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In Reply Refer To:
AESO/SE
22410-2009-F-0509-R001

December 19, 2017

Memorandum

To: Field Manager, Bureau of Land Management, Phoenix, Arizona

From: Field Supervisor

Subject: Biological Opinion and Conference Report on Hazardous Fuels Reduction and Vegetation Restoration along the Lower Gila River, Maricopa County Arizona

Thank you for your August 11, 2017, request for formal consultation/conference with the U.S. Fish and Wildlife Service (USFWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. § 1531-1544), as amended (Act). We received your request via e-mail that same day. At issue are impacts to the southwestern willow flycatcher (*Empidonax traillii extimus*), Yuma Ridgway's rail (*Rallus obsoletus yumanensis*), and western yellow-billed cuckoo (*Coccyzus americanus*) and its proposed critical habitat that may result from the proposed Hazardous Fuels Reduction and Vegetation Restoration along the Lower Gila River located in Maricopa County, Arizona. Specifically, there is need to revise your existing December 14, 2010, Biological Opinion to account for the listing of the western yellow-billed cuckoo and proposed designation of its critical habitat, and changes to the description of the proposed action since we issued the 2010 opinion. Because critical habitat is proposed for the cuckoo, this document represents a conference opinion that may be converted to a biological opinion if western yellow-billed cuckoo critical habitat is designated.

This biological and conference opinion (BO) is based on information provided in the July 2017, biological assessment (BA); e-mails; telephone conversations; and, other sources of information. Literature cited in this BO is not a complete bibliography of all literature available on the species of concern, prescribed or wildland fire and their effects, or on other subjects considered in this opinion. A complete record of this consultation is on file at this office.

Reinitiated Consultation History

- August 23, 2016: We received the preliminary BA and request for review.

- August 23, 2016–December 11, 2017: We exchanged electronic mails regarding the project to collect additional project information.
- August 11, 2017: The BLM submitted their request for formal consultation.
- December 6, 2017: We submitted the draft BO to the BLM for review.
- December 15, 2017: We received comments on the draft BO from the BLM.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The primary actions previously analyzed in the 2010 BO included reducing hazardous-fuel accumulations and reversing environmental degradation caused by tamarisk (*Tamarix ramosissima* and *Tamarix aphylla*), cane (*Phragmites communis*), giant reed (*Arrundo donax*), and ravenna grass (*Erianthus ravennae*) within wildland-urban interface (WUI) hazardous fuels reduction (HFR) areas, and implementing riparian revegetation projects along the lower Gila River. The proposed action now expands the action area, includes the western yellow-billed cuckoo and its proposed critical habitat, and revises the conservation measures to those outlined below. Therefore, changes to the proposed action include: 1) the total acreage of lands either managed by BLM or lands where BLM has fire-management responsibilities is 9,416 acres; 2) includes the western yellow-billed cuckoo and its critical habitat; and 3) species surveys will not be conducted as part of the proposed action.

The project is located within the floodplain of the lower Gila River between the bridge at Highway 85 (T. 1 S., R. 4W Sec. 23) and Gillespie Dam (T. 2 S., R. 5 W., Sec.32), Maricopa County, Arizona.

Conservation Measures

This list includes conservation measures and terms and conditions from the Arizona Statewide Land Use Plan Amendment and Environmental Assessment for Fire, Fuels, and Air Quality Management Biological Opinion (#02-21-03-F-0210) (Fire BO) and other measures developed specifically for this project. Some measures from the Fire BO have been edited specifically for this project as necessary.

- Implement the Conservation Measures for Fire Management Activities in Riparian and Aquatic Habitats listed in the Fire BO, as appropriate (see species-specific conservation measures below).

- Implement the Conservation Measures for Fire Management Activities listed in the Fire BO, as appropriate (see species-specific conservation measures below).

- Because pre-treatment surveys will not be conducted, suitable habitat in and adjacent to the treatment unit will be considered occupied and all applicable conservation measures will be applied.

- Any vegetation removal projects within or adjacent to flycatcher, rail, or cuckoo habitat will occur outside the breeding/nesting/fledging season (April-September).

- Transporting and disposing of garbage will be done off-site and in accordance with the Solid Waste Disposal Act.

- All refueling, oil changes, and lubrication of large-wheeled and tracked equipment (e.g., passenger vehicles, bulldozers) will be done outside of the riparian area, and be done in a manner to prevent spills.

- All terrain vehicle (ATV) or tractor-mounted herbicide applications will be timed to occur outside the flycatcher and rail breeding/nesting season (April through September).

- Pedestrian backpack foliar treatments and cut-stump applications will be permissible throughout the year with the implementation of species-specific conservation measures below.

    - Pedestrian backpack foliar treatments and cut-stump applications during the April to September breeding/nesting season will be implemented greater than 10 or 60 feet from marsh areas in accordance with the species-specific conservation measures below.

    - Herbicide will be marked with colored dye to identify areas treated.

- A buffer of 10 to 100 feet (see Yuma Ridgway's rail conservation measures below) will be used any time herbicide is applied near a sensitive water source (pool, open water, surface water, and drainage) to reduce potential impacts to Yuma Ridgway's rail, unless the herbicide is approved for aquatic application as stated by the manufacturer and application follows the label guidelines. This measure meets or exceeds the USFWS pesticide guidelines (White 2004).

- Sensitive water sources in the vicinity will be tested for active herbicide to determine environmental fates of herbicides.

- All personnel working with or in the vicinity of the herbicide application will have daily briefings that would inform them of federally listed species concerns.

Southwestern willow flycatcher and western yellow-billed cuckoo

- The use of chainsaws or bulldozers to construct fuel breaks through suitable habitat will be minimized except where necessary to reduce the overall acreage of suitable habitat or other important habitat areas that would otherwise be burned if not treated. Use of motorized equipment will occur outside of the flycatcher and cuckoo breeding/nesting/fledging seasons.

- Activities to reduce hazardous fuels or improve riparian habitats (mechanical, herbicide, or burning treatments) adjacent to or within suitable habitat for flycatchers will only be implemented during the non-breeding season (October 1 to March 31).

- Developing access roads that would result in fragmentation or a reduction in habitat quality will be avoided. All roads that were necessary for project implementation will be closed and rehabilitated.

- Burning will only occur to treat slash piles, not to create fuel breaks or buffers. Slash will be piled and burned in areas where flycatchers and cuckoos will not be affected by the activity or dispersing smoke.

- If project activities indicate potential effects beyond those addressed by these conservation measures, the BLM PDO will contact the USFWS Arizona Ecological Services Office for guidance on how to proceed with the project.

