-500 feet, while similar declines of 300 feet or more were similarly detected in Las Vegas, NV and Antelope Valley, CA (Bartolino and Cunningham 2004, p. 4). This large volume of depletion represents a "serious problem in the United States because much of this groundwater storage loss cannot be easily or quickly recovered and affects the sustainability of some critical water supplies and base flow to streams, among other effects (Konikow 2013, p. 50)." The consequences of large-scale removal of water from storage are becoming increasingly evident; they include land subsidence; loss of springs, streams, wetlands and associated habitat; and degradation of water quality.

The principal effect of diversion and groundwater pumping activities on flycatcher habitat is the simple reduction of water in riverine ecosystems and lowering of associated subsurface water tables, therefore removing or reducing the essential component that creates conditions for abundant riparian habitat to persist. Water in streams can be removed bit by bit through many small shallow groundwater pumps and diversions, and in other instances surface water can effectively cease through larger diversion dams. Without elevated groundwater tables, native woody riparian vegetation such as willow and cottonwood is unable to germinate, grow, and flourish (Stromberg *et al.* 1996, p. 123). The drying of riparian areas and/or lowering of groundwater tables through diversion and groundwater pumping reduce the ability of the area to support the abundance and distribution of riparian vegetation and moist conditions necessary for flycatcher territories and successful reproduction, and concurrently create drier conditions more conducive to the occurrence of tamarisk and fire (USFWS 2002, Appendix L).

Marshall *et al*. (2010) evaluated various watersheds across AZ, water use, and water management, concluding that without changes, anticipated future human population growth will cause river dewatering and degradation. In AZ, natural perennial streamflow has already declined or disappeared completely at a number of locations due to human groundwater use (Marshall *et al*. 2010, p. 5). Marshall *et al*.'s (2010, pp. 3-5) models concluded that if actions are not taken to reserve a portion of river base flows for the environment, then at least seven other AZ river systems will be dewatered over time and an additional four will experience substantial degradation. From these 11 imperiled AZ streams, the upper Verde River, San Pedro River, lower Cienega Creek, Big Sandy River, and Agua Fria River are important areas where flycatcher recovery goals exist.

The states of AZ and CA and others recognize the challenges of depleted groundwater resources and the needs for improved management (Leake *et al*. 2000, p. 1). For example, in 1980, the State of AZ altered its Groundwater Code to manage finite groundwater resources to support the growing economy (ADWR 2016). As a result, five defined AZ urban and rural geographic areas with heavy reliance on mined groundwater were identified and designated as Active Management Areas (AMAs). The five areas are subject to increased regulation, with unique goals such as: reaching a state of preservation of groundwater for agriculture and prevention of further water table declines by the year 2025 (ADWR 2016). However, these management goals and regulations do not take into consideration the conservation of water resources for the specific benefit of rivers, plants, fish, and wildlife (Marshall *et al*. 2010, p.5). Similarly, in 2014, the State of CA enacted the Sustainable Groundwater Management Act (SGMA), which is intended to ensure a reliable future CA water supply (ACWA 2014, p. 1). The SGMA provides a framework for sustainable management of groundwater supplies by local authorities, with a limited role for state intervention only if necessary to protect the resource (ACWA 2014, p. 1), but does not take into account the ecosystem needs for sustainable water.

Water rights may be bought and sold, offering the opportunity in some cases for purchase of water and conservation for rivers and wildlife. However, purchase of water rights specifically for the flycatcher and/or its habitat has been limited. Instead, water associated conservation actions will likely continue to rely on the existing (or highly similar) arrangement of water flows and rights. Entities such as The Nature Conservancy (TNC) and the Salt River Project (SRP) have been successful in acquiring properties with existing water rights and managing those water resources to benefit wildlife, the flycatcher, and riparian habitat. However, severing and transferring irrigation water rights to instream flow (for the benefit of wildlife) is complex. Up until 2005, legal issues in the State of AZ had prevented transfer applications from being approved (SRP 2011, p. 27, Medgal *et al*. 2011, pp. 267-269). Medgal *et al.* (2011, p. 269) reported that because of this complexity, other than the government, only TNC and a few individuals have held instream flow rights in AZ.

In addition to the legal difficulty in dedicating water for wildlife, even the way water law is written can create additional obstacles in conserving water for riparian habitat. For example, while groundwater and surface water form an interconnected hydrologic system, the laws of Arizona do not recognize this connection and regulate groundwater and surface water differently (Megdal *et al.* 2011, pp. 276-279). This split in the law provides a workable legal system, but it ignores the scientific reality that groundwater and surface water are often connected (Megdal *et al*. 2011, p. 276). Because of these different water management schemes, conflicts can arise when groundwater is hydrologically connected to surface water. In most areas of the state, those with land overlying an aquifer could pump groundwater for the beneficial use of their land as long as the uses are reasonable. But if the aquifer and surface water are connected, nothing protects the surface water from depletion.

In the future, water diversions and groundwater pumping are likely to continue and expand throughout the flycatcher's range (Smith and Finch 2016, pp. 128-129); one of the larger projects being planned is along the upper Gila River, NM. The upper Gila River in NM and AZ represents one of the few free-flowing portions of streams within the flycatcher's breeding range and, along with the Rio Grande, supports the greatest number of flycatcher territories across its breeding range. The State of NM, through the 2004 AZ Water Settlement Act (AWSA), has the opportunity to divert 140,000 acre feet of Gila River water in any ten-year period for the community of Silver City and nearby Cliff-Gila Valley (NM Interstate Stream Commission 2013, pp. 1-6, Gori *et al*. 2014, pp. v-x). Implementation of the AWSA in NM would include certain constraints that would take into account daily and seasonal flow standards before Gila River water could be diverted. The Department of Interior (DOI) and State of NM reached an agreement by the November 2015 deadline to move forward to evaluate the feasibility of the diversion project. There is a 2019 deadline for completing an analysis of the selected alternatives under the National Environmental Policy Act (NEPA). Smith and Finch (2016, p. 128) concluded that diversions like the proposed effort in the Cliff/Gila Valley would exacerbate the anticipated decreases in annual discharge, affecting the survival and reproduction of cottonwoods, willows, sycamores, and boxelders, potentially eliminating their contributions to riparian animal communities such as the flycatcher.

Water is a vital landscape component of flycatcher habitat and any attempt to use water to improve flycatcher habitat and populations must typically take into account the legal and economic aspects of water. In the Colorado River system, the "Law of the River" is the collection of international treaties, interstate compacts, court decrees, laws, rules, regulations and policies that govern the management, allocation and distribution of Colorado River water. Similar arrangements exist on all large rivers of the region that potentially provide flycatcher habitat, including coastal streams in CA; the Rio Grande in CO, NM, and TX; and Gila River in NM and AZ. However, there can be innovative flexibility. While slow to occur, site-specific in nature, and legally challenging, water purchases or modifications of existing legal arrangements can aid flycatcher recovery without disrupting established legal commitments.

There appear to be few options for wide-scale improvement to the river systems flycatchers rely upon from the impact of surface water diversion and groundwater pumping by multiple parties. The impact of historical groundwater pumping and diversion efforts, combined with the urbanization of the southwestern United States, future human population growth, legal obstacles, and the effects of climate change, are an overwhelming challenge. Groundwater pumping and diversion are two of the more widespread, ongoing, and significant threats to the flycatcher and its habitat, with an expected increased need for water as human populations continue to grow (USBR 2005, p. 5).

Tamarisk leaf beetle

Tamarisk is an important vegetative component of the flycatcher's breeding and foraging habitat (Durst *et al*. 2008, p. 15) (78 FR 355-357), and the reasons behind the presence and proliferation of tamarisk throughout the southwestern United States is often misunderstood by land managers/owners, agencies, and politicians (Gelt 2008, pp. 2-3; Nagler *et al*. 2009, pp. 11-31; Chew 2009; Stromberg *et al*. 2009). Rangewide, about 50% of all known flycatcher territories are located within sites where the habitat includes native/exotic vegetation mixtures (Durst *et al.* 2008, p.15). Nesting habitat comprised mostly of native vegetation accounts for fewer than half (44%) of the known flycatcher territories (Durst *et al.* 2008, p.15). Exotic plants (primarily tamarisk) can be important to nesting flycatchers by providing the preferred densely vegetated lower strata habitat structure (Durst *et al.* 2008, p.15) and supporting insect prey species for health and successful reproduction (Sogge *et al.* 2005, pp. 5-6).

Exotic tamarisk (salt cedar) leaf beetles (beetles) were introduced into the western United States to reduce the abundance of tamarisk. Initially, the beetles released north of the flycatcher's range were believed to only move "…tens of feet per year" (USFWS 1999, p. 2) and they could not flourish in the Southwest (USFWS 2005, p. 2). While APHIS researchers concluded the beetles would not be able to thrive in the southwestern United States or impact flycatchers and their habitat (USFWS 1999, pp. 1-2), the Flycatcher Recovery Team (1998) expressed concern and caution about the leaf beetle's release into the western United States and the potential impact to the flycatcher.

Beetles subsequently moved on their own (and with the assistance of people) into the southwestern United States, thriving beyond their expected geographical and physical limitations and into the flycatcher's breeding range (APHIS 2010a p. 3). A subtropical tamarisk leaf beetle (*D. sublineata*) better adapted to the southwestern climate was also released in TX (USFWS 2004a). In 2006, beetles were moved from Delta, UT, to the Virgin River near St. George, in southwestern UT (APHIS 2009, p. 4), and in 2008, the beetles were first detected defoliating tamarisk that comprised flycatcher nesting habitat (Paxton *et al*. 2010a). Leaf beetles defoliate tamarisk during the early portion of the flycatcher breeding season, reducing the vegetative cover relied upon for successful nesting (Paxton *et al.* 2011b, pp. 256-257). Paxton *et al*. (2011, pp. 261-262) described the effect of this sudden habitat change on nesting flycatchers and other riparian birds as an "ecological trap." It is anticipated that tamarisk will re-sprout following defoliation and continue those cycles until some proportion of the tamarisk trees die, which itself may eliminate or reduce nesting flycatcher habitat suitability (Paxton *et al*. 2011b, p. 258). APHIS terminated their leaf beetle biological control program in 2010, which included the cessation of new permits for interstate movement, environmental release, and field cage studies (APHIS 2010b).

The USGS (Shafroth *et al.* 2010b), in a report requested by Congress specific to tamarisk and Russian olive, completed the most extensive assessment of tamarisk and its effects on the environment. This assessment found that many long-held beliefs about the impact tamarisk has on the environment are not supported by science. For example, tamarisk does not transpire excessive amounts of water (USGS 2010, p. 2), cause increased soil salinity (Shafroth *et al*. 2010b, p. 24), or preclude productive use by many wildlife species (USGS 2010, p. 2).

Specific research comparing the flycatcher's use of native plants and tamarisk was completed in central AZ by USGS (Sogge *et al.* 2005). While Sogge *et al.* (2005, p.1) cautioned against extending their conclusions to the flycatcher's entire range (because the study occurred at a single location), they found no evidence from their long-term study that nesting in tamarisk-dominated habitat is detrimental to flycatcher physiology, immunology, site fidelity, productivity, or survivorship. And while they detected a difference between the two habitats in the flycatcher's diet of insects, they did not determine that food resources are limiting or insufficient in one habitat compared to the other. Also mentioned in the Recovery Plan (USFWS 2002, p. 39) was that, unlike native trees, tamarisk can maintain its fine branching structure as it grows to maturity, which may make it attractive to nesting flycatchers for a longer period of time compared to some native willows. Furthermore, tamarisk flowers throughout much of the summer, which may be important in attracting pollinating insects (a major component of flycatcher diet) throughout the flycatcher's breeding season.

From their initial release, beetles have spread into the flycatcher's breeding range in southern NV, southern UT, northern AZ, NM, and along the AZ/CA border. Along the Virgin River in southwestern UT where nesting flycatchers and beetles occur, tamarisk was defoliated while birds were nesting, degrading habitat quality (i.e. vegetative cover, humidity), likely causing or contributing to flycatcher nesting failure (Paxton *et al*. 2010). The arid southwestern desert-adapted tamarisk leaf beetle released in TX has moved north into the Middle Rio Grande in NM. In 2016 the beetles were found within the largest known concentration of flycatcher breeding territories at Elephant Butte Reservoir. After beetle movement had stalled for a number of years along the lower Colorado River near Hoover Dam and Lake Mohave, beetles were found in 2016 further south at Topock Marsh and along the lower Bill Williams River (both locations where flycatcher territories occur). It is now believed that the beetle is capable of spreading and defoliating tamarisk throughout the full breeding range of the flycatcher (APHIS 2010a, p.5, Tracy *et al*. 2008).

Even though APHIS has effectively terminated its beetle reintroduction program due to the beetle's unanticipated movements and potential impact to the flycatcher, there continues to be interest in moving and releasing beetles to control tamarisk. For example, in 2016, the University of CA at Santa Barbara collaborated with the State of CA, counties, and local landowners to seek transport and release of beetles to the Santa Clara River in Ventura County, CA (McMorran, R., USFWS, pers. comm. 2016). Currently leaf beetles are not known to occur within the flycatcher's breeding range in coastal CA. Portions of the Santa Clara River are designated as flycatcher critical habitat and have previously held flycatcher territories. Progress on beetle movement and release into southern CA is awaiting environmental compliance with various regulatory agencies.

Following tamarisk defoliation and mortality from beetles along altered/dammed streams like the lower Colorado River along the CA/AZ border or below Coolidge Dam along the middle and lower Gila River in AZ, it is not reasonable to expect that native riparian habitat will flourish on floodplains or that planting native trees will establish naturally functioning native riparian forests (USGS 2010, pp. 3-4). Within the flycatcher's breeding range, tamarisk flourishes largely because anthropogenic stressors degrade or alter conditions favorable to establishment of native trees and improve conditions favorable for tamarisk (Stromberg *et al*. 2005, p. 303). While the overall response from flood control and altering water flow is complex, the essential effect is that aquifers are not replenished, causing groundwater elevations to recede from the width of the floodplain and drop in depth farther into the earth. Because native cottonwoods and willows are shallow-water dependent trees that require elevated groundwater conditions to germinate and grow, these altered groundwater conditions prevent native trees from germinating, growing, and flourishing. In other words, the distribution and abundance of tamarisk is symptomatic of the more difficult and broader adverse effects from land and water management that impact the underlying physical and biological processes that shape the ecosystem (Stromberg *et al.* 2005, p. 303). To provide meaningful long-term solutions to improving the quality of streamside riparian areas, attention must be given to reducing the stressors that create conditions that allow tamarisk to flourish and prevent native trees from persisting.

USGS completed a report in 2016 that estimates beetle impact to flycatcher habitat along the Virgin, lower Colorado, and Gila rivers within the flycatcher's breeding range by using models based upon satellite images (Hatten 2016). Effects of beetles on flycatcher habitat were summarized for a 65 km (40 mi) segment of the lower Virgin River from 2010 to 2015, and simulations of how tamarisk leaf beetles may affect flycatcher habitat in the lower Colorado (549 km/341 mi) and upper Gila rivers (71 km/44 mi) were done for 2015. Along the Virgin River, comparing the years 2010 and 2015, which are pre- and post-beetle years, respectively, there were 937 ha (2315 ac) of predicted habitat in 2010, and 87 ha (215 ac) in 2015, representing a 90.7% loss (Hatten

2016, p. 51). A beetle-impact simulation for the lower Colorado River resulted in a 33.5% decrease in predicted flycatcher habitat, and along the upper Gila River in AZ, a 53.1% loss in predicted flycatcher habitat.

Along the upper Gila River, AZ, and Virgin River, NV, efforts are underway to improve the abundance of native vegetation in order to specifically reduce leaf beetle impact to flycatcher populations (USFWS 2015, 2016a). A total of about 400 acres (162 ha) is being planned for vegetation management treatment (tamarisk removal and native tree planting) over a 53-mile (85 km) length of river (USFWS 2016a, p. 6). During the first 50-acre phase of implementation, over 1,000 tamarisk re-sprouted per acre at one site and over 4,000 re-sprouts per acre occurred at another following tamarisk removal (GWP 2015, p. 19). Along the Virgin River, The NV Conservation Corps (NCC), working in partnership with the Service and Bureau of Land Management (BLM), helped to improve about 20 ac (8 ha) by planting native tree species and seeding the site with a native seed mix and using fences to protect saplings from vehicle or cattle damage (GBI 2013, p. 1).

Where tamarisk flourishes, management methods that focus on removing tamarisk and/or planting native vegetation, but do not address the underlying cause for tamarisk persistence, will likely fail to influence the long-term plant species composition (Shafroth *et al.* 2008, p. 98; USFWS 2002, pp. K11-K15; USFWS 2016a, p. 43). Additionally, where natural flooding occurs, alteration, damage, and removal of much of the planting effort can be expected, returning these vegetation management sites to the landscape conditions that initially caused tamarisk to flourish (USFWS 2016a, p. 43).

In 2014 and 2015, the NCC also helped to improve the abundance of native riparian plants for southwestern willow flycatchers at the Pahranagat National Wildlife Refuge (NWR) (Bristol 2015). Willows and other plants were planted at various locations surrounding water impoundments in order to take advantage of elevated groundwater to mimic existing flycatcher breeding sites at the NWR (Bristol 2015, p. 9).

In minute order from March 31, 2016, the Judge for the U.S. District Court for the District of Nevada, Las Vegas Division, granted the plaintiff's motion for summary judgment, finding U.S. Department of Agriculture (USDA) – APHIS violated section 7(a)(1) of the Act (CBD v Perdue, D. Nev. Case No. 13-cv-1785). Section 7(a)(1) of the Act states, "All other Federal agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered and threatened species listed pursuant to section 4 of this Act." Recently, on August 1, 2017, the district court issued an order focusing on the facts in the Administrative Record finding that APHIS violated 7(a)(1); an injunction is expected in a few months requiring APHIS to comply with 7(a)(1). At this time, we do not know what the injunction will be and to what extent APHIS' Section 7(a)(1) program will result in minimizing the impact of the leaf beetle on flycatcher habitat.

Because about 50% of all known flycatcher territories contain tamarisk as an important vegetative component (Durst *et al*. 2008, p. 15) and the beetle is anticipated to occur and impact tamarisk across the southwestern United States (APHIS 2010a, p.5, Tracy *et al*. 2008), the beetle is a significant threat to the quality and quantity of flycatcher habitat and recovery, especially in southern NV, southern UT, AZ, and western NM, where tamarisk is most prevalent within flycatcher territories. Even though APHIS' beetle program has ceased, misunderstandings about the reasons why tamarisk flourishes and its impact to water and wildlife resources have caused continued interest in moving and releasing leaf beetles into the flycatcher's breeding range. Human-aided beetle movement will likely continue to expand the beetle's occurrence across the southwestern U.S. The influence of beetles will be more noticeable and impactful in areas where native riparian habitat is unable to flourish due to land and water management activities, such as portions of streams regulated by dams, or affected by diversion/groundwater pumping.

Exotic Shot Hole Borer Beetles in Southern California

A disease complex involving polyphagous (PSHB) and kuroshio (KSHB) shot hole borer beetles and their associated fungi and pathogens is causing widespread damage to trees in riparian ecosystems throughout southern CA (Stewart 2016), and may potentially impact flycatcher habitat in the near future. The PSHB and KSHB are from Southeast Asia and believed to have come to CA from nursery plants (Stewart 2016). They create tunnels throughout trees and introduce fungal spores causing significant damage (Stewart 2016). The affected trees also become weakened and susceptible to other pathogens (Stewart 2016). The disease complex is known to attack 304 tree species (agricultural, ornamental, and native) and reproduce successfully in at least 43 tree species, including 13 natives such as riparian species (oak, willow, cottonwood, and sycamore) and desert species such as mesquite and palo verde (Stewart 2016).

Up until 2012, the disease complex was restricted to the Los Angeles Basin in CA, but now it has spread as far south as the Tijuana River and as far north as Ventura County, with potential occurrence in San Luis Obispo and Santa Cruz counties (Stewart 2016). It has also been reported in northern Baja CA, Mexico (Stewart 2016). Impacts from these insects have the capacity to spread quickly (Stewart 2016). Neither species of shot hole borer has yet been confirmed in a CA desert ecosystem (Stewart 2016).

To illustrate the proximity and risk to flycatcher habitat, we highlight a recent PSHB and KSHB occurrence within riparian habitat in southern CA along the Tijuana River. The disease complex was identified in 2015 along the Tijuana River, noted by the flycatcher recovery plan as an area of substantial recovery value in the San Diego Management Unit (Stewart 2016). By summer 2016, an estimated 65-82% of willows (140,000 trees) showed damage (Stewart 2016). The disease complex has had substantial outbreaks identified along the San Luis Rey River (San Diego County) less than 15 miles from a known flycatcher breeding site near Lake Henshaw. Also PSHB and KSHB have been detected along San Diego Creek (Orange County), Santa Ana River (Riverside County), and the Santa Clara River (Ventura County) where southwestern willow flycatcher territories and recovery goals occur (Stewart 2016, McMorran, R., USFWS, pers. comm, 2016).

Based on known host range and thermal requirements, CA researchers believe the disease complex can spread throughout much of the flycatcher's breeding range in CA (Stewart 2016). As a result, the flycatcher's breeding habitat and breeding success across the entire Coastal CA Recovery Unit and possibly the Basin and Mojave Recovery Unit is currently at risk from being adversely affected from the shot hole borer beetles (Stewart 2016). If the beetles are able to spread beyond CA and to riparian ecosystems throughout the flycatcher's range, the significance of the threat would grow.

Channelization and Bank Stabilization

Southwestern stream ecosystems have also been modified through physical manipulation, which in turn reduces available flycatcher habitat. Channelization, bank stabilization, levees, and other forms of flow controls are carried out chiefly for flood control. Engineering activities, such as levees, can affect riparian systems by separating a stream from the floodplain. Stream control structures can prevent overbank flooding, reduce the extent of alluvial-influenced floodplain, reduce water tables adjacent to streams, increase stream velocity, increase the intensity of extreme floods, and reduce the volume and width of riparian habitats (Szaro 1989, pp. 77-80, Poff *et al.* 1997, pp. 772-779).

Similar to groundwater pumping and diversions, the impact of these manipulations are difficult to quantify individually and collectively they have a greater impact on the development of flycatcher habitat. As with the impact associated with water withdrawal, these activities are widespread and numerous throughout the flycatcher's range and, as a result, reducing the impact of these structures is challenging because these manipulations are often associated with protection of private property, water delivery, and in some instances range and livestock management. For example, the Tonto National Forest in central AZ is currently evaluating the development of a broad, but unknown number of erosion control structures such as check dams, waddles, rock structures, or log structures along streams throughout the upper Salt River watershed in central AZ with potentially negative results to flycatcher habitat (Tonto National Forest 2013a, p. 8, 2013b, p. 93).

However, site-specific instances of improvement have also occurred. For example, a 3,390-foot long dike along the upper Gila River was removed in order to improve stream function by allowing the river increased access to its floodplain, thereby increasing the overall area where riparian habitat can grow (USFWS 2011a, pp. 2-6). And even though the International Boundary and Water Commission (IBWC) proposed future maintenance and management of levees and river channels along 105 miles of the Lower Rio Grande in NM, a portion of their project was to reduce the impacts and stressors of past actions to encourage better river function, more riparian vegetation, and flycatcher habitat (USFWS 2012a, pp. 2-13). Not only is the desire to implement these types of improvements infrequent, but the effort can require a great deal of technical expertise, labor, permitting, and funding. In these last two examples, the State of Arizona's Water Protection Fund and the Service's Partners for Fish and Wildlife Program contributed funding in AZ, while the Audubon Society and the Elephant Butte Irrigation District collaborated toward implementation of riparian improvement sites in NM.

Urbanization

Urbanization in or next to flycatcher habitat provides the catalyst for a variety of related and inter-related direct and indirect effects to riparian ecosystems that can impact flycatchers and their habitat. Urban development, even in areas away from streams with flycatcher habitat, can create increased demands for domestic and industrial water use. These demands are satisfied by diverting water from streams or through groundwater pumping. Municipal water management often involves developing reservoirs, removing or limiting riparian habitat, and creating flood control structures to alter stream courses and washes to protect floodplain development. Urban development can ultimately begin the slow degradation of habitat by instigating further activities that remove natural river processes and/or adding other stresses to riparian areas.

Urbanization provides the need for improved infrastructure such as increased or improved transportation systems that include bridges, roads, and vehicles, which can impact riparian habitat and wildlife. Marshall and Stoleson (2000, p. 18) described placement of bridges that resulted in the loss of seven known flycatcher territories in NM and AZ, and the possible collision and death of a flycatcher in AZ. Road and bridge renovations and developments have continued to be proposed, authorized, and developed in flycatcher habitat along streams such as the Gila (USFWS 2006), Virgin (USFWS 2010), San Pedro (USFWS 2012b) and Big Sandy rivers (USFWS 2003) and Tonto Creek (USFWS 2011b).

Establishing housing developments near rivers promotes additional risks to the rivers, riparian habitat, and flycatchers. Increased human presence generates a demand for recreational use of riparian areas. Developments can increase trash, bird feeders, and people, and as a result those can facilitate a more established or increased presence of brown-headed cowbirds (*Molothrus ater*), house cats, and other predators (e.g. great-tailed grackles, common ravens). Developers may remove or modify habitat nearest the floodplain, which can remove food, sheltering, perching, and foraging for the flycatcher. Development can reduce infiltration of water into the soil through changes in ground cover (i.e. concrete and asphalt). Urban development can also introduce pollutants to the environment through run-off, waste, and other chemicals; and increase the occurrence of exotic plant species and flammable ignition sources.

Treated waste water discharged into streams can help generate riparian habitat and has been identified as a potential flycatcher recovery tool, especially in areas where water management has reduced stream flow (USFWS 2002, p. I-13). The Recovery Plan identified waste water as an important source of water along the Las Vegas Wash, NV; Santa Ynez River, CA; and Santa Cruz River, AZ (USFWS 2002, pp. I13-I14, K6-K7). Along the lower Salt and Gila river confluence, an area where stream flow has been reduced due to upstream diversion and damming, the City of Phoenix and U.S. Army Corps of Engineers (ACOE) established an agreement to supply treated waste water to manage riparian vegetation. This effort culminated in the development of the Tres Rios Safe Harbor Agreement, which included the flycatcher (USFWS 2014a).

Conversely, in Los Angeles and Ventura counties, CA, tertiary treated water is being reclaimed resulting in the drying of riparian vegetation that flycatchers previously relied upon (Holly 2011, pp. 1-2; BioResource Consultants, Inc. 2013, pp. 5-6, 27). As a result of increasing demands for municipal water and improvements in technology, wastewater can now be used and subsequently not discharged into a stream (BRC 2015, p. 1). Most recently, the City of Santa Paula, after discharging treated effluent into the Santa Clara River for 75 years, constructed a new wastewater treatment plant with updated technology and infrastructure to address wastewater treatment standards and meet the demands of the City's forecasted 2020 human population. The new design eliminated the need to discharge treated effluent directly into the Santa Clara River (BRC 2014, p.1). Following three years of monitoring, the cessation of effluent discharge resulted in drier conditions and less native plant species and vegetation cover, which is believed to have caused a 2.75% increase in exotic plant species (BRC 2014, p. 93). The loss of effluent flows reduced surface water availability and increased the depth groundwater elevation, resulting in impacts to willow trees (BRC 2014, p. 93). Approximately 10.26 acres (4.15 ha) of willow habitat was impacted, causing loss to suitable southwestern willow flycatcher habitat (BRC 2014, p. 105).

Human populations are increasing across the southwestern United States. The U.S. Bureau of Reclamation (USBR 2005, pp. 4-5) compiled a list of interrelated realities of water management that are creating "crises" in important areas in the West, noting explosive human population growth from 1990 to 2000. The USBR (2005, pp. 1-27) anticipates this growth will stress already limited water resources and the greatest potential conflict is anticipated to occur in areas within the flycatcher's breeding range (USBR 2005, p. 9). From 1990 to 2000, AZ and NV, two of the most arid states in the nation (USBR 2005, p. 7), were the states with the greatest percent change in population growth, with 40% and 66% growth, respectively (USBR 2005, p. 5). From 2000 to 2010, those trends in population increases continued; the largest percent increase nationally occurred in AZ (25%), NV (35%), and also UT (24%) (Mackum and Wilson 2011, p. 2).

In southern CA, UT, and AZ, a collection of HCPs and SHAs have been completed by a variety of local governments in order to address threatened and endangered species and include them in overall community planning. For example, the flycatcher has been included in the completed HCPs for southern San Diego County (USFWS 1998), the City of Carlsbad (2004) in northern San Diego County, Western Riverside County (USFWS 2004b), and in two regions of Orange County (USFWS 2007). Large-scale HCPs such as these can be complex and take many years to develop, but the end result can foster a strategic ecosystem-based approach to habitat conservation planning. SHAs have been developed for the flycatcher in geographic areas such as Kane and Washington counties in UT (Color Country Resource Conservation and Development Council 2008). And most recently in 2016, Pima County in southern AZ completed a

HCP that addresses conservation of small portions of the flycatcher breeding habitat along the San Pedro and Santa Cruz rivers and Cienega Creek (USFWS 2016b, p.76). Through this process, the urban development permitted with the HCP process also addresses dozens of listed and other "covered" species, avoids and minimizes threats, and promotes habitat preservation and species conservation.

Throughout the southwestern United States we can anticipate expanded urbanization into areas where flycatcher habitat occurs and the multiple effects that are likely to follow. Even increased urbanization of communities far away from flycatcher habitat can draw water resources away from those essential habitats through canals and pipelines. When these changes occur and communities and infrastructure become established, the likelihood of reversing that change is slim. As a result of the wide-ranging inter-related impacts associated with urbanization that extend far beyond the footprint of an urban area, we believe urbanization to be a significant and increasing threat to the flycatcher and its habitat.

Agricultural Development

The availability of relatively flat land, rich soils, and high water tables in southwestern river valleys generated wide-scale agricultural development. Agricultural development can involve not only direct clearing of riparian vegetation that flycatchers rely upon, but also re-engineering floodplains (e.g., draining, protecting with levees), diverting water for irrigation, groundwater pumping, water storage, and applications of herbicides and pesticides that can also impact flycatchers and its habitat.

In some river reaches, flycatchers can use riparian habitat that is partly sustained by agricultural return flows. Agricultural return flow can create atypical wet conditions farther away from the river and closer to the edge of the floodplain. However, in contrast to artificially developed areas, improved river condition and function would be more likely to develop a greater proportion of self-sustaining native vegetation and support flycatcher populations over the long-term. Depending on unique local situations, a reduction in agricultural return flows could pose a temporal impact or potentially more permanent impact to some flycatcher breeding sites.

A reduction in irrigated agriculture can create additional water and land for flycatcher habitat improvement. On streams such as the Gila, San Pedro, Verde, and Kern rivers, mitigation lands acquired for the flycatcher through implementation of HCP's (SRP 2002, ERO and SRP 2008) and biological opinions (USFWS 1996, 2000) led to a change in agricultural practices and overall habitat improvement. Agricultural fields have been retired and are in the process of being returned to native grasses and plants, and previously diverted water has been reduced or allowed to remain in the aquifer and stream, where it is available to riparian plants.

Strips of riparian vegetation that develop along drainage ditches or irrigation canals can sometimes, under the right conditions, create or augment adjacent flycatcher habitat. Benefits to the flycatcher are greatest when these riparian vegetation strips are dense, abundant, and relatively near adjacent floodplain habitat and also when the vegetation is left undisturbed, as opposed to being periodically cleared.

Along regulated streams such as the lower Colorado River along the AZ/CA border, the Rio Grande, NM, and adjacent to Roosevelt Lake, AZ, agricultural fields and land management techniques have been used to create riparian habitat for the flycatcher and other riparian-dependent wildlife. As a result of the lack of natural function along the Colorado River, the USBR uses existing agricultural fields and associated water rights to cultivate riparian habitat (LCR MSCP 2004, pp. 5-37-40). Similarly, because of alteration to the Rio Grande, the Service manages water distribution at Bosque del Apache National Wildlife Refuge to simulate the timing and dynamic nature of river flow to facilitate riparian habitat germination and growth (Melanson 2012, pp. 4-5). Also, in order to provide habitat for flycatchers following the raising of Roosevelt Lake, SRP has attracted nesting flycatchers to willows and cottonwoods cultivated on a 20-acre agricultural field adjacent to the lake (SRP 2011, pp. 15-17).

The National Resource Conservation Service (NRCS) is implementing the Working Lands for Wildlife (WLFW) program in order to collaborate with private landowners who are agricultural and livestock producers and fund projects that can benefit southwestern rivers and flycatcher habitat. NRCS offers technical and financial assistance to help landowners voluntarily improve riparian areas on private lands. This assistance helps producers plan and implement a variety of conservation activities, or practices, which can benefit the flycatcher and agricultural operations (NRCS 2016, p. 1). These can range from direct vegetation management, fencing of cattle, improvement of water management, to other actions that can reduce stressors and improve riparian habitat within the flycatcher's breeding range.

The WLFW program is aiming to improve 2,755 acres (1,116 ha) of flycatcher nesting habitat by 2018 across the flycatcher's six southwestern recovery units. From 2012 through 2015, NRCS reports that they have implemented projects covering 379 acres (153 ha) in the Coastal CA Recovery Unit, 1 acre (0.4 ha) in Basin and Mohave Recovery Unit, 7 acres (3 ha) in the Upper Colorado Recovery Unit, 234 acres (95 ha) in Lower Colorado Recovery Unit, and 328 acres (133 ha) in the Rio Grande Recovery Unit (NRCS 2016, p. 2). To date there is no information yet to what degree these habitat improvements have resulted in attracting flycatcher territories.