Yuma Ridgway's rail

Fuel breaks and WUI buffers will typically not be established in areas with open water or marsh habitat suitable for rails. These areas naturally provide fuel breaks. Therefore, most activities under this project will occur outside areas of suitable rail habitat. However, suitable rail habitat is ephemeral and can occur in changing locations within the river based on floods, vegetation conditions, and precipitation patterns. Therefore, the following conservation measures are applicable:

- Any fuels reduction or buffer treatments implemented in suitable marsh habitat will only occur between September 1 and March 15 to avoid the rail breeding and molting seasons. The rail is resident in the area year round. The appropriate conservation measures will be applied as outlined below.

- Mechanical removal of overstory habitat (*Tamarix*) may occur as early as August 15, after the breeding season for rails, but will not occur in open water or marsh habitats. Mechanical treatments may occur outside the breeding season, but must be at least 100 feet from suitable open water/marsh habitat.

- Appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use will be applied based on risk assessment guidance, with minimum widths of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand applications. Drift-inhibiting agents should be used to assure that the herbicide does not enter adjacent marsh areas. Spot treatment by hand can occur at any time of the year due to the low disturbance and buffers associated with this type of treatment. This measure meets or exceeds the USFWS pesticide guidelines (White 2004).

- Disturbance to rails during burning activities will be minimized by using fire only to burn slash piles. Slash will be piled and burned in areas where the activity and smoke associated with the burning will not affect areas occupied by rails.

Description of the Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR § 402.02). In delineating the

action area, we evaluated the farthest reaching physical, chemical, and biotic effects of the action on the environment.

The action area was described in detail in the December 14, 2010, BO, and is incorporated herein via reference. Additionally, since the original 2010 consultation, three fire breaks have been created of 11, 23.5, and 39.4 acres in size. These areas may be expanded in the future.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this BO relies on four components: (1) the Status of the Species, which evaluates the southwestern willow flycatcher, Yuma Ridgway's rail, and western yellow-billed cuckoo range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the Environmental Baseline, which evaluates the conditions of the southwestern willow flycatcher, Yuma Ridgway's rail, and western yellow-billed cuckoo in the action area, the factors responsible for those conditions, and the relationship of the action area to the survival and recovery of the two species; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on each species; and (4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on each species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of each species' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild. The jeopardy analysis in this BO considers the range-wide survival and recovery needs of each species and the role of the action area in its survival and recovery as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Adverse Modification Determination

This BO relies on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02a. In accordance with policy and regulation, the adverse modification analysis in this BO relies on four components: 1) the Status of Critical Habitat, which evaluates the range-wide condition of proposed critical habitat for the western yellow-billed cuckoo in terms of physical and biological features, the factors responsible for that condition, and the intended value of the critical habitat for conservation of the species; 2) the Environmental Baseline, which evaluates the condition of the proposed critical habitat in the action area, the factors responsible for that condition, and the value of the critical habitat for conservation of the species in the action area; 3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the physical and biological features and how that will influence the value of affected

critical habitat units for conservation of the species; and 4) the Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the physical and biological features and how that will influence the value of affected critical habitat units for conservation of the species.

For purposes of the adverse modification determination, the effects of the proposed Federal action on the species' proposed critical habitat are evaluated in the context of the range-wide condition of the proposed critical habitat, taking into account any cumulative effects, to determine if the proposed critical habitat range-wide would remain functional (or would not preclude or significantly delay the current ability for the physical and biological features to be functionally established in areas of currently unsuitable but capable habitat) such that the value of proposed critical habitat for the conservation of the species is not appreciably diminished.

STATUS OF THE SPECIES AND CRITICAL HABITAT

Southwestern willow flycatcher

The southwestern willow flycatcher status and critical habitat have changed since the December 14, 2010, BO. Therefore, the updated status of the species and critical habitat description are as follows:

Description

The southwestern willow flycatcher is a small grayish-green passerine bird (Family Tyrannidae) measuring approximately 5.75 inches. The song is a sneezy "fitz-bew" or a "fit-a-bew," the call is a repeated "whit." It is one of four currently recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993). It is a neotropical migrant that breeds in the southwestern U.S. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). The historical breeding range of the southwestern willow flycatcher included southern California (CA), AZ, New Mexico (NM), western Texas (TX), southwestern Colorado (CO), southern Utah (UT), extreme southern Nevada (NV), and extreme northwestern Mexico (Sonora and Baja) (Unitt 1987).

Reasons for endangerment

Reasons for decline have been attributed to primarily loss, modification, and fragmentation of riparian breeding habitat, along with a host of other factors including loss of wintering habitat and brood parasitism by the brown-headed cowbird (Sogge et al. 1997, McCarthey et al. 1998). Habitat loss and degradation are caused by a variety of factors, including urban, recreational, and agricultural development, water diversion and groundwater pumping, channelization, dams, and excessive livestock grazing. Fire is an increasing threat to willow flycatcher habitat (Paxton et al. 1996), especially in monotypic saltcedar vegetation (DeLoach 1991) and where water diversions and/or groundwater pumping desiccates riparian vegetation (Sogge et al. 1997). Willow flycatcher nests can be parasitized by brown-headed cowbirds (*Molothrus ater*), which lay their eggs in the host's nest. Feeding sites for cowbirds are enhanced by the presence of

livestock and range improvements such as waters and corrals; agriculture; urban areas; golf courses; bird feeders; and trash areas. When these feeding areas are in close proximity to flycatcher breeding habitat, especially coupled with habitat fragmentation, cowbird parasitism of flycatcher nests may increase (Tibbitts et al. 1994).

Listing and critical habitat

The southwestern willow flycatcher was listed as endangered, without critical habitat on February 27, 1995 (USFWS 1995). Critical habitat was later designated on July 22, 1997 (USFWS 1997a). A correction notice was published in the Federal Register on August 20, 1997 to clarify the lateral extent of the designation (USFWS 1997b).

On May 11, 2001, the 10th circuit court of appeals set aside designated critical habitat in those states under the 10th circuit's jurisdiction (New Mexico). The USFWS decided to set aside critical habitat designated for the southwestern willow flycatcher in all other states (CA and AZ) until it could re-assess the economic analysis.

On October 19, 2005, the USFWS re-designated critical habitat for the southwestern willow flycatcher (USFWS 2005). A total of 737 river miles across southern CA, AZ, NM, southern NV, and southern UT were included in the final designation. The lateral extent of critical habitat includes areas within the 100-year floodplain.

On August 15, 2011, the USFWS proposed a revision to the critical habitat designation, identifying stream segments in each of the 29 Management Units where there are recovery goals (USFWS 2011). These segments totaled 2,090 stream miles. Similar to the 2005 rule, the lateral extent of critical habitat includes only the riparian areas within the 100-year floodplain. About 790 stream miles were identified as areas we will consider for exclusion from the final designation under section 4(b)(2) of the Act.