Parcels of land previously used for agricultural purposes were acquired along the lower San Pedro River, AZ, for the benefit of wildlife and riparian habitat that are expected to benefit the southwestern willow flycatcher due to their location within the bird's breeding range. Under a Natural Resource Damage Assessment and Restoration (NRDAR) settlement agreement with the ASARCO mining company, nearly 1,000 acres (including water rights) were transferred to the Arizona Game and Fish Department (AGFD) to manage for wildlife in perpetuity. AGFD also received a grant from the Cooperative Endangered Species Fund, authorized under Section 6 of the Endangered Species Act, that helped them acquire an additional 1,000 acres along the lower San

Pedro River (along with water rights), some of which are immediately adjacent to the ASARCO mitigation properties.

There is likely some degree of continued development or improvement of agricultural lands across the southwestern United States that impacts existing or future flycatcher habitat, but on a broad level the pace of new agricultural development and expansion appears to be slow. In 1996, following the listing of the flycatcher as endangered, up to 1.2 miles of occupied flycatcher nesting habitat was converted to agriculture along the Santa Ynez River in CA (USFWS 2002, p. 37). But overall, across the southwestern states of AZ, NM, CO, and UT, according to research conducted by Vanderbilt University, the number of irrigated acres overall decreased from 1959 (approximately 5,630,000 acres/2,278,429 hectares) to 2007 (approximately 5,460,000 acres/2,209,631 hectares) (Perrone and Hornberger 2007, p. 1). While it appears that significant riparian habitat is not being lost to new agricultural development, irrigated agriculture represents four-fifths of the Southwest's water use (Ackerman and Stanton 2011, p. 20). While there are successful efforts to help decrease the impact of agricultural impacts to riparian areas, the overall widespread impact of agricultural land conversion and water use represents an ongoing significant threat to the flycatcher, its habitat, and recovery.

Phreatophyte Control

In some areas, riparian vegetation (native and non-native habitat) is removed from streams, canals, and irrigation ditches with the intent to increase watershed yield, remove impediments to stream flow, and limit water loss through evapo-transpiration (Graf *et al.* 1984, pp. 1-2; USFWS 2002, p. 35). Flycatchers rely upon native and exotic (primarily tamarisk) riparian vegetation for essential breeding, feeding, cover, and shelter (78 FR 346-356) and a variety of riparian plants, including tamarisk, willow, and cottonwood trees, are identified as primary constituent elements of its designated critical habitat (78 FR 355).

Plants with a root system that draws its water supply from near the water table, including native cottonwoods, willows, and exotic tamarisk, are often described as "phreatophytes." Methods for removing phreatophyte vegetation include mowing, cutting, root plowing, and application of herbicides. Tamarisk is commonly the targeted plant for removal under the unsubstantiated opinion that it consumes more water than native plants and its removal will yield long-term water savings. There is little scientific support that phreatophyte control (including tamarisk removal) results in the anticipated water savings (Graf 1991, pp. 14-15, Shafroth et al. 2010, pp. viii-ix), improvement in riparian habitat quality (Shafroth et al. 2010, pp. xv-xvi), or provides a maintenance-free long-term solution to flood control or fire-fuel reduction (Shafroth *et al*. 2010, pp. xvi-xvii). Clearing or mowing riparian habitat can also result in establishment of other exotic plant species, with potentially additional deleterious impacts. With respect to the flycatcher, the results from these efforts are that the riparian habitat (exotic or native) it relies upon is eliminated or maintained at very early successional stages, which is not suitable as flycatcher habitat (Taylor and Littlefield 1986, pp. 1171-1172).

River managers do not always view groundwater-supported phreatophyte forests positively. Water users believe that the water transpired by the vegetation could be "salvaged" and used if they remove the phreatophytes, a concept that gave rise to phreatophyte removal programs and subsequent studies beginning in the 1930s and 1940s (Graf *et al*. 1984, pp. 8-9; 1991, p. 14; Chew 2009, pp. 24-25; Stromberg *et al*. 2009, pp. 178-181; Shafroth *et al*. 2010, p. 40). Extensive experiments, investments in tens of millions of dollars, and subsequent published research have demonstrated that water savings from phreatophyte removal is very limited to nonexistent (Graf *et al.* 1984, p. 14; Graf 1991, p. 15, Stromberg *et al*. 2009, pp. 178-179; Shafroth *et al*. 2010, p. vii).

Resource managers, scientists, and the general public appear to have mixed views and understandings of why tamarisk persists and flourishes throughout portions of the Southwest, the costs and/or benefits of tamarisk, and the likelihood of establishing native self-sustaining riparian forests in areas where tamarisk has become the dominant vegetation type (Gelt 2008, pp. 2-3, Stromberg *et al*. 2009, pp. 177-178, 182). When discussing the misunderstanding of issues surrounding tamarisk, Gelt (2008, p. 1) wrote that what is "… at issue is the contribution of science to land and water management." Chew (2009) discussed that tamarisk "provides an example of scientific 'monstering' and how slaying the monster, rather than allaying its impacts, became a goal in itself." This is not particularly unusual considering there are state-to-state and/or stream-to-stream differences on the costs and benefits of tamarisk and the mechanisms of its persistence. Additionally, there continues to be inaccurate or misleading information published in various news and online articles that perpetuates this confusion. A better understanding of why tamarisk flourishes in the southwestern United States and the measures needed to allow native riparian vegetation to flourish, along with the limitations caused by over a century of water developments, is necessary to address this issue on a range-wide level.

Studies document that phreatophyte control efforts offer no remedy for western water shortages (Graf 1991, pp. 14-15; Shafroth *et al.* 2005, pp. 235-236; Nagler *et al.* 2008, pp. 142-143). Yet, the interest in salvaging significant quantities of water from vegetation removal to benefit human use remains a prime motivation for riparian plant eradication (Graf *et al.* 1984, p. 1; Stromberg *et al*. 2009, p. 179). A 1997 project along the Pecos River in NM, chemically treated about 2,700 acres of tamarisk resulting in 85 to 90% plant mortality, but with no increase in river flow (Shafroth *et al*. 2010, p. 43). More recently, Fort Huachuca in AZ initially proposed, but subsequently withdrew a project to remove 900 acres of mesquite within the San Pedro River National Conservation Area in order to create water savings to contribute to the resource management of their military installation and the Town of Sierra Vista (Fort Huachuca 2013, pp. 2-41-42).

Additional pressures to remove phreatophyte cover come from flood control interests who view riparian habitat growth in and near channels as reducing flow capacity and increasing the likelihood of flood-related impacts (ACOE 2011, pp. 4-8) and also increasing fire-fuel load. Along the lower Gila River, a collection of communities including the City of Buckeye along with agencies such as the Maricopa County Flood

Control, City of Phoenix, Army Corps of Engineers, Bureau of Land Management, and others in 2016 held planning meetings toward efforts to remove riparian habitat in various configurations along about a 25-mile stretch of the lower Gila River (El Rio Project). The primary goals for implementing this project are water savings, flood control, and fuel reduction.

There have also been recent federal legislative efforts directed at research into the impacts of tamarisk, feasibility for removal of tamarisk, feasibility for water savings, restoration of land affected by tamarisk, and currently, the eradication of tamarisk within the Lower Colorado River Basin. The 2006 Salt Cedar and Russian Olive Demonstration Act (Public law 109–320—Oct. 11, 2006) provided 80 million dollars to conduct demonstration projects and various assessments, including a review of the science by USGS (Shafroth *et al*. 2010). USGS concluded, "Contemporary studies of evapotranspiration that use state-of-the-art measurement techniques challenge the notion that salt cedar and Russian olive transpire more than native riparian vegetation, and suggest that in some settings native species transpire about the same or more water than nonnative species (Shafroth *et al.* 2010, p. viii)." USGS also concluded that, "To date, research and demonstration projects have not shown that it is feasible to salvage (or save) significant amounts of water for consumptive use by removing salt cedar or Russian olive (Shafroth et al. 2010, p. ix)." In 2016, the U.S. Senate adopted amendments to the Fiscal Year 2017 Energy and Water Appropriations Bill to address the effects of drought in AZ and across the West. The first amendment calls on the DOI, USDA, and the National Academy of Sciences to study and develop a plan to remove all salt cedar from Federal land in the Lower Colorado River Basin. The Senate's stated intent is to remove and replace salt cedar with native vegetation in order to reclaim an estimated 860,000 acre feet of water (Dean 2016).

Groundwater storage or streamflow are not the only hydrologic characteristics that may be affected by vegetation removal (Shafroth *et al*. 2010, p. 43). Removal of riparian habitat, including tamarisk and Russian olive has other impacts that also may affect the hydrologic setting and water availability, such as erosion, geomorphologic changes, water quality, sedimentation, wildlife habitat, and invasion by other nonnative plants (Shafroth *et al*. 2010, p. 43).

The impact of phreatophyte control and similar riparian habitat removal projects have typically been site-specific; however, now with broader interests and effort directed toward a larger section of the lower Gila River and the entire lower Colorado River Basin, the nature of the threat becomes more substantial. Phreatophyte removal projects and legislation occur in areas where flycatcher recovery goals exist. Because the Gila and lower Colorado rivers and associated drainages have been altered due to large dams and diversions that prevent native vegetation from flourishing and creates conditions favorable to the establishment of tamarisk, there is a low likelihood of establishing self-sustaining native riparian forests. Habitat removal will likely have negative impacts because it directly removes or degrades the vegetation flycatchers rely upon for migration, breeding, cover, and foraging.

Livestock grazing and management

The primary impact from livestock grazing is the feeding on riparian vegetation along rivers, subsequently altering the occurrence, abundance, growth, and density of vegetation flycatchers rely upon for nesting, shelter, and foraging (Taylor 1986, pp. 254-257, USFWS 2002, Appendix G). Palatable broadleaf plants like willows and cottonwood saplings may also be preferred by livestock, as are grasses and forbs comprising the understory, depending on season and the availability of upland forage. Flycatchers nesting in low-stature habitats, especially those found in high-elevation short-stature willows, may be vulnerable to livestock that physically contact and destroy nests as they move through flycatcher habitat (Sanders and Flett 1989, p. 263). In order to seek shade, livestock may also degrade and fragment nesting habitat by trampling vegetation and creating trails that nest predators and people may use (USFWS 2002, pp. G 4-7). Furthermore, improper livestock grazing in watershed uplands above riparian systems can cause bank destabilization; increased runoff, sedimentation, and erosion; and reduced capacity of soils to hold water (USFWS 2002, p. G-5).

Quantitative and qualitative reviews addressing grazing impacts across the western United States and southwestern riparian areas have concluded that livestock have had a broad and significant impact to the western United States (Fleischner 1994, Belsky *et al*. 1999, Jones 2000). Belsky *et al*. (1999, p.1) concluded that "livestock grazing has damaged approximately 80% of stream and riparian ecosystems in the western United States." Fleischner (1994, p. 629) similarly concluded that because 70% of the western United States is grazed, the ecological costs of this ubiquitous form of land use can be dramatic. Fleischner (1994, p. 635) emphasized that because livestock select riverside areas in arid and semi-arid regions, grazing impacts to easily damaged riparian habitat are magnified. Jones (2000) was critical of Fleischner's (1994) review, and less so of Belsky *et al*.'s (1999) summary, while expressing the difficulty in assessing the inconsistent grazing literature. Even so, nearly 70% of Jones' quantitative analysis revealed significant detrimental effects of cattle grazing, suggesting that cattle can have a negative impact on North American xeric (arid or dry) ecosystems.

The Technical Flycatcher Recovery Team also conducted a literature review specific to livestock impacts to the flycatcher and its habitat (USFWS 2002, Appendix G). They concluded that "the effects of livestock grazing vary over the range of the flycatcher, due to variations in grazing practices, climate, hydrology, ecological setting, habitat quality, and other factors. Also, other stressors affect the flycatcher's habitat to varying degrees, including water management practices, stream channel control, recreational use, wild ungulate grazing (e.g. elk), and agricultural activities. In some situations, these and other factors may aggravate livestock impacts and are sometimes difficult to separate from domestic grazing effects (USFWS 2002, p. G1)." Overall, the Technical Subgroup concluded that the preponderance of evidence indicates that excessive grazing is harmful to riparian habitats and deleterious to flycatcher habitat, because key attributes of southwestern willow flycatcher habitat (dense deciduous vegetation, high water tables) are among the riparian characteristics most affected by livestock grazing (USFWS 2002, p. G5). However, they noted, there are examples of breeding flycatchers existing with livestock grazing (USFWS 2002, p. G5).

Determining the abundance of all livestock across federal, state, tribal, and private lands from one year to the next is virtually impossible within the flycatcher's breeding range. Based upon recent compilation from Wiles and Warren (2016), the amount of grazing allowed on U.S. Forest Service (USFS) and BLM lands across the western United States has fallen over the last 50 years. On BLM lands, livestock authorization has decreased from over 18 million animal unit months (AUM) in 1953 to about 8 million in 2014 (Wiles and Warren 2016). An AUM equals the amount of forage that can support a cow and calf, one horse, or 5 sheep/goats for a month. Authorization on USFS lands has dropped from almost 9 million AUMs in 1953 to about 6,600,000 in 2014 (Wiles and Warren 2016). These reduced numbers were attributed to various different forces including market consolidation, rising operational costs, drought and climate change, less demand for wool, urban development, feedlot proliferation, increased market power of meat packers, improved range science, and wildfire (Wiled and Warren 2016).

Because the impact of livestock herbivory can be highly variable both geographically and temporally, grazing management strategies to improve riparian habitat must be developed locally (USFWS 2002, p. G-32). Measures to reduce the impact of herbivory in riparian areas have resulted in improvements in flycatcher habitat, territory distribution, and abundance along streams in the Southwest. For example, in central AZ, improved grazing management is believed to have contributed to habitat improvement and expansion of flycatcher breeding sites along Tonto Creek and the Salt River on the Tonto National Forest (Tonto National Forest 2013a, pp. 27-30) and nearby Pinal Creek (Freeport McMoRan 2012, p. 5). Similarly, acquisition and/or management of private properties specifically for riparian habitat and/or flycatcher habitat by agencies and groups such as the ACOE, USBR, TNC, Los Angeles Department of Water and Power (LADWP), and SRP have improved cattle management along portions of streams such as the San Pedro, Gila, Verde, Santa Clara, Owens, and Kern rivers. Along both the upper Gila River in the Cliff-Gila Valley, NM, and along the Kern River, CA, livestock operators are able to support flycatcher habitat and populations while continuing their grazing operations through a unique combination of abundant water resources and use of alternative pastures outside of the riparian areas (USFWS 2002, p. G-21). With these resources available, operators are able to relieve grazing pressure on riparian areas and reduce potential conflicts between livestock and flycatchers and their habitat (USFWS 2002, p. G-21).

The Technical Flycatcher Recovery Team Subgroup noted that, "the effort to fine tune recovery recommendations with respect to livestock grazing is worthwhile, as livestock operators, biologists, and management agencies increasingly learn that much can be accomplished by working together" (USFWS 2002, p. G-22). Through an extensive literature review, the subgroup concluded that with respect to livestock grazing, flycatcher recovery would be most assured, and in the shortest time, with total exclusion of livestock grazing from those riparian areas that are deemed necessary to recover the flycatcher and where grazing has been identified as a principal stressor (USFWS 2002, p.

G-22). However, “there is also evidence that under the right circumstances, certain types of grazing are likely to be compatible with recovery. While the data are insufficient to identify specifically what grazing systems are compatible in which specific circumstances, exploring the levels of grazing that may be compatible with maintenance of suitable flycatcher habitat is warranted” (USFWS 2002, p. G-22).

Maintaining, implementing, and documenting improved grazing strategies towards flycatcher recovery are still challenges throughout important areas of its breeding range. While habitat improvement and expansion of flycatcher breeding sites has occurred on the upper Salt River on the Tonto National Forest following the reduction in grazing pressure, there have also been increases of cattle proposed in the riparian area (Tonto National Forest 2013a, p. 40). It is uncertain whether increasing grazing can be compatible with the maintenance and development of flycatcher habitat at this location. Trespass cattle or conflicts with wild ungulates, such as elk, can add additional challenges to land management. For example, trespass cattle along the Virgin River in NV, from neighboring private lands, have impacted flycatcher habitat on BLM and state-managed wildlife conservation lands (Cooper, S., USFWS, pers. comm. 2014). There are other federal lands throughout their breeding range where flycatchers are not known to occur and where grazing is believed to be a significant stressor; improved grazing practices could increase the quality of habitat that could result in an increase in the distribution and abundance of territories, and contribute towards reaching recovery goals.

There is a general lack of specific information from land managers about grazing strategies which can sustain riparian habitat and flycatcher populations that could be replicated in other areas (USFWS 2002, p. G-1). In various parts of the flycatcher’s range such as the Owens River in CA (LADWP 2005, p.6) and the San Luis Valley in CO (ERO 2012, p. 128), land managers have committed to implement grazing strategies that can increase the quality and quantity of flycatcher habitat. Efforts on these lands and others will be important to not only improve and maintain flycatcher habitat, but to also document sustainable and repeatable practices that can be shared with others to contribute to flycatcher recovery.

Cattle ranching on private, tribal, state, and federal lands have a long tradition throughout much of the Southwest, and in some instances, riverine and riparian areas are important portions of these operations. Because of the variety of land owners and managers associated with this activity over a broad geographic area, the impact of livestock grazing on flycatcher habitat is widespread. Where grazing is a significant stressor, a change in grazing management can improve riparian habitat quality, in some instances in just a few years (Krueper *et al*. 2003, p. 608). Therefore, because of the widespread nature of livestock use across the flycatcher’s breeding range, but the ability for changes in management to result in improved habitat conditions, we believe that livestock grazing is an ongoing moderate threat to the flycatcher and its habitat. We continue to encourage partnerships and cooperation toward finding innovative solutions and common ground that can further improve grazing management and compatibility with flycatcher recovery.

Fire and fire management

Riparian area fires are likely more common and impactful today compared to those occurring prior to European settlement (Busch 1995, pp. 259-265, USFWS 2002, Appendix G). Although fires occurred to some extent in some southwestern riparian habitats historically, they were likely uncommon, and as a result, many native riparian plants are neither fire-adapted nor fire regenerated (USFWS 2002, pp. L1-L2). Busch (1995, pp. 264-265) documented that the current frequency and size of fires in riparian habitats on two regulated rivers (Colorado and Bill Williams rivers) are greater than historical levels because reduced floods have allowed buildup of fuels and highly-flammable tamarisk has expanded. Especially at lower elevations of the flycatcher's range, land and water management have created drier conditions with more flammable vegetation (including giant reed *Arundo donax*) that have led to fires, causing immediate changes in riparian plant density and species composition. In addition to natural ignition sources, such as lightning, there are more anthropogenic sources, from power lines and land clearing activities (ERO 2012, p. 76) to recreational, accidental, and negligent incidents. Also, an increase in fuels generated by defoliation and mortality associated with the tamarisk leaf beetle may increase the impact and extent of fire in the future (Drus *et al*. 2012, p. A). Not surprisingly, the riparian plant species likely to recover following a fire are expected to be associated with the hydrologic conditions at a site. As a result, re-establishment of native plant communities is more likely where elevated groundwater occurs (Smith *et al.* 2009, pp. 49-50). In contrast, where land and water management have caused groundwater elevations to decline or changed river hydrology, etc., establishment of better adapted plants such as tamarisk would be expected.

Riparian wildfires have continued to occur since the flycatcher's listing and impacted flycatcher habitat and nesting sites. Near the completion of the 2002 Recovery Plan, fires affecting riparian flycatcher habitat were recorded along the Rio Grande in NM, the San Pedro and Gila rivers in AZ, Colorado River along the AZ/CA border, and in the Escalante Wildlife Area in CO (USFWS 2002, p. 36 & Appendix L). Fire in riparian areas has continued to be documented at flycatcher breeding sites and within its breeding range, such as the Gila and San Pedro rivers (SRP 2011, pp. 27, 39-44) in AZ, and the middle Rio Grande in NM (Smith *et al.* 2009, p. 42). More recently, in April 2013, at the higher elevations of southern CO in the San Luis Valley along the Conejos River, a 925-acre wildfire burned over 50% of the known flycatcher breeding sites, impacting at least seven known territories (Harvey and Rawinski 2015, p.3). And in June 2015, the Kearny Fire near the Gila/San Pedro River confluence, which was believed to have been intentionally started, led to over 1,400 acres of burned habitat (Mahoney 2015), including habitat for 13 existing flycatcher territories and likely active nests (Evans, C., USBR, pers. comm. 2015).

In addition to the traditional fire-fighting actions by federal (USFWS 2011c, pp. 27-31) and state land managers, other actions have been implemented to reduce the occurrence and/or impact of fires in flycatcher habitat. For example, power companies are managing vegetation within transmission line corridors across National Forests in AZ to reduce power outages and wildfire (USFWS 2007a, pp. 3-7; 2008, pp. 5-16). Because of the challenge of fighting fires on rural private lands, SRP in AZ has developed response plans and established key contacts to help reduce fire impacts on their AZ flycatcher mitigation properties (SRP 2011, p. 25). Additionally, a Tonto National Forest Protection Officer, working specifically toward flycatcher habitat protection, issued 16 citations for violating fire restrictions (including one for abandoning a fire) and educated hundreds of people at campsites about fire rules and restrictions at Roosevelt Lake in AZ (SRP 2011, p. 19).

The increase in riparian area wildfires has also intensified the desire to remove riparian habitat in various manners to reduce the overall impact of fire, which can subsequently reduce the likelihood of flycatcher habitat developing. These strategies and proposals can vary from seeking complete removal of riparian vegetation to more moderate fire breaks to reduce the overall impact of fire. For example, the BLM has proposed to remove select mosaics of vegetation along portions of the lower and middle Gila River (USFWS 2016c, BLM 2016) to reduce the extent of wildfire and minimize loss of riparian habitat. In contrast, an additional proposal exists that seeks to remove nearly all tamarisk along a 25-mile length of the lower Gila River through western Maricopa County (El Rio Project).

While there has been an increased risk and occurrence of fire in flycatcher habitat over time, especially at mid to lower elevations across the flycatcher's breeding range, the impacts of fire and fire management have been mostly site-specific and not widespread. As a result, we believe that fire is currently a moderate threat to the flycatcher and its habitat. However, with the anticipated increase in fuels related to defoliation and mortality of leaf beetle-affected tamarisk (Drus *et al*.2012, p. A), the anticipated spread of the leaf beetle into more tamarisk dominated habitats in AZ and NM, greater interest in removing riparian habitat over a larger area, and possibly additional drying of riparian areas from due to drought and climate change, fire and certain fire management actions may become a greater threat to the flycatcher and its habitat in the future.

Brood Parasitism

Brood parasitism by brown-headed cowbirds can negatively affect flycatchers and flycatcher populations by reducing reproductive performance. The cowbird lays its eggs in the nests of other species. The "host" species then incubate the cowbirds' eggs and raise the young. Because cowbird eggs have relatively short incubation times and hatchlings develop quickly, they often out-compete the hosts' own young for parental care. Cowbirds may also remove eggs and nestlings of host species from nests (or injure nestlings in nests), thereby acting as nest predators.

Brown-headed cowbirds are a native species to North America and have probably occurred naturally in much of the flycatcher's range for thousands of years. However, they are closely associated with anthropogenic actions such as forest clearing, livestock grazing, settlements, and agriculture and likely increased in abundance and distribution with European settlement (Goguen and Matthews 2007, pp. 1863, 1868). At normal levels, parasitism is rarely an impact on host species at the population level. However, for a rare host like the southwestern willow flycatcher with a short reproductive life-span, parasitism may be a significant impact on production of young at the population level, especially with the high predation rates flycatchers can experience. When combined with negative influences of predation, habitat loss, and overall rarity, parasitism can be a significant contributor to declines of local flycatcher populations.

Since completion of the Recovery Plan, there has been increased monitoring of flycatcher nests to understand the extent and impact of cowbird parasitism. The Recovery Plan (USFWS 2002, p. 40) compiled mean annual parasitism levels (0 to 66%) from 396 flycatcher nests (range 3-163 nests) monitored in CA, NV, and AZ, between 1987 and 1997. Since completion of the Recovery Plan, long-term studies in AZ and NM have compiled brown-headed cowbird parasitism rates on just over 4,600 flycatcher nesting attempts from four of the densest and largest known flycatcher breeding sites. Within flycatcher breeding sites at Roosevelt Lake, the San Pedro/ Gila River confluence (Ellis *et al*. 2008, pp. 71, 81), and the middle Rio Grande (Moore and Ahlers 2012, p. 66) various methods of cowbird management were implemented, including combinations of trapping, removal of cowbird eggs from nests, and managing breeding season proximity of cattle. From 1996 to 2005, Ellis *et al*. (2008, p. 81) described that in AZ there was an overall low parasitism rate of 2.8% among 1,941 flycatcher nests monitored along the Salt River and Tonto Creek at Roosevelt Lake and surrounding the San Pedro and Gila River confluence. The highest rate of parasitism (42.9%) occurred in 2002 at both the Salt River and Tonto Creek study areas, likely due to reduced vegetation density and cover caused by drought conditions (Ellis *et al*. 2008, p. 88-89). From 1999 to 2012, along the Middle Rio Grande in NM, Moore and Ahlers (2012, p. 62) recorded an overall parasitism rate of 14% (313 out of 2,204 flycatcher nests). In western NM, along the Gila River, from 1997 to 2004, Brodhead *et al*. (2007, p.1218) detected an overall parasitism rate of 20.2% from monitoring 491 flycatcher nests (annual range from 11.3% to 32.2%).

Research into factors influencing the susceptibility of flycatcher nests to brown-headed cowbirds parasitism concluded that habitat configuration is an important factor (Moore 2006, pp. 14 and 19; Brodhead *et al*. 2007, p. 1213; Stumpf *et al*. 2011, p. 1). In southern NV and northwestern AZ, flycatcher nests greater than 330 feet from an edge were 50% less likely to be parasitized than those on an edge (Stumpf *et al*. 2011, p. 1). Brodhead *et al*. (2007, p. 1213) reached a similar conclusion that flycatcher nests placed deeper into habitat are less prone to parasitism, but they also added that a larger patch size attracts nest parasites because of a potentially greater abundance of hosts. Brodhead et al. (2007, p. 1213) also concluded that parasitism was significantly lower within the core of large patches, but the insulating effect was not evident in small and medium-sized patches. Along the Middle Rio Grande in NM, Moore (2006, p. 14) concluded that the area with the highest density of trees and concealment had the least amount of cowbird parasitism of flycatcher nests. As a result, habitat loss, reduced habitat quality, and smaller patches of habitat, etc. are likely to increase the risk of brood parasitism on flycatcher nests.

The effects and management of cowbird parasitism with respect to the flycatcher are complex (USFWS 2002, Appendix F). Cowbird parasitism levels, as indicated from extensive monitoring across the flycatcher's range and described above, can vary widely. Landscape management focusing on reducing cowbird feeding areas (e.g. corrals) or increasing the distance between feeding area attractants (e.g. livestock) and bird nesting areas may be useful alternatives (USFWS 2002, Appendix F, pp. 15-16; Goguen and Matthews 2007, p. 1868). Aggressive cowbird control, such as trapping, may or may not result in significant or even measurable flycatcher benefits (Moore 2006, p. 19). This is in part because cowbird parasitism acts in concert with many other negative influences on the flycatcher, some related and some not. These include habitat degradation, predation, size of a flycatcher population, etc. In some cases a single impact like cowbird parasitism may not appear significant, but the additive (or synergistic) effects with other impacts may be very detrimental, even critical. But, even if the targeted flycatcher population does not grow due to cowbird management, flycatcher reproductive output may improve and thereby increase the number of flycatchers that can colonize other nearby habitat patches, or stall declines in the targeted population (USFWS 2002, Appendix F, p. 26). Cowbird control, such as trapping, should be instituted with caution, and managers should in most cases consider cowbird control only when adequate data show that parasitism on a local population exceeds critical rates (USFWS 2002, p. F-29). The Recovery Plan appendix on cowbird parasitism provides further discussion on the complex issues associated with cowbird parasitism and management (USFWS 2002, Appendix F).

Due to the rangewide occurrence of cowbird parasitism, the results of long-term flycatcher nest monitoring studies, and the overall distribution of flycatcher territories, we conclude that parasitism is currently a moderate threat, but also recommend caution that the impact of parasitism might increase in the future due to changes in vegetation quality from leaf beetles or short-term or long-term changes in climate. As identified at four of the largest known flycatcher breeding populations, local populations can grow, persist, and contribute to recovery concurrent with nest parasitism. The results from these study sites reinforce recommendations reached in the Recovery Plan that the best solution to cowbird parasitism is to improve the quality and abundance of riparian habitat (USFWS 2002, p. F-28). However, a large proportion of flycatcher breeding sites have been established where riparian habitat is less expansive and potentially more susceptible to the impacts of parasitism, in contrast to the large populations with greater abundance of habitat described above. Eighty-four percent of the 288 known flycatcher breeding sites either have no flycatchers (50%) or fewer than five territories (34%) (Durst *et al*. 2008, p. 8). Additionally, future vegetation impacts from defoliating tamarisk leaf beetles may create more opportunities for brood parasites to find and lay eggs in flycatcher nests, similar to the increased parasitism rates detected at Roosevelt Lake in 2002 as a result of decreased plant vigor from drought conditions.

Recreation

In the Southwest, recreation is often concentrated in riparian areas because of the shade, water, aesthetic values, and recreation opportunities. As regional human populations grow, the magnitude and cumulative effects of these activities to some riparian species are considerable. Effects include: reduction in vegetation through trampling, clearing, woodcutting and prevention of seedling germination due to soil compaction; bank erosion; increased incidence of fire; establishment of exotic plant species; increases in predators and scavengers due to food scraps and garbage (ravens, jays, grackles, skunks, squirrels, domestic cats, etc.); increases in brood parasitic cowbirds; and noise disturbance. Recreational development also tends to promote an increased need for foot and vehicle access, roads, pavement, trails, boating, and structures (e.g. verandas, picnic areas, camp sites), which fragment habitat. Reduction in the density and diversity of bird communities, including willow flycatchers (*E. t. adastus*), have been associated with recreational activities (Blakesley and Reese 1988, pp. 401- 402; Szaro 1980, p. 413 & 1989, pp. 80-81; Knight and Cole 1991, pp. 238-239; Riffell *et al*. 1996, pp. 498-502; Marshall and Stoleson 2000, p. 18).

Management of recreation in and around flycatcher habitat can result in effective protection of riparian habitat, and conversely, less management of recreation can increase impacts to flycatcher habitat. The Tonto National Forest developed a broad vehicle closure surrounding portions of the exposed floodplain of the Roosevelt Lake conservation space where a flycatcher breeding population occurs. The closure was designed to reduce impacts to the flycatcher and its habitat and provide other land management benefits within this area, such as a reduction in the occurrence of fire (USFS 2012, pp. 162-163). While foot and boat traffic allowed access to recreation areas within this dynamic floodplain, the vehicle closure was successful in helping to protect habitat for one of the largest breeding populations of nesting flycatchers (USFWS 2013a, pp. 427-428).

The impact of recreation is also a concern on non-federal conservation lands. State-managed wildlife areas in NV along the Virgin River are affected by surface and noise impacts from recreation (USFWS 2013a, p. 486). Tribal management plans developed for riparian areas along the AZ/CA border on the lower Colorado River all identified alleviation of recreation impacts as a management objective (USFWS 2013a, pp. 413-414). Flycatcher conservation land management reports compiled by SRP along the Verde (SRP 2011, p. 38; 2013, B-11), Gila (SRP 2009, p. 24; 2012, p. 19; 2013 B-14), and San Pedro (SRP 2013, p. 36) rivers all describe concerns about impacts from recreationists, hunters, trespassers/vandals, and/or all-terrain vehicles. Additionally, along the Owens River in CA, LADWP implements recreation management along riparian areas (LADWP and Ecosystem Science 2010, Chapter 4, pp. 3-4) to minimize the type, abundance, and location of access (LADWP 2005, pp. 6-7).

Overall, based upon the broad geographic nature and variety of recreation-based impacts, we believe recreation is currently a moderate ongoing threat to the flycatcher and its habitat.

Summary

The primary cause of the flycatcher's decline is habitat loss and modification, which are caused by a myriad of complex and inter-related factors primarily rooted in river regulation and water use. In more pristine conditions, the flycatcher's riparian nesting habitat was dispersed and dynamic due to the variation in river ecology and geology, and also from natural disturbance and regeneration events such as floods, drought, and to a lesser extent, fire. These habitat characteristics have been exacerbated over time due to alteration of river function from land and water management actions and resource use, causing reduced abundance and distribution of flycatcher habitat, and subsequently fewer flycatcher territories and greater isolation of breeding populations. With increasing human populations and related agricultural and urban development, river alteration and management of limited water supplies are established and ongoing components of human society in the Southwest. Flycatcher habitat and their populations are threatened further with additional stressors such as livestock grazing, phreatophyte control, leaf beetle and shot-hole borer beetle introduction, fire, brood parasitism, and recreation. All of these threats to the flycatcher and its habitat vary in severity over the Southwest, and at any given location, multiple stressors are likely to be at work, with cumulative and synergistic effects.

The failure to recognize the impact of river regulation and water use on the reduced distribution and abundance of native riparian vegetation and increase/spread of tamarisk has helped generate additional and ongoing widespread threats to the flycatcher and its habitat that are expected to increase in the future. The general misunderstanding that simply removal of tamarisk will result in improved water supplies and more native riparian habitat has been a catalyst for the introduction and spread of the leaf beetle, legislative efforts to eradicate tamarisk, and funding to remove tamarisk and plant native riparian plant species. However, few of these efforts address the landscape-based root cause for the reduction of the distribution and abundance of native riparian vegetation and increase and spread of tamarisk, which is primarily caused by the alteration of river flow, water use, and lowering of groundwater tables.