On January 3, 2013, the USFWS completed its flycatcher critical habitat revision by designating approximately 1,227 stream miles as critical habitat. These areas are designated as stream segments, with the lateral extent including the riparian areas and streams that occur within the 100-year floodplain or flood-prone areas encompassing a total area of approximately 208,973 acres. About 948 stream miles of proposed critical habitat were excluded from the final revised designation.

A final recovery plan for the southwestern willow flycatcher was signed by the USFWS Region 2 Director and released to the public in March, 2003 (USFWS 2002). The Plan describes the reasons for endangerment, current status of the flycatcher, addresses important recovery actions, includes detailed issue papers on management issues, and provides recovery goals. Recovery is based on reaching numerical and habitat related goals for each specific Management Unit established throughout the subspecies range and establishing long-term conservation plans (USFWS 2002).

The five-year review for the flycatcher was completed in August 2014 by the Arizona Ecological Services Office and is posted on the Office's web site (Arizona Ecological Services Office flycatcher web site).

Habitat

The southwestern willow flycatcher breeds in dense riparian habitats from sea level in California to approximately 8,500 feet in AZ and southwestern CO. Historical egg/nest collections and species' descriptions throughout its range describe the southwestern willow flycatcher's widespread use of willow (*Salix* spp.) for nesting (Phillips 1948, Phillips et al. 1964, Hubbard 1987, Unitt 1987). Currently, southwestern willow flycatchers primarily use Geyer willow (*Salix geyeriana*), coyote willow (*Salix exigua*), Goodding's willow (*Salix gooddingii*), boxelder (*Acer negundo*), saltcedar (*Tamarix* sp.), Russian olive (*Elaeagnus angustifolio*), and live oak (*Quercus agrifolia*) for nesting. Other plant species less commonly used for nesting include: buttonbush (*Cephalanthus* sp.), black twinberry (*Lonicera involucrata*), cottonwood (*Populus* spp.), white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), and stinging nettle (*Urtica* spp.). Based on the diversity of plant species composition and complexity of habitat structure, four basic habitat types can be described for the southwestern willow flycatcher: monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native/exotic (Sogge et al. 1997).

The flycatcher's habitat is dynamic and can change rapidly: nesting habitat can grow out of suitability; saltcedar habitat can develop from seeds to suitability in about four to five years; heavy runoff can remove/reduce habitat suitability in a day; or river channels, floodplain width, location, and vegetation density may change over time. The flycatcher's use of habitat in different successional stages may also be dynamic. For example, over-mature or young habitat not suitable for nest placement can be occupied and used for foraging and shelter by migrating, breeding, dispersing, or non-territorial southwestern willow flycatchers (Cardinal and Paxton 2005, McLeod et al. 2005). Flycatcher habitat can quickly change and vary in suitability, location, use, and occupancy over time (Finch and Stoleson 2000).

Tamarisk is an important component of the flycatcher's nesting and foraging habitat in the central part of the flycatcher's breeding range in AZ, southern NV and UT, and western NM. In 2001 in AZ, 323 of the 404 (80 percent) known flycatcher nests (in 346 territories) were built in a tamarisk tree (Smith et al. 2002). Tamarisk had been believed by some to be a habitat type of lesser quality for the southwestern willow flycatcher; however, comparisons of reproductive performance (USFWS 2002), prey populations (Durst 2004) and physiological conditions (Owen and Sogge 2002) of flycatchers breeding in native and exotic vegetation has revealed no difference (Sogge et al. 2005).

The introduced tamarisk leaf beetle was first detected defoliating tamarisk within the range of the southwestern willow flycatcher in 2008 along the Virgin River in St. George, Utah. Initially, this insect was not believed to be able to move into or survive within the southwestern United States in the breeding range of the flycatcher. Along this Virgin River site in 2009, 13 of 15 flycatcher nests failed following vegetation defoliation (Paxton et al. 2010). As of 2012, the beetle has been found in southern NV/UT and northern AZ/NM within the flycatcher's breeding range. It

was detected along the Colorado River below Hoover Dam in 2012. In 2017, the beetle was found farther into central AZ, with detections in western AZ along the the Bill Williams, Santa Maria, and Big Sandy River, and in Maricopa County along the Hassayampa River. In NM, the beetle has traveled south along the Rio Grande from Colorado and north from releases in TX. By 2016, the beetle had been found throughout the length of the Rio Grande in NM, in particular at the densest population of breeding flycatchers at Elephant Butte Reservoir. Because tamarisk is a component of about 50 percent of all known flycatcher territories (Durst et al. 2008), continued spread of the beetle has the potential to significantly alter the distribution, abundance, and quality of flycatcher nesting habitat and impact breeding attempts.

Territory and home range size

The riparian patches used by breeding flycatchers vary in size and shape. They may be relatively dense, linear, contiguous stands or irregularly-shaped mosaics of dense vegetation with open areas. According to the Recovery Plan (USFWS 2002), southwestern willow flycatchers nest in patches as small as 0.25 acre along the Rio Grande, and as large as 175 acres in the upper Gila River in New Mexico. More recently, Cardinal and Paxton (2005) found that home ranges of telemetered flycatchers at Roosevelt Lake, Arizona, varied from 0.37 to 890 acres. Mean patch size of breeding sites supporting 10 or more flycatcher territories was 62.2 acres, although aggregations of occupied patches within a breeding site may create a riparian mosaic as large as 494 acres or more (USFWS 2002). Flycatchers are generally not found nesting in confined floodplains where only a single narrow strip of riparian vegetation less than approximately 33 ft wide develops, although they may use such vegetation if it extends out from larger patches, and during migration (USFWS 2002).

Movements

Evidence gathered during multi-year studies of color-banded populations shows that although most southwestern willow flycatchers return to former breeding areas, flycatchers regularly move among sites within and between years (Netter et al. 1998, Kenwood and Paxton 2001, M. Whitfield unpubl. data). From 1997 through 2000, 66% to 78% of flycatchers known to have survived from one breeding season to the next returned to the same breeding site; conversely, 22% to 34% of returning birds moved to different sites (Luff et al. 2000). Both males and females move within and between sites, with males showing slightly greater site fidelity (Netter et al. 1998). Within-drainage movements are more common than between-drainage movements (Kenwood and Paxton 2001). Typical distances moved range from 2 to 30 km (1.2 - 18 mi); however, long-distance movements of up to 220 km have been observed on the lower Colorado River and Virgin River (McKernan and Braden 2001). In some cases, willow flycatchers are faced with situations that force movement, such as when catastrophic habitat loss occurs from fire or flood. Several such cases have been documented, with some of the resident willow flycatchers moving to remaining habitat within the breeding site, some moving to other sites 2 to 28 km (1.2 - 16.8 mi) away (Paxton et al. 1996, Owen and Sogge 1997), and others disappearing without being seen again.