While conservation efforts towards improving and conserving flycatchers and their habitat have been achieved with HCPs, management plans, and voluntary efforts, the available information indicates that these efforts have not been extensive enough yet to counter the widespread impact of historical and ongoing habitat loss and modification across the Southwest. Voluntary land management and conservation has helped to improve the abundance, stability, and expansion of flycatcher territories in the Owens, Gila/San Pedro, Upper Gila, Roosevelt, and Lower Rio Grande Management Units. Yet, since completion of the Recovery Plan in 2002, there continues to be little to no change or declines in the number of flycatcher territories within the Lower Colorado, Basin and Range, Upper Colorado River, and Coastal California Recovery Units. Because of their recent implementation, it is uncertain whether voluntary management efforts initiated by the NRCS to improve riparian habitat management across the range of the flycatcher and other efforts to reduce the impact of the leaf beetle will increase and/or protect existing flycatcher territories and result in long-term benefits. When considering the scope of the flycatcher's southwestern breeding range, the wide-ranging impacts of river regulation and water use, combined with additional ongoing urban, rural, and agricultural stressors, land resource use, and ongoing water demands, continue to overwhelm current conservation efforts.

We conclude based on the best scientific and commercial information available that the present or threatened destruction, modification, or curtailment of its habitat or range currently poses a significant threat to the southwestern willow flycatcher, and is likely to continue to be a threat to the subspecies in the future.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

No known recent effects from overutilization or collection have been documented for the flycatcher. Overuse was not listed as a threat in the final rule to list the species nor in the Recovery Plan. Soon after listing, refinements in leg banding protocols and techniques were established that effectively reduced occurrence of leg injuries. Survey training occurs annually sponsored by Service Field Offices and other partners (State Wildlife Agencies, USGS, consultants, etc.) and provides technical and field experience regarding the flycatcher survey protocol and identification. This species is not a member of a taxon known to be collected or traded, therefore this threat likely does not exist, and there is no expectation for a change in the future.

We found no information indicating that overutilization has led to the loss of populations or a significant reduction in numbers of individuals of the southwestern willow flycatcher. Therefore, we conclude based on the best scientific and commercial information available that overutilization for commercial, recreational, scientific, or educational purposes does not currently pose a threat to the southwestern willow flycatcher, nor is it likely to become a threat in the future.

Factor C. Disease or Predation

Nest Predation

Because the flycatcher builds open cup nests, its eggs and nestlings are susceptible to predation by birds, mammals, and reptiles. Predation, particularly during the nesting phase, is a significant factor in the natural history and population dynamics of most small birds, including the flycatcher (Finch and Stoleson 2000, p. 87, Paxton *et al*. 2007, p. 47). Predation events on adults of most passerine birds are rarely observed, and there are virtually no data of this kind for the flycatcher (Finch and Stoleson 2000, p. 87).

Flycatcher nest monitoring studies have recorded a wide variety of nest predators such as the common kingsnake (*Lampropeltis getulus*), gopher snake (*Pituophis melanoleucus affinis*), Cooper's hawk (*Accipiter cooperii*), western screech owl (*Otus kennicottiii*), yellow-breasted chat (*Icteria virens*) (Ellis *et al*. 2008, Appendix J), and great horned owl (*Bubo virginianus*) (Finch and Stoleson 2000, p. 87). Brown-headed cowbirds can effectively function as nest predators if they remove flycatcher eggs or nestlings during parasitism events. Other potential predators of flycatcher nests are believed to include lizards (various species), raccoons (*Procyon lotor*), skunks (various species), domestic cats, jays (various species), crows (*Corvus brachyrhynchos*), ravens (*Corvus spp*.), and roadrunners (*Geococcyx californianus*) (Finch and Stoleson 2000, p. 109).

For many flycatcher populations, nest predation is the major cause of nest failure (Finch and Stoleson 2000, p. 87). Soon after listing, nest monitoring in AZ, CA, and NM recorded a wide range of nest predation rates, ranging from 14 to 60% (Whitfield and Strong 1995, pp. 7-9; Spencer et al. 1996, pp. 12-13, 25; Sferra *et al*. 1997, p.21; Sogge *et al*. 1997b, p. 147; Stoleson and Finch 1999, pp. 10-13). Long-term monitoring studies of many AZ and NM flycatcher nests (which included time-lapse video) similarly found that nest predation was the leading cause of flycatcher nest failure (Ellis *et al*. 2008, p. 89; Moore and Ahlers 2012, p. 62). In central AZ, 36% of 1,873 flycatcher nests with a known outcome failed due to predation (Ellis *et al*. 2008, p. 131). Moore and Ahlers (2012, p. 62) observed similar results during their 10-year effort along the Middle Rio Grande, with predation at 35% of flycatcher nests (775 out of 2,204 nests). Also, Ellis *et al*. (2008, p. 113) found the probability of nest predation decreased as nest height increased, and predation was more likely with older nestlings (Ellis *et al.* 2008, p. 89).

While the nest predation rate of flycatchers can vary from year-to-year and site-to-site, the rates from long-term studies in AZ (Ellis et al. 2008) and NM (Moore and Ahlers 2012) are within the expected range of what small open-cup nesting birds experience (approximately 35%). Most small bird species in North America experience moderate rates of nest predation (30 to 60%) (Finch and Stoleson 2000, p. 21). The AGFD's review (Ellis *et al*. 2008, pp. 148-149) identified predation rates for open cup nesters, ranging from 1 to 82%. Populations within both central AZ and the Middle Rio Grande were able to persist and grow while experiencing normal nest predation rates and the known distribution and abundance of the overall flycatcher breeding population has improved.

As a result of the nest predation rate information collected on flycatchers, including about 4,000 nesting attempts in AZ and NM, predation is expected to be within normal rates. Because of the persistence of these large flycatcher populations and the overall improved known distribution and abundance of flycatcher territories, the impact of normal nest predation rates is believed to currently not be a threat to the flycatcher. However, habitat fragmentation can increase the risk of nest predation for birds like the flycatcher (Finch and Stoleson 2000. p. 79). Similar to cowbird parasitism, nest placement and habitat quality are expected to influence predation rates and subsequently its impact to a population. Anticipated future changes in habitat quality as a result of the tamarisk leaf beetle and possibly the effects of climate change (Paxton *et al*. 2007a, p. 43) may cause increased exposure and access to flycatcher nests and therefore increase the impact of predation on productivity and population persistence.

Disease

Although wild birds are exposed to disease and various internal and external parasites, little is known of the role of disease and parasites on most species or populations. Disease and parasites may be significant factors in periods of environmental or physiological stress, during certain portions of a life cycle, or when introduced into a new or naive host.

The willow flycatcher is known to be a host to a variety of internal and external parasites (blood parasites, blow fly, and nasal mites) and susceptible to viral pox (USFWS 2002, pp. 27-28), but little overall is known (Paxton *et al*. 2007a, p. 141). Although these parasites likely occur in flycatchers, there is no information on what impact they have on infected birds or populations. McCabe (1991, pp. 109-110) identified mites (*Ornithonyssus sylviarum*) in 43% of flycatcher nests and blowfly larvae (*Calliphora spp.)* in 32% of nests, but noted no significant negative effects from either. Whitfield and Enos (1998, p. 10) documented one case of nestling flycatcher mortality due to severe mite infestation. The USGS collected mosquito samples and avian blood samples at Roosevelt Lake, AZ, to determine if West Nile Virus (WNV) was present (Paxton *et al.* 2007a, p. 141). While WNV has become established in the Southwest, USGS found no evidence of the virus in mosquitoes at Roosevelt Lake (Paxton et al. 2007a, p. 141). Paxton *et al.* (2007a, p. 141) did confirm WNV was present in at least two bird species, but not the flycatcher. The USGS (Paxton *et al*. 2007a, p.142) indicated that flycatchers may be very susceptible to WNV because the Tyrannidae Family, to which the flycatcher belongs, evolved in the New World and WNV is of Old World origin. The same could be true of highly pathogenic avian influenza, which has not yet been found in North America, but which has the potential for eventual establishment through natural or human-assistance dispersal (Paxton *et al.* 2007a, p. 142).

While little is currently known about disease impacts to the flycatcher, based upon the overall improved understanding, distribution, and abundance of the flycatcher population since listing, the growth of some large local populations of flycatchers, and the lack of any known single disease or parasite that has noticeably affected flycatcher populations, we believe that disease or parasites are a minor current and future threat to the flycatcher.

The best available information indicates that nest predation occurs within southwestern willow flycatcher populations but is not believed to be currently causing population impacts. However, because flycatchers are susceptible to predation, the uncertainty of how animals may respond to stressors from climate change, and the potential for broad future habitat impacts associated with habitat degradation that may facilitate increased predation, predation may become a future factor. Therefore, we conclude based on the best scientific and commercial information available that predation does not currently pose a threat to the southwestern willow flycatcher, but may become a threat in the future.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

Existing regulatory mechanisms that affect the flycatcher include laws and regulations promulgated by Federal and State governments in the United States and in Mexico. In relation to Factor D under the Act, we consider relevant Federal, State, and Tribal laws, regulations, and other such mechanisms that may minimize any of the threats we describe under the other four factors, or otherwise enhance conservation of the species. We give strongest weight to statutes and their implementing regulations and to management direction that stems from those laws and regulations; an example would be State governmental actions enforced under a State statute or constitution, or Federal action under statute. For currently listed species, we consider the adequacy of existing regulatory mechanisms to address threats to the species absent the protections of the Act. Potential threats acting on the flycatcher for which governments may have regulatory control include impacts associated with water use/management, urban and agricultural development, fire management, phreatophyte control, leaf beetle and shot hole borer movement and management, the effects of climate change, riparian vegetation management, livestock grazing and management, and brood parasitism management.

Federal Mechanisms

National Environmental Policy Act (NEPA)

All Federal agencies are required to adhere to the NEPA of 1970 (42 U.S.C. 4321 *et seq.*) for projects they fund, authorize, or carry out. Prior to implementation of such projects with a Federal nexus, NEPA requires the agency to analyze the project for potential impacts to the human environment, including natural resources. However, NEPA does not impose substantive environmental obligations on Federal agencies—it merely prohibits an uninformed agency action. Although NEPA requires full evaluation and disclosure of information regarding the effects of contemplated Federal actions on sensitive species and their habitats, it does not by itself regulate activities that might affect the flycatcher; that is, effects to the subspecies and its habitat would receive the same scrutiny as other plant and wildlife resources during the NEPA process and associated analyses of a project's potential impacts to the human environment.

Migratory Bird Treaty Act (MBTA)

The MBTA prohibits ''take'' of any migratory bird, which is defined as: ''…to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect…'' There are no provisions in the MBTA preventing damage or alteration of habitat unless direct fatality to birds or destruction of active nests occurs. Because the reason for the flycatcher's endangerment is so closely connected to habitat impacts, the MBTA does not address an essential component necessary for flycatcher conservation and recovery.

Endangered Species Act of 1973, as Amended (Act)

Upon its listing as endangered, the southwestern willow flycatcher benefited from the protections of the Act, which include the prohibition against take and the requirement for interagency consultation for Federal actions that may affect the species. Section 9 of the Act and Federal regulations prohibit the take of endangered and threatened species without special exemption. The Act defines ''take'' as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 U.S.C. 1532(19)). Our regulations define ''harm'' to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Our regulations also define ‘‘harass’’ as intentional or negligent actions that create the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3).

Section 7(a)(1) of the Act requires all Federal agencies to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered species and threatened species. Section 7(a)(2) of the Act requires Federal agencies to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species or destroy or adversely modify their critical habitat.

Under section 10(a)(1)(B) of the Act, the Service may issue permits authorizing the incidental take of federally listed animal species. Incidental take permittees must develop and implement a habitat conservation plan (HCP) that minimizes and mitigates the impacts of take to the maximum extent practicable and that avoid jeopardy to listed species. Incidental take permits are available to private landowners, corporations, Tribal governments, State and local governments, and other non-Federal entities. These permits can reduce conflicts between endangered species and economic activities and develop important partnerships between the public and private sectors. As discussed in the Urban and Agriculture sections above, we have issued incidental take permits for flycatchers in regional HCPs for urban areas in southern CA, southern AZ, and HCPs for dam management and water delivery along the lower Colorado River and central AZ.

Since 1995, the Service has addressed impacts to the flycatcher on Federal lands and from federal permitting and funding through the interagency consultation process, as described in section 7 of the Act. The consultations have included projects such as BLM and Forest Service plans, livestock grazing, bridge development and widening projects, weed and vegetation management, and others. Section 7 consultations have also been conducted with the U.S. Army Corps of Engineers for Clean Water Act permit applications, and other Federal agencies on specific actions. In addition to ‘‘projects,’’ we have consulted with the U.S. Marine Corps to address potential impacts to the flycatcher and its habitat from military training activities on Marine Corps Base Camp Pendleton (Camp Pendleton), and we have consulted with the U.S. Navy on actions related to the management of Naval Weapons Station Seal Beach Detachment Fallbrook (Fallbrook Naval Weapons Station).

We reviewed our files for the number of formal section 7 consultations including the southwestern willow flycatcher completed from 1995 through 2016. In total, the collection of Service Field Offices in CA, AZ, NV, NM, UT, and CO completed at least 240 formal consultations during that time period. In all of these consultations, we concluded that, due to the implementation of conservation measures to avoid, minimize, and offset impacts to the subspecies and its habitat, the effects of the proposed actions in all but six actions were not likely to jeopardize the flycatcher’s continued existence. Reasonable and Prudent Alternatives were implemented in those six projects to remove the "jeopardy" from the proposed actions. We concluded that none of the actions were anticipated to result in destruction or adverse modification of designated critical habitat. We will continue to evaluate impacts of proposed projects to the subspecies and its habitat for those areas outside of the Natural Community Conservation Planning Act (NCCP)/HCPs through other provisions of the Act, such as section 7 consultation, recovery implementation, and periodic status reviews.

Our evaluation confirms that federal lands resource management, highway and road maintenance, development, vegetation management, and other associated threats continue for the southwestern willow flycatcher, but listing under the Act as endangered has provided protection to the subspecies and its habitat, including the prohibition against take and the conservation mandates of section 7 for all Federal agencies.

Sikes Act

The Sikes Act (16 U.S.C. 670a–670f, as amended) directs the Secretary of Defense, in cooperation with the Service and State fish and wildlife agencies, to carry out a program for the conservation and rehabilitation of natural resources on military installations. The Sikes Improvement Act of 1997 (Pub. L. 105– 85) broadened the scope of military natural resources programs, integrated natural resources programs with operations and training, embraced the tenets of conservation biology, invited public review, strengthened funding for conservation activities on military lands, and required the development and implementation of an Integrated Natural Resources Management Plan (INRMP) for relevant installations, which are reviewed every 5 years.

INRMPs incorporate, to the maximum extent practicable, ecosystem management principles, provide for the management of natural resources (including fish, wildlife, and plants), allow multipurpose uses of resources, and provide public access necessary and appropriate for those uses without a net loss in the capability of an installation to support its military mission. An INRMP is an important guidance document that helps to integrate natural resource protection with military readiness and training. In addition to technical assistance that the Service provides to the military, the Service can enter into interagency agreements with installations to help implement an INRMP. The INRMP implementation projects can include wildlife and habitat assessments and surveys, fish stocking, exotic species control, and hunting and fishing program management.

On Department of Defense lands, including Camp Pendleton, Fallbrook Naval Weapons Station, and Vandenberg Air Force Base, the flycatcher's riparian habitat is generally not subjected to threats associated with large-scale development. However, the primary purpose for military lands is to provide for military support and training. At these installations, INRMPs provide direction for project development and for the management, conservation, and rehabilitation of natural resources, including the flycatcher and its habitat. For example, on Camp Pendleton, management measures that benefit the flycatcher and its habitat include annual surveys, nonnative vegetation control, nonnative animal control, and habitat enhancement and restoration (USMC 2007, pp. F58–F67)).

Some conservation measures are applied to training and construction activities to help minimize disturbance to breeding flycatchers and impact to its riparian habitat (USMC 2007, pp. F58–F67). Without the protections provided to the subspecies and its habitat under the Act (that is, if the flycatcher was delisted), there would be less incentive for the Marine Corps, Navy, or Air Force to continue to include specific provisions (for example, monitoring) in their INRMPs to provide conservation benefits to the subspecies, beyond that provided under a more general integrated natural resource management strategy at these and other DOD installations.

Habitat Conservation Plans (HCPs), The Natural Community Conservation Planning (NCCP) Act, and Safe Harbor Agreements (SHA)

Section 10 of the Act gives the authority to issue permits to non-Federal and private entities for "take" of listed species as long as such taking is incidental to, and not the purpose of, carrying out otherwise lawful activities. HCPs authorize incidental take, but not the activities that result in take. This process ensures that the effects of the authorized incidental take will be adequately minimized and mitigated. HCPs are used to develop creative partnerships between the public and private sectors in the interest of conserving listed species.

In 1999, we issued a new policy under Section 10 of the Act for SHAs through enhancement of survival permits for listed species. The standard for a SHA is that the agreement must realize a "net conservation benefit" (i.e., by implementing the terms of one or more SHA, populations of a listed species will increase and/or their habitats will be improved). SHAs are temporary habitat protections with "take" allowed at some time in the future back to an agreed upon baseline.

The NCCP program is a cooperative effort between the State of California and numerous private and public partners with the goal of protecting habitats and species. The NCCP program identifies and provides for the regional or area-wide protection of plants, animals, and their habitats while allowing compatible and appropriate economic activity. The program uses an ecosystem approach to planning for the protection and continuation of biological diversity (*https://www.wildlife.ca.gov/Conservation/Planning/NCCP*). Regional NCCPs provide protection to federally-listed and other covered species by conserving native habitats upon which the species depend. NCCPs are usually developed in conjunction with habitat conservation plans (HCPs) prepared pursuant to the Act.

The flycatcher has been included in HCPs across its range, such as those developed for some southern CA and AZ cities and counties, portions of south-central CO, dam operations along the lower Colorado River and central AZ, etc. The flycatcher has also been included a number of SHAs for specific properties implementing habitat improvement projects and also for those choosing to engage in habitat improvement projects and enroll within a specific geographic area (Kane and Washington counties, UT) (Color Country Resource Conservation and Development Council 2008).

Habitat conservation plans (including SHAs) that have been approved and are being implemented include: LCR MSCP; SRP's Horseshoe and Bartlett Dams HCP; SRP Roosevelt HCP; Pima County MSCP; San Luis Valley HCP; Western Riverside County Multiple Species HCP; San Diego County Multiple Species HCP; Orange County Southern Subregional HCP; City of Carlsbad Habitat Management Plan; Tres Rios SHA; and Kane and Washington County SHA.

These plans provide a habitat-based approach to the protection of covered species, including the flycatcher, by focusing on lands identified as important for the long-term conservation of the covered species and through the implementation of management actions for conserving those lands. These protections are outlined in the management actions and conservation objectives described within each plan. In some of the regional plans, because the total habitat protection associated with these plans is not expected until plans are fully implemented, and because not all areas are covered, habitat loss may still occur into the future. Depending on the plan and location, the amount of flycatcher conservation may vary from a relatively small part of the overall conservation strategy, to a plan where the flycatcher is a key component of the plan.

- The San Diego County Multi Species Conservation Plan (MSCP) in southern CA, contains stream segments of potential flycatcher habitat along the San Dieguito River (9.2 mi, 5.7 km); San Diego River (9.6 km, 6.0 mi); upper Santa Ysabel Creek (2.4 km, 1.5 mi); lower Santa Ysabel Creek (1.1 km, 0.7 mi) and Sweetwater River (2.1 km, 1.3 mi). The specific flycatcher habitat conservation objectives in the County of San Diego Sub-area Plan include preserving and managing 1,344 ha (3,322 ac) of riparian habitat within the preserve planning area (USFWS 1998, p. 36).

- The San Diego Multiple Habitat Conservation Program (MHCP) — Carlsbad Habitat Management Plan (HMP) in southern CA, includes two segments of potential flycatcher habitat along Agua Hedionda Creek totaling 5.3 km (3.3 mi). Specific conservation objectives in the Carlsbad HMP for the flycatcher include conserving 200 ha (494 ac) of riparian habitat and 10 ha (25 ac) of oak woodland within the preserve (USFWS 2004c, p. 174).

- The Orange County Central— Coastal NCCP/HCP in southern CA, contains a stream segment of potential flycatcher habitat along Canada Gobernadora Creek (4.7 km, 2.9 mi). The specific flycatcher conservation objectives in the Orange County Southern Subregion HCP include preserving and managing 249 ha (615 ac) of nesting and foraging habitat within the Habitat Reserve (USFWS 2007, p. 120).

- The Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) in southern CA, contains stream segments of potential flycatcher habitat along Santa Ana River (30.0 km, 18.6 mi); San Timoteo Creek (21.4 km, 13.3 mi); two segments of Bautista Creek totaling 3.1 km (1.9 mi); and Temecula Creek (18.7 km, 11.6 mi). The specific flycatcher conservation objectives include conserving at least 4,282 ha (10,580 ac) of core habitat (breeding and migration habitat) and linkage areas (connection between core areas) in the Western Riverside County MSHCP Conservation Area (Dudek and Associates Inc. 2003, p. B.475).

- The Lower Colorado River (LCR) MSCP contains segments of potential flycatcher habitat along the lower Colorado River (394.1 km, 244.8 mi) and Bill Williams River (10.6 km, 6.6 mi) along the border of CA, AZ, and NV. The flycatcher is a key species in the LCR MSCP where the permittees will create and maintain 1,639 ha (4,050 ac) of flycatcher habitat within the planning area, which includes NWRs, tribal lands, and other Federal and private lands (from Lake Mead to Mexico). The intent is to create, within the Lake Mead to Mexico LCR MSCP planning area, thousands of acres of protected and managed riparian habitat that can be used by territorial, breeding, nonbreeding, foraging, dispersing, and migrating flycatchers and reach the conservation goals established in the Recovery Plan within the legal and physical limitations existing along the LCR.

- The Salt River Project (SRP) Roosevelt Dam HCP in central AZ, includes portions of Tonto Creek (12.8 km, 7.9 mi) and the Salt River (16.3 km, 10.1 mi) within the conservation space of Roosevelt Lake that could develop flycatcher habitat. The Roosevelt Dam HCP conservation strategy focuses primarily on: (1) the acquisition and management of flycatcher habitat outside of Roosevelt Lake (607 ha, 1,500 ac); (2) the protection of existing habitat within the Roosevelt Lake conservation space through a US Forest Service Protection Officer; and (3) the creation of riparian habitat adjacent to Roosevelt Lake.

- The SRP Horseshoe-Bartlett HCP in central AZ, includes a portion of potential flycatcher habitat along the Verde River (9.6 km, 6.0 mi) within the conservation space of Horseshoe Lake. The Horseshoe Bartlett HCP conservation strategy focuses primarily on the protection and management of flycatcher habitat within the Horseshoe Lake conservation space through modified dam operations; acquisition and management of flycatcher habitat outside of Horseshoe Lake (81 ha, 200 ac); and the implementation of measures to conserve Verde River water.

- The San Luis Valley HCP in south-central CO includes portions of potential flycatcher habitat along the Rio Grande (119.5 km, 74.3 mi) and Conejos River (64.9 km, 40.4 mi). The HCP provides incidental take coverage for agriculture and infrastructure activities on more than 4,000 square miles (2.9 million acres) of land and focuses conservation on about 250 stream miles of riparian habitat. The conservation strategy is that for each acre of permanent damage resulting from the covered activities, 1.25 acres of mitigation land of equal or greater habitat value will be protected. Similarly, each acre of temporary impacts will be mitigated by 0.75 acres of mitigation land.

- The City of Phoenix SHA for Tres Rios Ecosystem Restoration Site occurs along an 8.7 km (5.4 mi) segment of potential flycatcher habitat along the Gila River in central AZ. The City of Phoenix will attempt to restore stream function, maintain reliable water, and improve riparian vegetation along this segment of the Gila River. Project construction within the Tres Rios area includes channel formation and habitat development, such as creating wetland and riparian biotic communities, including mesquite forest, cottonwood/willow forest, freshwater marsh, floodplain terrace, and open water. After the conservation measures are implemented, the lands will be managed with the primary goal of habitat conservation.

- Within the Pima County MSCP in southern AZ, there are short segments of potential flycatcher habitat along the San Pedro River and Cienega Creek already under conservation status, and outside of the modeled area of the HCP. No effects to flycatcher habitat are anticipated to result in incidental take, but direct take from covered activities is possible. Pima County anticipates providing 170 ha (420 ac) of protected and managed conservation lands for the flycatcher (146 ha, 360 ac occur in designated critical habitat).

- Within Kane and Washington County, UT, a programmatic SHA agreement was developed for property owners to enroll that would 1) promote flycatcher conservation through voluntary restoration, enhancement, and management of native riparian habitat in southwestern UT; 2) provide certain regulatory assurances to landowners participating in management efforts; and 3) to accomplish the foregoing without negatively affecting farming and ranching activities.

These collections of NCCP/HCPs, HCPs and SHAs (plans) across the flycatcher's breeding range address at a minimum, about 8,572 ha (21,181 ac) of riparian habitat. Because the occurrence and quality of flycatcher habitat is dynamic, protection can occurs in a step-wise fashion and implementation strategies vary; the amount of suitable breeding habitat at any one time is less than the total acreage, and subsequently the number and distribution of territories are expected to fluctuate. Overall, these plans occur in just 11 of the 32 management units across flycatcher breeding range where numerical territory and habitat recovery goals were established.

Therefore, while these plans help to conserve the flycatcher in areas of its breeding range, the subspecies and its habitat remain susceptible to various water and land management and other related threats. Without the protections provided to the flycatcher and its habitat under the Act (that is, if the flycatcher was delisted), the current plans may provide some ancillary benefits to the subspecies given that other federally listed species of plants and animals covered under these plans are also found within similar riparian habitat (for example, the western yellow-billed cuckoo (*Coccyzus americanus*)). By continuing to implement the plans, the permittees would retain incidental take coverage for these other species. However, permittees under these plans could request permit modifications or request that their long-term permits be renegotiated should the flycatcher be delisted under the Act. Similarly, any the plans currently under development would likely require reevaluation. However, all conservation already implemented would continue to provide benefits to the flycatcher even if it was delisted.

Because conservation and management for the flycatcher has not yet been fully implemented under the plans in place, some developing plans are not yet completed, and some plans may not contain enrolled agents, all of the potential conservation anticipated under these plans is not yet fully assured absent the protections of the Act.

State Mechanisms

State Laws Affecting the Southwestern Willow Flycatcher

State regulations address the flycatcher where it occurs in AZ, CA, CO, NM, NV, and UT, but are limited in the degree of habitat protection and more closely mirror protections associated with the MBTA. With the exception of AZ, all other states in the flycatcher's breeding range classify it as "endangered." The State of AZ describes the flycatcher as a "species of greatest conservation need" in its Wildlife Action Plan. State designations in AZ, CO, NV, NM, and UT do not convey habitat protection or protection of individuals beyond existing regulations on capture, handling, transportation, and take of native wildlife. State designations provide no formal legal status for additional conservation or protection. They are generally intended to highlight those species at risk or of concern to State and Federal and local governments, land managers, and others, as well as to encourage research for those species whose life history and population status are poorly known.

Protections for state endangered species in CA are similar to those of other southwestern states, but the CA Endangered Species Act (CESA) and CA Environmental Quality Act (CEQA) add some additional considerations. CESA requires consultation between the CA Department of Fish and Wildlife and other State agencies to ensure that activities of State agencies will not jeopardize the continued existence of State-listed species. CEQA (as described below), which is similar to the NEPA, has three primary purposes: 1) minimizing impacts on the environment by identifying impacts and then applying mitigation measures; 2) disclosing to decision-makers and the public the potential impacts of a proposed action and associated mitigation measures; and 3) disclosing the rationale behind decision makers' determinations to the public.

California Environmental Quality Act (CEQA)

CEQA (California Public Resources Code 21000–21177) is the principal statute mandating environmental assessment of projects in CA. The purpose of CEQA is to evaluate whether a proposed project may have an adverse effect on the environment and, if so, to determine whether that effect can be reduced or eliminated by pursuing an alternative course of action, or through mitigation. CEQA applies to certain activities of State and local public agencies; a public agency must comply with CEQA when it undertakes an activity defined under CEQA as a ''project.''

As with NEPA, CEQA does not provide a direct regulatory role for the CA

Department of Fish and Wildlife or other State and local agencies relative to activities that may affect the flycatcher. However, CEQA requires a complete assessment of the potential for a proposed project to have a significant adverse effect on the environment. Among the conditions outlined in the CEQA Guidelines that may lead to a mandatory finding of significance are where the project ‘‘has the potential to . . . substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; threaten to eliminate a plant or animal community; [or] substantially reduce the number or restrict the range of an endangered, rare or threatened species’’ (title 14 of the California Code of Regulations (CCR), § 15065(a)(1)). The CEQA Guidelines further state that a species ‘‘not included in any listing [as threatened or endangered] shall nevertheless be considered to be endangered, rare, or threatened, if the species can be shown to meet the criteria’’ for such listing (14 CCR 15380(d)).

Existing Regulatory Mechanisms Summary

Outside of the Act, few Federal management and conservation measures exist throughout the U.S. range of the flycatcher that provide protections to the subspecies and its habitat. State management and conservation measures are limited primarily to the planning and implementation of the NCCP Act, HCPs, or SHAs, and there is uncertainty as to whether the plans would continue to provide the full conservation benefits anticipated should the subspecies be delisted under the Act. Limited protection is provided to the flycatcher through the inclusion of its designation as a Species of Special Concern within CA State (CEQA) planning processes.

Based on the best available data, the listing of the flycatcher by the Mexican government as a species at risk on the “Lista de Especies en Riesgo” (Proyecto de Norma Official Mexicana PROY-NOM-059-ECOL-2010) provides a limited level of protection or conservation benefit to any potentially breeding flycatchers in northern Mexico. Similarly, migratory flycatcher populations found in Central America, such as Costa Rica, Guatemala, or Panama, are not expected to benefit from any habitat-based protections from government regulations. Comprehensive reserve areas for the flycatcher and its habitat are not known to exist. While existing Mexican regulatory mechanisms may provide some protection for the subspecies, we lack information on implementation of those mechanisms specifically related to protection of the flycatcher and its habitat, and abatement of threats.

Therefore, although regulatory mechanisms are in place and provide some protection to the flycatcher and its habitat throughout its range, absent the protections of the Act (for example, section 7, section 9, and section 10(a)(1)(B)), these mechanisms would provide substantially less protection from the stressors currently acting on the flycatcher such as water and land resource use stressors. Moreover, some of the threats faced by the species and its habitat, including fire, leaf beetle and shot hole borer impacts, cowbird parasitism, etc. are not readily susceptible to amelioration through regulatory mechanisms.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Drought and the effects of climate change

Periods of drought in the Southwest are common; however, the frequency and duration of droughts may be altered by climate change. Increasing temperatures and associated effects on regional climatic regimes are not well understood, but climate predictions for the southwestern United States include less overall precipitation and longer periods of drought. Based on broad consensus among 19 climate models, Seager *et al*. (2007, p. 1182) predicted that the Southwest will become drier in the 21st century and that this drier climate change is already occurring. Increased aridity associated with the current on-going drought and the 1950s drought is expected to become the norm for the American Southwest within a matter of years to a few decades if the models are correct. The result of these changes would likely result in adverse effects to water availability, insects, and riparian vegetation, causing widespread ecological impacts to flycatchers and their habitat.

The 2014 Intergovernmental Panel on Climate Change (IPCC) report discusses observational evidence of a changing climate, the impacts caused by the change, and the human contributions to it (IPCC 2014, pp. 39-54). Cascading impacts of climate change can now be attributed along chains of evidence from physical climate to intermediate systems. Specifically, in western North America, land surface warming will cause decreasing spring snowpack and early spring peak flows. Atmospheric warming will cause an increase in insect pests and tree mortality (IPCC 2014, pp. 51-52). The IPCC weighed the future risk of animal and plant species, describing their confidence of harmful impacts by the combination of climate change effects (such as variable precipitation and reduced river flows) and other stressors (IPCC 2014, p. 67). "A large fraction of terrestrial, freshwater and marine species faces increased extinction risk due to climate change during and beyond the 21st century, especially as climate change interacts with other stressors (high confidence) (IPCC 2014, p. 67)." "Many plant and animal species will be unable to adapt locally or move fast enough during the 21st century to track suitable climates under mid- and high range rates of climate change (medium confidence)(IPCC 2014, p. 67)."

In the southwestern region of the United States, temperatures have increased and are predicted to increase in the future. The Southwest has "heated-up markedly in recent decades;" the period since 1950 has been hotter than any comparable period in at least 600 years (Garfin *et al*. 2014, p. 464). The recent decade (2001-2010) was the warmest in the 110-year instrumental record with temperatures almost 1.1 ° Celsius (C) (2° Fahrenheit [F]) higher than historic averages (Garfin *et al*. 2014, p. 464). During this century, the average annual temperature is predicted to rise by about 2º to 5.3º C (3.5º to 9.5 º F) (Garfin *et al.* 2014, p. 464). Future predictions identify overall less snowpack and earlier spring melt and runoff in the Intermountain West and southwestern states (Parmesan and Galbraith 2004, Udall and Bates 2007, pp. 1-8, Garfin *et al*. 2014, p. 464). Projected precipitation changes are less uniform throughout the region, reduced winter and spring precipitation is consistently projected for the southern part of the Southwest by 2100, however in the northern part of the region, projected winter and spring precipitation changes are smaller than natural variations (Garfin *et al*. 2014, p. 465).