Rangewide distribution and abundance

There are 288 known southwestern willow flycatcher breeding sites in California, Nevada, Arizona, Utah, New Mexico, and Colorado (all sites from 1993 to 2007 where a territorial flycatcher has been detected) holding an estimated 1,299 territories (Durst et al. 2008). It is difficult to arrive at a grand total of flycatcher territories since not all sites are surveyed annually. Numbers have increased since the bird was listed and some habitat remains unsurveyed; however, after nearly a decade of intense surveys, the existing numbers are just past the upper end of Unitt's (1987) estimate of 20 years ago (500-1000 pairs). About 50 percent of the 1,299 estimated territories (Table 1) throughout the subspecies range are located at four general locations (Cliff/Gila Valley – New Mexico, Roosevelt Lake – Arizona, San Pedro River/Gila River confluence – Arizona, Middle Rio Grande – New Mexico).

Table 1. Estimated rangewide population for the SWFL based on 1993 to 2007 survey data for Arizona, California, Colorado, New Mexico, Nevada, Utah, and Texas[1].

State	Number of sites with WIFL territories 1993-07[2]	Percentage of sites with WIFL territories 1993-07	Number of territories[3]	Percentage of total territories
Arizona	124	43.1 %	459	35.3 %
California	96	33.3 %	172	13.2 %
Colorado	11	3.8 %	66	5.1 %
Nevada	13	4.5 %	76	5.9 %
New Mexico	41	14.2 %	519	40.0 %
Utah	3	1.0 %	7	0.5%
Texas	?	?	?	?
Total	288	100 %	1,299	100 %

[1]Durst et al. 2008.
[2]Site boundaries are not defined uniformly throughout the bird's range.
[3] Total territory numbers recorded are based upon the most recent year's survey information from that site between 1993 and 2007.

Arizona distribution and abundance

While numbers have significantly increased in AZ (145 to 459 territories from 1996 to 2007) (English et al. 2006, Durst et al. 2008), overall distribution of flycatchers throughout the state has not changed much. Currently, population stability in AZ is believed to be largely dependent on the presence of three population centers (Roosevelt Lake, San Pedro/Gila River confluence, upper Gila River). Therefore, the result of catastrophic events or losses of significant populations either in size or location could greatly change the status and survival of the bird. Conversely, expansion into new habitats or discovery of other populations would improve the known stability and status of the flycatcher.

Critical habitat

The primary constituent elements of designated critical habitat are based on riparian plant species, structure and quality of habitat and insects for prey.

1. Primary Constituent Element 1— *Riparian vegetation.* Riparian habitat along a dynamic river or lakeside, in a natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Gooddings willow, coyote willow, Geyer's willow, arroyo willow, red willow, yewleaf willow, pacific willow, boxelder, tamarisk, Russian olive, buttonbush, cottonwood, stinging nettle, alder, velvet ash, poison hemlock, blackberry, seep willow, oak, rose, sycamore, false indigo, Pacific poison ivy, grape, Virginia creeper, Siberian elm, and walnut) and some combination of:
    (a) Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 to 30 m (about 6 to 98 ft). Lower-stature thickets (2 to 4 m or 6 to 13 ft tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests;
    (b) Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft) above ground or dense foliage only at the shrub or tree level as a low, dense canopy;
    (c) Sites for nesting that contain a dense (about 50 percent to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground);
    (d) Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 ac) or as large as 70 ha (175 ac).
2. Primary Constituent Element 2—*Insect prey populations.* A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (*Hymenoptera*); dragonflies (*Odonata*); flies (*Diptera*); true bugs (*Hemiptera*); beetles (*Coleoptera*); butterflies, moths, and caterpillars (*Lepidoptera*); and spittlebugs (*Homoptera*).

The physical and biological features of flycatcher critical habitat are the principal biological or physical elements essential to flycatcher conservation that may require special management considerations or protection (USFWS 2013a). We primarily identified the features and functions of rivers that generate flycatcher habitat and its food such as low gradient/broad floodplains, water, saturated soil, hydrologic regimes, elevated groundwater, and fine sediments, etc. (USFWS 2013a).

Past consultations

Since listing in 1995, at least 240 Federal agency actions have undergone (or are currently under) formal section 7 consultation throughout the flycatcher's range. This list of consultations can be found in the administrative record for this consultation. Since flycatcher critical habitat was finalized in 2005, at least 33 formal opinions have been completed in AZ (within and outside designated critical habitat). While many opinions were issued for the previous critical habitat designation, the stream reaches and constituent elements have changed.

Activities continue to adversely affect the distribution and extent of all stages of flycatcher habitat throughout its range (development, urbanization, grazing, recreation, native and non-native habitat removal, dam operations, river crossings, ground and surface water extraction, etc.). Introduced tamarisk-eating leaf beetles were not anticipated to persist within the range of the southwestern willow flycatcher. However, they were detected within the breeding habitat (and designated critical habitat) of the flycatcher in 2008 along the Virgin River near the Town of St. George, UT. In 2009, beetles were also known to have been detected defoliating habitat within the range of flycatcher habitat in southern Nevada, and along the Colorado River in the Grand Canyon and near Shiprock in AZ. As of 2017, leaf beetles had spread to the only known breeding sites along the lower Colorado River in AZ, along the Hassayampa River in Maricopa County, and at the largest flycatcher breeding population rangewide along the Middle Rio Grande at Elephant Butte, NM. Stochastic events also continue to change the distribution, quality, and extent of flycatcher habitat.

Conservation measures associated with some consultations and Habitat Conservation Plans have helped to acquire lands specifically for flycatchers on the San Pedro, Verde, and Gila rivers in AZ and the Kern River in CA. Additionally, along the lower Colorado River, the U.S. Bureau of Reclamation is currently attempting to establish riparian vegetation to expand and improve the distribution and abundance of nesting flycatchers. A variety of Tribal Management Plans in CA, AZ, and NM have been established to guide conservation of the flycatchers. Additionally, during the development of the critical habitat rule, management plans were developed for some private lands along the Owens River in CA and Gila River in NM. These conservation actions are just a portion of those that have been established across the subspecies' range.

Yuma Ridgway's rail

The Yuma Ridgway's rail status has changed since the December 14, 2010, BO. Therefore, the updated status of the species and critical habitat description are as follows:

Regulatory Status

The Yuma Ridgway's (clapper) rail (*Rallus obsoletus [=longirostris] yumanensis*) was federally listed as a species in danger of extinction in the United States (U.S.) on March 11, 1967, pursuant to the Endangered Species Preservation Act (ESPA) of 1966 (32 FR 4001, March 6, 1967). The population in Mexico was included under the 1969 Act; it was listed range-wide under the Endangered Species Act of 1973 (as amended). Critical habitat has not been designated.

Species Description and Life History

The Yuma Ridgway's rail is a medium sized subspecies of the Ridgway's rail genus, with adults standing 20-23 centimeters (cm) (8 inches [in]) tall. Males tend to average between 266.8 grams (g) (9.3 ounces [oz]) in weight (Todd 1986, p. 4) while females are slightly smaller, averaging between 226.2 g (8.0 oz) (Todd 1986, p. 4) and 193.0 g (6.8 oz) (Eddleman 1989, p. 65). Sexes can be differentiated based on use of several external measurements (Eddleman 1989, p. 66).

Adult Yuma Ridgway's rails of both sexes are similar in plumage; they possess a long, slender slightly de-curved bill, a laterally compressed body, and relatively long legs and toes compared to body size. The upper mandible (bill) is dark grey, fading to orange at the base and the tip. The head and scapular (shoulder) area are grey, with browns and oranges appearing on the sides of the neck and under the head. The chin and upper throat are white, and there is a light eyebrow stripe extending from above the eye to the upper mandible. The breast is tawny- or burnt-orange in the male, and a brick-orange in breeding females. The upper body is light grey to dark brown, becoming blotchy and dominant on the rump and distally on the wings. The underside and flanks forward of the legs are dark grey with vertical white stripes. The tail is dark brown above and white below. Legs are un-feathered and orange-flesh in color (Todd 1986, pp. 3-4). Adult rails have a basic pre-body molt in May-August, with simultaneous molt of rectrices (tail feathers) and remiges (wing feathers) which both allow for flight. These flightless adults are found between mid-July and the end of September. A second, pre-alternate molt occurs from September to December and does not involve the wing or tail flight feathers (Eddleman 1989, p. 6). Hatchlings are downy black, with many having some white downy feathers on their anterior abdominal region (Meanley 1985, p. 64). This down makes hatchlings susceptible to drowning before their juvenile molt that occurs one month after hatching.

Yuma Ridgway's rails are secretive, and more often heard than seen, especially in the morning and evening hours (Eddleman 1989, p. 42). They are good swimmers, and with laterally compressed bodies can maneuver through cattails relatively quick. They are capable of long distance flights, but are not well adept at short distance flying.

The diet of the Yuma Ridgway's rail is varied. It is currently believed to be dominated by crayfish, with small fish, tadpoles, clams, and other aquatic invertebrates also utilized (Ohmart and Tomlinson 1977, entire; Anderson and Ohmart 1985, p. 123; Todd 1986, p. 69; Eddleman 1989, pp. 90-95; Conway 1990, pp. 34, 41). Crayfish (*Procamberus clarki* and *Orconectes virilis*) are not native to the lower Colorado River basin and were introduced to the basin about 1968 for aquatic weed control and to provide forage for sport fish (Inman et al. 1998, p. 3). The spread of crayfish in the lower Colorado River may have assisted the expansion of Yuma Ridgways rail, as crayfish provided a more abundant and secure food supply during the breeding season (Ohmart and Tomlinson 1977, p. 336).

Habitat Requirements and Limiting Factors

The rail is the only subspecies of Ridgway's rail largely found in freshwater marshes. Historically, cattail/bulrush marshes in the Colorado River Delta in Sonora, Mexico were the apparent stronghold for the species, since the species was not recorded in the early biological surveys of the lower Colorado River valley in the U.S. However, the virtual elimination of freshwater flows down the lower Colorado River to the Delta due to upstream diversions from the river for agriculture and municipal uses drastically reduced the habitat in Mexico. Rails responded by dispersing to the freshwater marshes along the lower Colorado River in the U.S. and fringes of the Salton Sea.

The Yuma Ridgway's rail has a relatively large potential range in which it utilizes habitat ranging from small patches that have formed from agricultural drains, to larger patches along

river channels. Despite this flexibility, the number of individuals present in a particular area is driven by the habitat quality; fewer birds are present when desired conditions begin to be compromised. The primary components of good quality rail habitat include freshwater marshes dominated by cattail (*Typha* sp.) and bulrush (*Scirpus* ssp.) averaging greater than 2 m (6 ft) high, shallow (1-15 cm [6 in]) water and limited fluctuations during the breeding season (Anderson and Ohmart 1985, p. 121; Eddleman 1989, pp.79-87). Suitable marsh conditions also include open water areas either as channels or pools with minimal daily water fluctuation (Tomlinson and Todd 1973, p. 179; Gould 1975, p. 8) that contain open dry ground or mud flats (slightly higher than the water level) between water, vegetation, or marsh edge for foraging and movement (Smith 1975, p. 20; Eddleman 1989, pp. 87-88; Conway et al. 1993, p. 288). Limiting factors are primarily habitat availability restrictions, especially as it relates to cattail marshes having a natural succession process that makes them less suitable which then requires active management. Without this management and protection of water sources to support the habitat the areas the rail occupies could be lost. Other factors for this species include continuing land use changes in floodplains, human activities, environmental contaminants (particularly increases in selenium levels), climate change, and reductions in connectivity between habitat areas.

Population Status

Annual survey data compiled by the Service for the period from 2006 to present had consistent survey methodology and has shown decline (Table 2). To note, these numbers are the sum of the highest counts for each site and do not represent a population estimate though it is likely that the trends seen in these surveys can be indicative of population trends.

Table 2. Marsh bird data for Yuma Ridgway's rail using sum of highest counts (unpubl. Service data).

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
US Total	753	823	645	671	570	565	435	431	401	636	555	683

The third major population center--the Cienega de Santa Clara in Sonora, Mexico—supports the largest marsh in the rail's U.S.-Mexico range and >70 percent of the global population (Hinojosa-Huerta et al. 2013). Suitable habitat fluctuates in size and quality depending on annual effluent inflows, earthquake-related changes to hydrology, episodic fire, and maintenance dredging (Hinojosa-Huerta et al. 2013), but the rail population has remained high during the most recent survey period from 2007 to 2011 and supports an estimated population (based on untested response rate assumptions) of about 8,600 rails (Hinojosa-Huerta et al. 2013). However this habitat remains under significant threat because (1) U.S. agricultural drain water supplies could decline or be eliminated with increasing agricultural water use efficiencies in the U.S., (2) the Mexican population is not protected by section 7 consultation requirements under the Act, (3) changing hydrology and lack of natural marsh-rejuvenating flood flows, and (4) replacement of brackish irrigation effluent from the U.S. with hypersaline brine from a proposed water-recycling/desalinization project in Arizona (Glenn et al. 1992, 1996; Hinojosa-Huerta et al. 2008).