Climate simulations of the Palmer Drought Severity Index (a calculation of the cumulative effects of precipitation and temperature on surface moisture balance) for the Southwest for the periods of 2006–2030 and 2035–2060 show an increase in drought severity with surface warming. Additionally, drought still increases during wetter simulations because of the effect of heat-related moisture loss (Hoerling and Eicheid 2007, p. 19). Annual mean precipitation is likely to decrease in the Southwest, as well as the length of snow season and snow depth (Christensen *et al.* 2007, p. 887). Most models project a widespread decrease in snow depth in the Rocky Mountains along with earlier snowmelt (Christensen *et al.* 2007, p. 891).

Perry *et al*. (2011, p. 16) concluded that semiarid and arid western North American riparian ecosystems are likely to change dramatically with the effects of climate change. Specifically, Perry *et al*. (2011, p. 16) wrote that "…lower late-spring and summer stream flows will compound effects of increased drought due to warming, leading to strong reductions in water availability. Greater water stress will alter plant community composition and structure, favoring drought-tolerant species and reducing abundance of currently dominant, drought-intolerant cottonwoods and willows. Tamarisk seems especially likely to increase, but other drought-tolerant species may increase instead if the recently released biocontrol tamarisk leaf beetle reduces tamarisk abundance..." Other drought-tolerant plant species (e.g. arrowweed and saltbush) likely to establish will most likely not be suitable substitutes for nesting flycatchers.

Insect prey items that flycatchers rely upon may be affected by climate change, which could provide additional obstacles for successful flycatcher reproductive success. For most arthropods that control body temperature through movement and choice of microhabitat (ectotherms), warming is likely to alter behavior and physiology, and may reduce survival (Perry *et al*. 2011, p. 11). Non-mobile ectotherms, like insect eggs and pupae, may be particularly vulnerable to warming, because they cannot move to cooler areas and instead must rely on parents or earlier life stages to select sites with favorable microclimates (Perry *et al.* 2011, pp. 11-12). Predicted increases in carbon dioxide may adversely affect insects that rely on carbon dioxide gradients to locate fruit, flowers, prey, or ovi-positioning sites (Perry *et al*. 2011, p. 15). Warmer and intermittent stream flows may also experience reduced abundance of some aquatic insects (Perry *et al*. 2011, p. 15).

Because increased occurrence of drought is predicted as a result of climate change, it is important to examine what impacts extreme drought has had on flycatchers in order to understand and anticipate potential future impacts from the effects of climate change. Since the flycatcher was listed, we have observed that drought has had negative effects on breeding flycatchers and their habitat. The USGS (Paxton *et al*. 2007a, p. 141) noted that the Southwest experienced a long-term drought during their 10-year study period, and in 2002, the year of the most severe drought, there was strong evidence that it affected virtually all aspects of flycatcher ecology. Hatten's (2016, p. 61) habitat model evaluating the quality of flycatcher breeding habitat across its range, concluded that in

2002, the least amount of available breeding habitat occurred on the upper Gila River in NM and AZ. The extreme drought of 2002 caused near complete reproductive failure of the 146 flycatcher territories at Roosevelt Lake in central AZ (Smith *et al*. 2003, pp. 8, 10) and caused a dramatic rise in the prevalence of non-breeding and unpaired flycatchers (Paxton *et al*. 2007a, p. 4). The high rate of failure was likely due to less vigorous vegetation conditions caused by the drought and that resulted in less cover for nests (Ellis *et al*. 2008, p. 89). Along the lower San Pedro River, long-term drought conditions contributed to less water at the Cook's Lake breeding site (Ellis *et al*. 2008, p. 34). As a result, after years of being a productive nesting site, riparian habitat quality declined and flycatcher territories were not detected at Cook's Lake from 2002 to 2007 (Ellis *et al*. 2008, pp. 34-35). Not surprisingly, AGFD concluded that increases in rainfall had a positive effect on flycatcher nest success at the San Pedro and Gila River study areas (Ellis *et al*. 2008, p. ii).

While extreme drought during a single year can generate impacts to breeding success, the broader effect of drought can also have localized benefits in some regulated streams. At some reservoirs (i.e. Roosevelt Lake, AZ and Lake Isabella, CA), drought led to reduced water storage, which increased the exposure of wet soils at the lake's perimeter. Extended drought allowed the exposed areas to grow vegetation and become flycatcher nesting habitat (primarily comprised of tamarisk).

The USGS (Paxton *et al*. 2007a, p. 141) considered how drought and the effects of climate change could impact flycatchers and future management. Paxton et al. (2007a, p. 141) wrote that "the near total collapse of reproductive success in a single drought year like 2002, coupled with the short average lifespan of southwestern willow flycatchers, strongly suggests that several successive years of extreme drought could cause a major population crash and possible extirpation of flycatchers, the speed of which would depend on the starting population size. This is an important consideration with respect to forecasting the long-term persistence of flycatchers at our study sites, and possibly elsewhere. For example, most climate change models predict increased drought frequency and severity in the Southwest. Therefore, long-term management of southwestern willow flycatchers will be more effective if it considers how flycatcher habitat and breeding populations may respond to changes in southwestern climate, and whether there are management actions that can ameliorate any negative effects…"

How land and water is managed during drought and/or more limited water supply can also indirectly result in impacts to flycatcher habitat. The need to reclaim discharged waste water instead of releasing it into the Santa Clara River in Ventura County, CA, has already contributed to degradation in flycatcher habitat quality (PRC 2015, p. 1). Additional efforts could have a much broader impact to flycatcher recovery such as legislation to eradicate tamarisk throughout the Lower Colorado River Basin in an effort to increase water availability (Dean 2016).

Smith and Finch (2016) recently examined the past, present, and future condition of riparian trees and aridland streams of the southwestern United States that are affected not only from factors such as dams, diversion, and withdrawals, but also from predicted increases in temperature. Smith and Finch (2016) compiled information and literature on riparian habitat and conducted analyses from 40 years of USGS hydrological data, along with modeled future discharge patterns for 11 stream gage sites. Six of the "Southern Rockie" streams (Colorado, Green, Gunnison, and San Juan Rivers, the Rio Chama, and the Rio Grande), are headwatered in the Rocky Mountains of Wyoming and CO. Five Central Highland streams (Gila, Salt, San Francisco, and Verde rivers and Tonto Creek), are headwatered in the Central Highland ranges of AZ and NM.

Smith and Finch (2016, pp. 120 & 129) concluded that many southwestern streams have been altered by regulation and will be further affected by warming temperatures. More specifically, their stream gage data analysis concluded that future cottonwood, willow, and boxelder reproduction will decrease in CO, NM, and UT due to reduced volume of annual discharge and mean peak discharge, and a shift to earlier peak discharge. Similarly, streams in the Central Highlands of AZ and NM will likely see reductions in annual discharge volume, which could also limit reproduction and survival of cottonwood, willow, boxelder, and Arizona sycamore. Smith and Finch (2016, p. 128) concluded these impacts would likely have wide ranging ecological effects to animals and highlighted the riparian-obligate southwestern willow flycatcher. These effects may be exacerbated by demands of expanding urban areas and agricultural operations, but could also be ameliorated by increasing water use efficiency and environmental mitigation.

Based upon how extreme drought impacts the flycatcher's habitat and reproduction (Smith *et al*. 2003, pp. 8, 10; Paxton *et al*. 2007a, p. 141; Ellis *et al.* 2008, p. 89) and the continued widespread impacts from water/land management actions, we anticipate that the impacts of the effects of climate change will be a significant threat to the flycatcher, its habitat, and recovery. Almost certainly the flycatcher's riparian habitat, which is reliant on the relationship between precipitation and stream function to generate conditions for expansive riparian forests, will be affected in some manner by the effects of climate change. Friggens *et al*. (2013, p. 28) evaluated the vulnerability of 42 bird species to effects of climate change along the Middle Rio Grande, and the flycatcher was ranked as the most vulnerable. It may be that because of the effects due to climate change, the single season occurrence of extreme drought observed in 2002 will be a more frequent future environmental condition. Riparian habitat features that the flycatcher relies upon (water and plant abundance, and insect prey items – components of the flycatcher's designated critical habitat's physical and biological features) would likely be adversely affected by climate change (Perry *et al*. 2011). As a result, this habitat change would lead to lower riparian animal diversity and abundance and greater abundance of animals associated with drier conditions (Perry *et al.* 2011, p. 16). Overall, Perry *et al*. (2011, p. 16) concluded that increased carbon dioxide and the effects of climate change may change plant community composition and reduce surface water, which would likely reduce habitat quality for many riparian animals.

Vulnerability of Small and/or Isolated Populations

<u>Isolated populations</u>

The distance or degree of isolation between flycatcher breeding groups (especially those with small numbers) can increase their risk of extirpation by reducing the likelihood of immigration from other populations to offset impacts from catastrophic dynamic habitat events (e.g. flooding) and demographic-related issues (e.g. birth/death rates and sex ratios) (Finch and Stoleson 2000, p. 14). The estimated 1,299 rangewide flycatcher territories are distributed in a large number of small breeding groups and a small number of relatively large breeding groups (Durst *et al*. 2008, p. 4). From 1996 to 2005, USGS collaborated with AGFD to conduct a 10-year flycatcher banding and re-sighting study in central AZ, as well as multiple auxiliary breeding sites to help understand flycatcher movements (Paxton *et al*. 2007a, Ellis *et al.* 2008). The discovery of flycatcher fidelity to breeding sites, year-to-year movement of adult and young-of-the-year flycatchers, and the interconnected nature of breeding sites (Paxton *et al*. 2007a, p. 2) improved our understanding about how territory distribution and abundance may affect population persistence and flycatcher recovery.

When we apply the improved understanding of flycatcher movement to the varied range-wide configuration of flycatcher territories, we reach complex conclusions about the vulnerability of the flycatcher breeding population. As a result of the flycatcher's ability to move, we increased our confidence in the general recovery strategy of establishing a network of populations throughout its breeding range (USFWS 2002, pp. 72-81). We also improved our confidence in the stability of larger flycatcher population centers and the benefits they provide other nearby populations. However, the rarity and limitation of long-distance flycatcher movements still causes concern for the persistence of territories that are the most isolated from population centers.

Banded adult flycatchers had high fidelity to productive breeding habitat (mostly within the same drainage), but can quickly move should habitat conditions and subsequent reproduction deteriorate (Paxton *et al*. 2007a, pp. 64-74; 76). On average, 41% of adult banded flycatchers moved between-years to another breeding location, but most movements were confined to nearby areas within the same drainage (Paxton *et al*. 2007a, p. 75). The USGS documented 712 adult flycatchers making between-year movements, with distances ranging from 0.1 to 133 mi (214 km) (mean distance moved by adults = 6 mi/9.5 km) (Paxton *et al*. 2007a, p. 65). Flycatchers can quickly colonize developing riparian habitat, and immigration into the young habitat is the dominant movement pattern (Paxton *et al*. 2007a, pp. 76-77). In contrast, as the habitat matures, immigration declines while emigration from the patch increases (Paxton *et al*. 2007a, p.2). Reproductive success and habitat selection may strongly influence whether an individual returns to the same general breeding location (Paxton *et al*. 2007a p. 68).

Flycatchers banded as nestlings had less fidelity to their natal breeding site compared to the fidelity of breeding adults to the previous year's nesting location (Paxton *et al*. 2007a, pp. 62-78). The USGS and collaborators detected 123 of 498 flycatchers banded as nestlings in subsequent years; all but two returning nestlings dispersed to a non-natal area (Paxton *et al*. 2007a, p. 64). The average natal dispersal distance was 20.5 km (range = 0.03 to 444 km) (Paxton *et al*. 2007a, p.65).

While both adult and returning young-of-the year flycatchers regularly returned to locations within the same drainage, 30 long-distance between-drainage movement events by natal and breeding flycatchers were recorded (Paxton *et al*. 2007a, p. 61). Adult flycatchers accounted for 21 instances (ranging from 30 to 133 mi/49 km to 214 km), while natal dispersal accounted for 9 cases (ranging from 32 to 276 mi/52 km to 444 km) (Paxton *et al*. 2007a, p. 61).

An improved understanding of flycatcher movements reinforced the recovery strategy of establishing a network of connected populations throughout the flycatcher's breeding range (USFWS 2002, pp. 61-92) and emphasized that geographically separate flycatcher populations are more inter-connected. The probability of flycatchers colonizing new breeding habitat appears to depend on distance from neighboring populations (Paxton *et al.* 2007a, p. 74). Flycatcher breeding habitats that are within 30 to 40 km of each other will have higher metapopulation connectivity and a higher colonization probability of new habitat within this distance (Paxton *et al*. 2007a, pp. 75-76).

Because only 1% of flycatcher movements detected in central AZ were to other drainages, infrequent long-distance between-drainage movements are probably not sufficient to sustain declining populations in distant drainages that are reproductive "sinks" (Paxton *et al*. 2007a, p. 75). Even some of the larger, but relatively isolated flycatcher populations along the Kern River in CA and lower Colorado River along the CA/AZ border were unable to sustain their numbers over time. Over a 24-year period, the number of Kern River breeding flycatchers declined from about 70 to 80 flycatchers to 11 (Whitfield 2013, p. 22). After eliminating other potential causes (i.e. habitat declines, etc.), Whitfield (2013, pp. 37-42) concluded that being 120 km away from the next closest breeding population, and the resultant lack of immigrant flycatchers from elsewhere, may be a likely reason for the decline of the Kern River flycatcher population. Similar slow declines in flycatcher nesting pairs, without apparent changes in habitat quality habitat or decline in reproductive output, were detected at Camp Pendleton along the Santa Margarita River in southern CA.

From 2000 to 2015, a declining flycatcher breeding population along the Santa Margarita River at Camp Pendleton, CA, resulted in a skewed sex ratio of breeding birds and increasing occurrence of polygynous breeding males (Kus *et al.* 2016). Changes in sex ratios can cause problems in small, declining populations, reducing the ability for birds to find mates and reproduce. As this flycatcher breeding population declined, especially the number of breeding males, more males became polygynous (mating with multiple females) (Kus *et al.* 2016). Two to three males would breed with about 10 females (Kus *et al*. 2016). Sex ratios of small populations can become unbalanced, but at this location, it unclear why more female than male birds were hatched almost every year of the study (Kus *et al.* 2016). A bias toward females in the adult population and nestlings suggests it is not a random outcome of a declining population (Kus *et al*. 2016).

When considering that the overall flycatcher breeding population is comprised mostly of breeding groups possessing few territories, the impact of small and/or isolated populations is currently a moderate threat, which may increase its significance in the future should populations decline over a broader area. Preventing this threat from having a greater impact is the current widespread distribution of flycatcher territories (Durst *et al.* 2008, pp. 12-13) and the bird's ability to move great distances and quickly colonize habitat. Additionally, the large number of known flycatcher territories (865 of 1,299) on three rivers (Gila River, San Pedro River, and Rio Grande) (Durst *et al*. 2008, p. 11) improves the stability of flycatcher populations along those streams and nearby areas. However, future impacts to habitat quality and abundance from the introduction of the tamarisk leaf beetle and climate change may further decrease population size and increase isolation.

<u>Genetic Effects</u>

Because the flycatcher exists in mostly small populations distributed across a broad area, low genetic variation within populations and effects from inbreeding are potential issues (Marshall and Stoleson 2000, p. 14). Low genetic variation can result in reduced fecundity and survival, lowered resistance to parasites and disease, and/or physiological abnormalities (Allendorf and Leary 1986, pp. 57-76).

Genetic and field data collected from the flycatcher suggest that the current level of flycatcher movement is sufficient to provide for widespread gene flow and maintenance of high genetic variation (Busch *et al*. 2000, p. 593). Even though there are many small and disjunct breeding locations, between-drainage movement appears adequate to sustain genetic connectivity because there is substantial genetic variation within and among flycatcher breeding groups, and within and between watersheds (Busch *et al*. 2000, p. 592). Another positive result from the Busch *et al.* (2000) flycatcher genetic analysis was that no biologically significant structuring was found, or in other words, no single population was found to be genetically more important than any other (Busch *et al.* 2000, p. 593). Multiple lines of genetic evidence suggest that disjunct breeding groups function as a metapopulation and regularly exchange genetic material (Busch *et al*. 2000, p. 592).

Busch *et al.* (2000, p. 593) concluded that their flycatcher genetic analysis did not reveal any highly differentiated breeding groups of special management concern. Therefore, combine these positive genetic results with the improved known distribution and abundance of flycatcher territories detected since listing, and genetic impacts to flycatcher populations appear to not currently be a threat. However, future impacts to flycatcher habitat associated with the leaf beetle and the effects of climate change can further reduce and isolate breeding populations, potentially reducing genetic diversity and causing a greater threat to the flycatcher.

Cumulative Effects from Factors A through E

Threats can work in concert with one another to cumulatively create conditions that may impact the flycatcher or its habitat beyond the scope of each individual threat. The best available data indicate that cumulative impacts are currently occurring from the synergistic effects of a number of stressors, including the impact of river management, occurrence of exotic plant species, wildfire, leaf beetle, and the effects of climate change.