Summary

Despite the Yuma Ridgway's rail high fecundity, ability to disperse, generalized diet, and flexibility to occupy a wide range of habitat, the population appears to be experiencing a multi-year decline. There is no direct correlation between this decline and any one factor, but the decrease in water availability for conservation and agriculture, as well as the decrease in habitat suitability and lack of connectivity are likely having a large influence on the population.

Past consultations

The range of the Yuma Ridgway's rail is extensive with including several states and the Colorado River Delta in Mexico. Due to this the number of consultations done, both formal and informal, is significant. Biological opinions on actions potentially affecting Yuma clapper rails in Arizona, where most of the consultations have occurred, may be found at the Arizona Ecological Services Office web site in the Section 7 Biological Opinion page of the Document Library. In California, informal and formal consultations have been few in number, and primarily involved water delivery and supply projects in the Imperial and Coachella valleys with the Bureau of Reclamation (Reclamation). All projects subject formal consultation have not reduced the habitat base of the species, and have resulted in non-jeopardy conclusions, in part because those projects with the largest potential direct or indirect impacts have committed to avoid and offset adverse effects and conserve habitat for the species.

Western yellow-billed cuckoo

Legal Status

The western distinct population segment (DPS) of the yellow-billed cuckoo was listed as a threatened species under the ESA on October 3, 2014 (USFWS 2013b, 2014b; 78 FR 61622, 79 FR 59992). Within the DPS (see Figure 1 at 79 FR 59994, in the final listing rule (79 FR 59992; October 3, 2014)), the habitats areas used by the species for nesting are located from southern British Columbia, Canada, to southern Sinaloa, Mexico, and may occur from sea level to 7,000 feet (ft) (2,154 meters (m)) in elevation (or slightly higher in western Colorado, Utah, and Wyoming). Critical habitat for the yellow-billed cuckoo DPS was proposed on August 15, encompassing 546,335 acres across the western United States (USFWS 2014a; 79 FR 48548). The discussions of the status of this species in these documents are incorporated herein by reference. A revised proposed rule that may include additional proposed critical habitat is under development.

Description

Adult yellow-billed cuckoos have moderate to heavy bills, somewhat elongated bodies and a narrow yellow ring of colored bare skin around the eye. The plumage is grayish-brown above and white below, with reddish primary flight feathers. The tail feathers are boldly patterned with black and white below. They are medium-sized birds about 12 inches in length, and about 2 ounces in weight. Males and females differ slightly; the males have a slightly smaller body size,

smaller bill, and the white portions of the tail tend to form distinct oval spots. In females the white spots are less distinct and tend to be connected (Hughes 1999).

Morphologically, the yellow-billed cuckoos throughout the western continental United States and Mexico are generally larger, with significantly longer wings, longer tails, and longer and deeper bills (Franzreb and Laymon 1993). Birds with these characteristics occupy the DPS and we refer to them as the "western yellow-billed cuckoo." Only the DPS was listed as a threatened species (USFWS 2014b). Yellow-billed cuckoos in the west arrive on the breeding grounds 4 to 8 weeks later than eastern yellow-billed cuckoos at similar latitude (Franzreb and Laymon 1993, Hughes 1999).

Distribution

The yellow-billed cuckoo is a member of the avian family Cuculidae and is a Neotropical migrant bird that winters in South America and breeds in North America. The breeding range of the entire species formerly included most of North America from southeastern and western Canada (southern Ontario and Quebec and southwestern British Colombia) to the Greater Antilles and northern Mexico (American Ornithologists Union (AOU) 1957, 1983, 1998).

Based on historical accounts, the western yellow-billed cuckoo was formerly widespread and locally common in California and Arizona, more narrowly distributed but locally common in New Mexico, Oregon, and Washington, and uncommon along the western front of the Rocky Mountains north to British Columbia (AOU 1998, Hughes 1999). The species may be extirpated from British Colombia, Washington, and Oregon (Hughes 1999). The western yellow-billed cuckoo is now very rare in scattered drainages in western Colorado, Idaho, Nevada, and Utah, with single, nonbreeding birds most likely to occur (USFWS 2013b, 2014a, 2014b). The largest remaining breeding areas are in southern and central California, Arizona, along the Rio Grande in New Mexico, and in northwestern Mexico (USFWS 2014b).

In Arizona, the species was a common resident in the (chiefly lower) Sonoran zones of southern, central, and western Arizona (Phillips et al. 1964). The yellow-billed cuckoo now nests primarily in the central and southern parts of the state, as well as at revegetation sites along the lower Colorado River (McFarland and Horst 2015; USFWS 2013b, 2014a, 2014b, McNeil et al. 2013).

Yellow-billed cuckoos spend the winter in South America, east of the Andes, primarily south of the Amazon Basin in southern Brazil, Paraguay, Uruguay, eastern Bolivia, and northern Argentina (Ehrlich et al. 1992, AOU 1998). Wintering yellow-billed cuckoos generally use woody lowland vegetation near fresh water. However, wintering habitat of the western yellow-billed cuckoo is poorly known.

Habitat

<u>Breeding Habitat</u>

The western yellow-billed cuckoo breeds in riparian (hydro- and xero- riparian) woodlands, and in Madrean evergreen woodland drainages and mesquite woodlands of arid areas. Habitat conditions are typically cooler and more humid than in the surrounding environment (USFWS 2014a,b). The vegetation making up the breeding habitat of the western yellow-billed cuckoo varies across the species' range and includes native and nonnative -riparian and upland nonriparian species including cottonwood (*Populus* spp.), willow (*Salix* spp.), mesquite (*Prosopis* spp.), box elder (*Acer negundo*), sycamore (*Platanus* spp.), ash (*Fraxinus* ssp.), walnut (*Juglans* spp.), alder (*Alnus* spp.), hackberry (*Celtis spp.*), soapberry (*Sapindus saponaria*), oak (*Quercus* spp.), acacia (*Acacia* spp.), desert willow (*Chilopsis linearis*), elderberry (*Sambuccus mexicanus*), juniper (*Juniperus* spp.), pine (*Pinus* spp.), Russian olive (*Elaeagnus angustifolia*), and tamarisk (*Tamarix* spp.) (Gaines 1974, pp. 7–9; Gaines and Laymon 1984, pp. 59–66; Laymon and Halterman 1989, pp. 274–275; Dettling and Howell 2011, p. 28).

In most of the DPS, the western yellow-billed cuckoo primarily breeds in large riparian woodlands dominated by willow and cottonwood along low-gradient rivers and streams, and in open riverine valleys that provide wide floodplain conditions (USFWS 2014a,b). In the Southwest, however, cuckoos can also breed in higher gradient drainages, and narrower and drier reaches of riparian habitat (Corman and Magill 2000; WestLand Resources, Inc. 2013a, 2013b, 2015a, 2015b, 2015c; Arizona Game and Fish Department (AGFD) 2017; Cornell Lab of Ornithology 2017; MacFarland and Horst 2015, 2017; Tucson Audubon 2015). Large expanses of gallery riparian woodland habitat supports greater densities of cuckoos than less dense reaches of scattered riparian trees or more xero-riparian woodlands. However, these less dense reaches of scattered riparian trees and more xero-riparian woodlands are also important to yellow-billed cuckoos as nesting substrate, foraging habitat, and as a buffer between more hydric sites and the adjacent, xeric uplands (USFWS 2014a, b; Griffin 2015; Groschupf 2015; McFarland and Horst 2015, 2017). To distinguish between the western yellow-billed cuckoo breeding habitat in riparian areas throughout the range and breeding habitat found in more arid areas of the Southwest, we use the terms "Rangewide" and "Southwestern" breeding habitat, respectively. We describe both the Rangewide and Southwestern breeding habitat below:

Rangewide breeding habitat

Rangewide breeding habitat (including in the Southwest) is generally, but not exclusively, comprised of mixed willow and cottonwood riparian woodlands with an overstory and understory vegetation component in contiguous or nearly contiguous patches. Rangewide breeding habitat is usually within floodplains or in upland areas or terraces adjacent to watercourses often greater than 325 ft (100 m) in width and 200 ac (81 ha) or more in extent (USFWS 2014a). The width of some patches may be less, depending on location and habitat conditions. The slope of the water courses within or adjacent to habitat patches is generally less than 3% but may be greater in some instances. The habitat patches are usually dominated by willow or cottonwood, but are sometimes dominated by other riparian species of similar structure (for example boxelder). Habitat patches contain one or more nesting groves that have above average canopy closure (greater than 70%), and have a cooler, more humid environment than the surrounding riparian and otherwise arid upland habitats (Laymon and Halterman 1989, Hughes 1999). These features provide sites for breeding, nesting, sheltering, and

foraging. Riparian breeding habitat in the Southwest ranges from the dense habitat described above to narrower and more sparsely vegetated habitat (described below).

Southwestern breeding habitat

Southwestern breeding habitat is located in the Southwestern United States (particularly in Arizona) and is comprised of riparian woodlands, mesquite woodlands, or Madrean evergreen woodlands with a variable overstory canopy and understory component within drainages at least 200 ac (81 ha) in size. In addition to cottonwood, willow, and mesquite, occupied riparian habitat in Arizona may also contain a greater proportion of xero-riparian species than in the rest of the DPS. Oak, hackberry, sycamore, walnut, ash, acacia, tamarisk, and juniper are among the most common xero-riparian species in Southwestern breeding habitat (Corman and Magill 2000, Corman and Wise-Gervais 2005, USFWS unpubl. data). Tamarisk may be a component of breeding habitat, but there is usually a native riparian tree component within the occupied habitat (Gaines and Laymon 1984, Johnson et al. 2008, McNeil et al. 2013, Sechrist et al. 2013, Carstensen et al. 2015). Habitat patches in the arid Southwest contain a greater proportion of xero-riparian and nonriparian tree species than elsewhere in the DPS. Habitat patches are often interspersed with large openings and include narrow stands of trees, small groves of trees, or sparsely scattered trees. As such, the canopy closure is variable, and where trees are sparsely scattered, canopy closure may be dense only at the nest tree. Southwestern breeding habitat types are as follows:

- Riparian woodland is more water-limited, contains a greater proportion of xero-riparian species, and is often narrower, patchier, and sparser than where water is more abundant. This more arid riparian woodland occurs in perennial and intermittent drainages and floodplains throughout the Southwest.
- Mesquite-dominated woodland habitat occurs in floodplains, adjacent terraces, and adjacent uplands in perennial, intermittent, and ephemeral drainages throughout the Southwest.
- Madrean evergreen woodland (usually oak-dominated) habitat occurs in intermittent and ephemeral drainages and adjacent hillsides in the foothills and mountains of southeastern Arizona, up to 7000 ft in elevation. The amount of oak varies and may be interspersed with mesquite and other species in Madrean evergreen woodland.

Nest Site

A large majority of nests are placed in willow trees, but cottonwood, mesquite, walnut, box elder, sycamore, hackberry, oak, alder, soapberry (*Sapindus saponaria*), seepwillow (*Baccharis glutinosa*), acacia, pecan (*Carya* sp.), prune (*Prunus domestica*), almond (*Prunus dulcis*) and tamarisk are also used (Laymon 1980, pp. 7–8; Groschupf 1987; Kingsley 1989, p. 142; Laymon 1998, p. 7; Hughes 1999, p. 13; Corman and Magill 2000, p. 16; Launer et al. 1990, p. 22; Halterman 2001, p. 11; Halterman 2002, p. 12; Halterman 2003, p. 11; Halterman 2004, p. 13; Corman and Wise-Gervais 2005, p. 202; Halterman 2005, p. 10; Halterman, 2006; Halterman 2007, p. 5; Holmes et al. 2008, p. 21; McNeil et al. 2013, pp. I-1 – I-3; Tucson Audubon 2015, p.

44; Groschupf 2015, *in litt.*; MacFarland and Horst 2015, pp. 9–12)). Cuckoos may also nest at more than one location in a year (USFWS 2014a,b). On the upper San Pedro River, many cuckoos renested following both successful and unsuccessful nesting attempts (Halterman 2009). These subsequent nests are sometimes hundreds of meters away from previous nests. Yellow-billed cuckoos at this site appear to be regularly double-brooded, and occasionally triple brooded, based on behavior and timing of nests. On the upper San Pedro River, cuckoos were not regularly detected on surveys until late June, and breeding in some years did not begin until late July (Halterman 2006). The breeding season for cuckoos in southeastern Arizona appears to be prolonged, however, and in most years conditions are apparently right for producing multiple broods.

Hydrological Conditions

Habitat for the western yellow-billed cuckoo in much of its range is largely associated with perennial rivers and streams that support the expanse of vegetation characteristics needed by breeding western yellow-billed cuckoos. The range and variation of stream flow frequency, magnitude, duration, and timing that will establish and maintain riparian habitat can occur in different types of regulated and unregulated flows depending on the interaction of the water and the physical characteristics of the landscape (Poff et al. 1997, USFWS 2002). Cuckoos often nest where young trees interface with more mature trees, such as along the scour zone of rivers or newly planted revegetation sites on the lower Colorado River (McNeil et al. 2013). Hydrologic conditions at western yellow-billed cuckoo breeding sites can vary widely between years and during low rainfall years, when water or saturated soil may not be present. Cuckoos may move from one area to another within and between years in response to hydrological conditions.

Humidity

Humid and cooler conditions created by surface and subsurface moisture and trapped by the multilayered canopy appear to be important habitat parameters for the western yellow-billed cuckoo. The western yellow-billed breeds in drainages where humidity is adequate for successful hatching and rearing of young (Hamilton and Hamilton 1965; Gaines and Laymon 1984; McFarland and Horst 2015, 2017; Rosenberg et al. 1991). The moist and humid conditions that support riparian plant communities typically exist in lower elevation, broad floodplains, as well as where rivers and streams enter impoundments. However, these conditions can also be found in some areas up to 7,000 feet (or slightly higher in western Colorado, Utah, and Wyoming) in elevation. In the foothills and mountain xero-riparian drainages of southeastern Arizona and Sonora Mexico, high humidity and the summer monsoon are important factors in cuckoo presence (USFWS 2014a,b; MacFarland and Horst 2015, 2017).

Foraging Habitat

In addition to the dense nesting grove or tree, often referred to as the core area, western yellow-billed cuckoos need adequate foraging areas near the nest. Foraging areas can be less dense or patchy with lower levels of canopy cover and may be a mix of shrubs, ground cover, and scattered trees (Sechrist et al. 2009, 2013; Carstensen et al. 2015; Griffin 2015; USFWS, unpubl.

data). Cuckoos often forage in open areas, woodlands, orchards, and adjacent streams (Hughes 1999), which include stands of smaller mesquite trees and even tamarisk (Rosenberg et al. 1991). In Arizona, adjacent habitat is usually more arid than occupied nesting habitat. This adjacent habitat can be used for foraging where large insects are produced. Foraging habitat includes Sonoran desertscrub, Mojave desertscrub, Chihuahuan desertscrub, chaparral, semidesert grassland, plains grassland, and Great Basin grasslands (Brown 1994, Brown et al. 2007, Brown and Lowe 1982).

Migration Habitat

Migration habitat needs are not well known, although they appear to include a relatively wide variety of conditions. Migrating yellow-billed cuckoos have been found in coastal scrub, second-growth forests and woodlands, hedgerows, forest edges, and in smaller riparian patches than those used for breeding (USFWS 2014a).

Home Range and Movement

At the landscape level, the available information suggests the western yellow-billed cuckoo requires large tracts of willow-cottonwood, mesquite forest, or Madrean evergreen woodland for their nesting season habitat. Site-specific variation is likely a result of characteristics unique to each location (e.g., types and quality of habitat, configuration of patch), and flexible home ranges with overlapping territories in this weakly territorial species (Hughes 1999; Halterman 2009; Sechrist et al. 2013, p. 417). Habitat can be relatively dense, contiguous stands, irregularly shaped mosaics of dense vegetation with open areas, narrow and linear, or savannah-like. The association of breeding with large tracts of suitable riparian habitat is likely related to home range size. Rangewide, individual home ranges during the breeding season average over 100 ac (40 hectares) (Laymon and Halterman 1987b, Halterman 2009, McNeil et al. 2013, Sechrist et al. 2013).

In studies in Arizona and New Mexico, home ranges of cuckoos fitted with radio-telemetry varied between sites and between individual birds (Table 3; Halterman 2009, McNeil et al. 2013, Sechrist et al. 2013). Home ranges of these three studies averaged between 49 ac (20 ha) and 153 ac (62 ha). Breeding cuckoos occupy overlapping home ranges, exhibit little territoriality, and have flexible home ranges. Cuckoos may shift use areas within home their ranges during a season, perhaps in response resource availability or nesting habitat.

In a study on the lower Colorado River, home ranges of 43 cuckoos tracked for at least 7 days averaged consistently close to 20 ha (95% KDE) during each year, though with high variation (Table 3; McNeil et al. 2013, p. 136). McNeil et al. (2013) found no significant differences in average home range size based on gender, site, or days tracked ($P > 0.05$ for all tests). However, transient (unmated) birds had significantly larger home range sizes compared to breeding birds, especially females. Of 30 confirmed breeding birds tracked for at least 7 days, the average home range was 18.1 ha compared to 26 ha for 13 presumed non-breeding birds with at least 7 days of data. Females exhibit lower site fidelity and may travel farther distances than males in search of mates or breeding territories (McNeil et al. 2013, p. 136). The core nesting area (50% KDE) averaged 3.6 ± 1.5 ha (equivalent to a circle of radius 107 ± 69 m surrounding the nest).

In a study on the San Pedro Riparian National Conservation Area in southeastern Arizona from 2001-2005, the average 95% KDE home range of 28 cuckoos tracked for at least 7 days each was 39 ha, ranging from 1.5 - 158.1 ha (Table 3; Halterman 2009). There were large variances for all home range estimates. There was no significant difference in home range size for nesting or non-nesting, or mated or unmated cuckoos. Males and females had significantly different home ranges sizes, with female home ranges estimated to be 60% smaller than those of males. Double-brooded cuckoos moved significantly farther to renest if their first nest was unsuccessful.

In a study along the Middle Rio Grande in central New Mexico in 2007 and 2008, 13 cuckoos tracked for 5 to 13 days each averaged home ranges of 153 ac (62 ha) ((95%-kernel-home-range (KHR)) (Table 3; Sechrist et al. 2013, p. 411). Home range size varied considerably among individuals, indicating variability in spatial use by cuckoos. Additionally, use of habitat differed between core areas and overall home ranges, but the differences were nonsignificant. There was no statistically significant difference between the 95% KHR mean size of home range by sex, although the small sample size suggests low power to detect a difference if it exists (Sechrist et al. 2013, p. 415).

Table 3. Average western yellow-billed cuckoo home range derived from three studies in Arizona and New Mexico using telemetered birds. Home range size varied greatly with the individual bird and habitat. Home range size has not been studied in more sparsely vegetated riparian habitat or in Madrean evergreen woodland drainages in the Southwest.

Location	Home Range 95% KDE ac (ha)	St Dev ac (ha)	Source
Rio Grande NM (n=13)	153 (62)	± 143 (58)	Sechrist et al. 2013
San Pedro River National Conservation Area AZ (upper San Pedro R) (n=28)	96 (39