Stressors can interact in multiple ways, as mentioned in the threats section above, but one of note is the combined impact of water regulation, exotic plants, leaf beetle impacts, fire, and projected effects of climate change on flycatchers and the habitat they rely upon for establishing territories, breeding, cover, and foraging. The regulation of river flow, diversion of river surface water, and pumping of shallow groundwater creates conditions that promote the degradation in the abundance, distribution, and quality of the flycatcher's native riparian breeding habitat. The use and regulation of these water resources generates conditions (increased soil salinity and deeper groundwater levels) that prevent native riparian habitat from germinating/growing and creates conditions favorable for other plants to develop, such as introduced exotic tamarisk. Increased drying of riparian areas and spread of more flammable tamarisk vegetation, combined with natural and human-caused ignition sources, increases the occurrence of fire in riparian areas and loss of flycatcher habitat. Under appropriate conditions, tamarisk can provide flycatcher breeding habitat; however, the subsequent release and spread of the tamarisk leaf beetle is anticipated to degrade these habitat conditions and elevate fire risk from the increase in leaf litter and fuels created by repeated leaf defoliation and plant mortality. These risks could be increased along heavily regulated streams where dynamic flood flows are not present to disperse ground litter. Additionally, the degradation of tamarisk from leaf beetle defoliation and plant mortality is also expected to increase flycatcher breeding failure from increased nest exposure to climatic factors, predation, and parasitism. Because leaf beetle impacts are just now beginning to occur and have yet to spread across some areas of the Southwest, it is uncertain which plant species may replace tamarisk and its effects. In areas most affected and regulated by water and land resource uses, replacement vegetation is not anticipated to be native riparian habitat. The effects associated with climate change have the potential to exacerbate all of these stressors by further contributing to the drying of riparian areas and degradation of conditions that support abundant riparian vegetation and food necessary for flycatcher territories and successful nesting attempts.

The water regulation – plant species conversion – leaf beetle – fire connection has resulted in a reduction in the amount of suitable flycatcher breeding habitat and the projected future impacts of climate change will likely exacerbate these negative impacts, causing greater likelihood for adverse effects to the flycatcher and its habitat. Moreover, these stressors, working singly or in combination, are operating at a landscape scale. These stressors may affect large areas and may not be addressed by current management plans. Thus, in the absence of management to counteract the identified effects, these stressors are contributing to the habitat alteration and degradation that is occurring throughout the flycatcher's breeding range and are likely to continue to act as high-level stressors on the flycatcher and its habitat now and into the future.

Finding

In making this finding, we have followed the procedures set forth in section 4(a)(1) of the Act and regulations implementing the listing provisions of the Act in 50 CFR part 424. We reviewed the petition, information available in our files, and other available published and unpublished information. We sought input from subject matter experts, the public, and other Federal, State, and Tribal agencies. On the basis of the best scientific and commercial information available, we find that the petitioned action to delist the southwestern willow flycatcher is not warranted. Review of the best available scientific and commercial data did not show that the original determination, made at the time the subspecies was classified as endangered in 1995, is now in error. Rather, using the best available scientific and commercial data supports the southwestern willow flycatcher (*Empidonax traillii extimus*) as a valid (distinguishable) subspecies. Likewise, we do not find that the subspecies has recovered to the extent that it is no longer endangered.

For the purposes of our status review, as required by the Act, we considered the five factors in assessing whether the southwestern willow flycatcher is endangered or threatened throughout all of its range. In our threats analysis, we examined the best scientific and commercial information available regarding the past, present, and foreseeable future threats faced by the subspecies. We reviewed the information available in our files, information submitted by the public in response to our 90-day finding (81 FR 14058; March 16, 2016), and other available published and unpublished information.

As described above, the petitioners did not provide any new information on any of the factors, but presented familiar issues addressed at the time of listing (60 FR 10694), in the recovery plan (USFWS 2002), critical habitat rules (62 FR 39129; 70 FR 60886; 78 FR 344), and the most recent five-year review (USFWS 2014). Based on our review of the best available scientific and commercial information, we find that the current and future threats are of sufficient imminence, intensity, or magnitude to indicate that the southwestern willow flycatcher remains in danger of extinction. Therefore, the southwestern willow flycatcher currently meets the definition of an endangered species.

We evaluated each of the potential stressors discussed in the 2014 five-year review (USFWS 2014) and any new information in order to determine whether the following factors have impacted the flycatcher and its habitat or may affect flycatcher individuals or populations in the future: *Factor A*: Habitat Loss and Modification - Dams and Reservoirs, Diversion and Groundwater Pumping, Tamarisk Leaf Beetle, Exotic Shot Hole Borer Beetle, Channelization and Bank Stabilization, Urbanization, Agricultural Development, Phreatophyte Control, Livestock Grazing and Management, Fire and Fire Management, Cowbird Parasitism, and Recreation; *Factor B* – Overutilization for Commercial, Recreational, Scientific, or Educational Purposes; *Factor C* –Disease or Predation; *Factor D*: Inadequacy of Regulatory Mechanisms; *Factor E*: Other Natural or Manmade Factors – Drought and the Effects of Climate Change, Vulnerability of Small or Isolated Populations, and Genetic Effects; and *Cumulative Effects of Factors A through E*.

We did not find potential stressors from Factor B (Overutilization) or Factor C (Disease or Predation) to be threats at this time. Overutilization (Factor B) is not known to occur. Under Factor C, both disease and predation naturally occur within flycatcher populations, but are currently believed to be within normal levels and not known to be an existing threat. However, both could be elevated in the future as a result of continued impacts from habitat degradation associated with factors such as leaf beetle defoliation or the effects of climate change.

At this time and for the foreseeable future, impacts associated with water use and river management (dams and reservoirs; diversion and groundwater pumping; and channelization and bank stabilization) continue to be high-level stressors for the flycatcher and its habitat (Factor A). Implementation of existing HCPs has helped to reduce site-specific impacts of some operations, but these plans are limited in scope in comparison to the wide reach of the impact of water resource use and development. Dams developed in the 20th century have altered the function and flow of water across hundreds of miles of the Southwest's largest rivers (and many smaller tributaries), affecting the abundance, distribution, germination, growth, and recycling of riparian vegetation flycatchers rely upon for nesting, foraging, and cover. The addition of river flow alteration across floodplains from channelization and stabilization, loss of surface flow from diversion, and depletion of groundwater from pumping are widespread and abundant across the flycatcher's range. These river flow and groundwater altering actions have led not only to changing conditions that allow native riparian cottonwood and willows to grow, but have generated drier conditions that favor the growth and spread of exotic tamarisk (a more flammable plant). State laws managing water diversions and pumping are limited in the extent to which they can protect water for plants and wildlife, as is the legal complexity from existing water treaties, laws, and compacts between states, countries, and tribes. Because these water resources and associated developments are firmly connected to the persistence of human society in the Southwest, and because human populations continue to grow, water use and management is a significant threat to the flycatcher now and into the future.

Land uses such as agriculture, urbanization, livestock grazing, and recreation (Factor A) represent moderate to significant ongoing threats to the flycatcher across its breeding range now and into the future. Urbanization and agriculture can often occur in flat open valleys (i.e. San Luis Valley in CO, Safford Valley in AZ, Cliff/Gila Valley in NM, etc.) near or adjacent to rivers where flycatcher habitat occurs. Not only can their development directly remove riparian habitat, but it typically generates interrelated land and water impacts from the need for water, pumping/diversion, transportation, recreation, flood protection, and reservoirs, etc. Irrigated agriculture is reported to be the single largest consumer of water in the Southwest. Regional HCPs in southern CA, CO, and AZ have implemented measures to help improve conservation of remaining resources within their boundaries, and the NRCS has committed to help assist producers in implementing measures to improve their land, reduce impacts, and improve flycatcher habitat. However effective, these HCPs and programs are limited in scope across the flycatcher's breeding range, and once established, urban and agricultural infrastructure pressure is challenging to manage. Livestock grazing can adversely affect flycatcher habitat from herbivory and trampling. While livestock grazing is impactful and widespread across the Southwest, it can also be temporary. Through better management, both private and federal lands have reduced herbivory impacts at various sites resulting in improved flycatcher habitat. Therefore, while efforts through HCPs, programs, and improved grazing management have made noticeable improvements, the overall ongoing and widespread impact of a variety of land uses and their interrelated impacts provides an ongoing and future threat to the flycatcher and its habitat.

The introduction and spread of the exotic tamarisk leaf beetle and more recent discovery of exotic shot hole borer beetles in southern California (Factor A) represent a relatively new and increasing threat, because they not only diminish the occurrence and quality of flycatcher nesting habitat, but expose nests to predators, brood parasites, and climatic factors and create more flammable conditions. Shot hole borers are now found in southern CA and can impact both native and exotic riparian vegetation. Within the flycatcher's breeding range, leaf beetles have spread throughout the length of the Rio Grande in NM, occur in southern NV and UT, and have recently begun to expand along the Colorado and Bill Williams Rivers along the AZ/NV/CA border. APHIS is currently in litigation over the leaf beetle, and it is yet to be determined how their efforts may reduce the leaf beetle impacts. A general lack of understanding about tamarisk and its reason for persistence, and a misunderstanding about its impacts on water and wildlife cause continued interest in the spread of the beetle throughout the Southwest. Coalitions in CA exist to try and understand the shot hole borer and to determine what efforts can be done to reduce its impact and prevent its spread. Because about 50% of all known flycatcher territories contain tamarisk as an important vegetative component, the leaf beetle is anticipated to occur and impact tamarisk across the southwestern United States, and shot hole borers target native and exotic vegetation, these insects represent a significant current and future threat to the flycatcher and its habitat.

Phreatophytes can be targeted for removal from streams, canals, and irrigation ditches with the intent to increase watershed yield, remove impediments to stream flow, and limit water loss through evapo-transpiration (Factor A). While the results of studies have documented that phreatophyte control efforts offer no remedy for western water shortages, interest in salvaging water through vegetation removal to benefit human use remains a prime motivation. Additional pressures to remove phreatophyte cover come from flood control interests and the desire to reduce fire-fuel load. While these efforts have previously been site-specific and few in nature, there is renewed interest across a broader portion of the flycatcher's breeding range and recently introduced federal legislative efforts directed at tamarisk eradication throughout the Lower Colorado River Basin. Therefore, phreatophyte control is a current and growing threat to the flycatcher and its habitat.

Riparian fire and fire management (Factor A) are current and increasing threats to the flycatcher and its habitat as a result of continued drying of riparian areas and the spread of leaf beetles and possibly shot hole borers. Riparian area fires have increased as riverine areas have become drier, flammable tamarisk has spread, and ignition sources increased. Since listing of the flycatcher, riparian fires have consistently occurred, but were typically site-specific and not widespread occurrences. Fire management efforts have been implemented and planned that range from selective fire breaks intended to protect riparian forests to efforts where all vegetation is identified for removal. The increased fuel load from future tamarisk leaf beetle defoliation and mortality, combined with the lack of flushing river flows in the most regulated sections of river, are believed to further elevate the risk and impact of fire. Similarly, additional drying projected from future effects of climate change may also increase the risk of fire. Therefore, we find that wildand fire and some fire management efforts are current threats to the flycatcher due to the spreading impacts of the leaf beetle and projected impacts from the effects of climate change, and increasing threats into the future.

Brown-headed cowbirds are a native species and their brood parasitism impacts on flycatcher nesting success can be exacerbated by human activities (Factor A). Because flycatchers have a short reproductive life-span, parasitism can be a significant impact on nest success and persistence of breeding sites, especially where small and isolated populations occur. When combined with negative influences of predation, habitat loss, and overall rarity, parasitism can be a significant contributor to a local population decline. But, similar to predation and disease, it is a normal occurrence and, as has been shown at some of the largest flycatcher breeding sites, populations can grow, persist, and contribute to recovery concurrent with normal levels of nest parasitism. Possibly the best long-term solution to combat cowbird parasitism impacts is to improve the quality and abundance of riparian habitat. However, about 80% of the known flycatcher breeding sites either have no flycatcher territories or fewer than five. Most currently known flycatcher breeding sites are established where riparian habitat is less expansive and potentially more susceptible to the impacts of parasitism (in contrast to the large populations with greater abundance of habitat described above). While continued monitoring since listing has helped us to determine that parasitism is currently more of a moderate flycatcher threat, anticipated future impacts caused by exposure from defoliating tamarisk leaf beetles and projected effects of climate change may increase cowbird impact and threat to the flycatcher.

Periods of drought in the Southwest are common; however, the frequency and duration of droughts may be altered by climate change leading to adverse effects to water availability, insects, and riparian vegetation, causing widespread ecological impacts to flycatchers and their habitat (Factor E). Increasing temperatures and associated effects on regional climatic regimes are not well understood, but climate predictions for the southwestern United States include less overall precipitation and longer periods of drought. Currently, the impacts of climate change are considered a low-to-moderate threat, but the projected impacts could become a significant threat by reducing flycatcher habitat germination, distribution and abundance; decreasing nest success and increasing predation and parasitism; and increasing fire frequency and occurrence.

The distance or degree of isolation between flycatcher breeding groups (Factor E) (especially those with small numbers) can increase their risk of extirpation by reducing the likelihood of immigration from other populations to offset impacts from catastrophic dynamic habitat events and demographic-related issues. Currently, we believe this a low-to-moderate threat because of the widespread distribution of flycatcher territories and the bird's ability to move great distances and quickly colonize habitat. Also, the large number of known flycatcher territories on three rivers (Gila River, San Pedro River, and Rio Grande) improves the stability of flycatcher populations along those streams and nearby areas. However, future impacts to habitat quality and abundance from the introduction of the tamarisk leaf beetle and the effects of climate change may further decrease population size and increase isolation, subsequently causing the isolation of breeding sites to become a more significant threat.

Available regulatory mechanisms, such as the combined NCCP/HCP program, INRMPs on local military bases, and SHAs are providing important protections that help reduce the threats affecting the flycatcher and its habitat from such activities such as urban development, habitat fragmentation, dam operations, and agricultural management. Absent the provisions of the Act, some of these protections would no longer be in place. In Mexico and central America, the listing of the flycatcher provides only a limited level of protection or conservation benefit to breeding flycatchers and wintering populations. Therefore, absent the protections of the Act, existing regulatory mechanisms would provide substantially less protection from the threats currently acting on the subspecies. Some of the threats faced by the flycatcher such as fire, leaf beetle and shot hole borer impacts, and cowbird parasitism cannot be readily ameliorated through regulatory mechanisms. At this time, some site-specific threats are being reduced through existing regulatory mechanisms, and we expect that full implementation of regional NCCPs/HCPs will continue to provide protection for flycatcher habitat. However, many areas are not yet protected by existing plans and other plans are still in development.

The cumulative synergistic effects of river management, exotic plant species proliferation, leaf beetle, and wildfire has the potential to be exacerbated in the future from the impact of projected climate change effects. These factors promote the degradation of flycatcher habitat through leaf beetle impacts and increase in fire frequency and intensity. With projected drying from the effects of climate change, fire frequency and intensity may increase. Therefore, we find that cumulative impacts of multiple stressors are a threat to the flycatcher, and that this threat is likely to continue at the same level or increase into the foreseeable future.

Therefore, as required by the Act, we considered the five factors in assessing whether the southwestern willow flycatcher is endangered or threatened throughout all of its range. In our threats analysis, we examined the best scientific and commercial information available, reviewed information available in our files, other available published and unpublished literature, and information submitted by the public in response to our 90-day finding (81 FR 14058; March 16, 2016). We find that the southwestern willow flycatcher continues to meet the definition of an endangered species under the Act, and is in danger of extinction throughout its range. As a result, we find that reclassification to a threatened species or delisting is not warranted at this time.

Because we have determined that the southwestern willow flycatcher is an endangered species throughout all its breeding range, no portion of its range can be “significant” for purposes of the Act’s definitions of “endangered species” and “threatened species.” See the Service’s final policy interpreting the phrase “significant portion of its range” (SPR) (79 FR 37578; July 1, 2014).

We request that you submit any new information concerning the status of, or threats to, the southwestern willow flycatcher to our Arizona Ecological Services Office (see ADDRESSES) whenever it becomes available. New information will help us monitor the subspecies and encourage additional conservation actions.

References Cited

A complete list of references cited is available on the Internet at http://www.regulations.gov in Docket Number FWS–R2–ES–2016–0039 and upon request from the Arizona Ecological Services Office (see ADDRESSES).

Author(s)

The primary author(s) of this notice are the staff members of the Arizona Ecological Services Office and Southwestern Regional Office.

Authority

The authority for this action is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.).

Approve: ____

Regional Director, Fish and Wildlife Service Date

Concur: ____

Director, Fish and Wildlife Service Date

Do not concur:____

Director, Fish and Wildlife Service Date

Director’s Remarks:

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: for E Nicholopoulos 8/17/17

Acting Regional Director, Fish and Wildlife Service — Date

Concur: ______________________ ________

Director, Fish and Wildlife Service — Date

Do not concur: ______________________ ________

Director, Fish and Wildlife Service — Date

Director's Remarks: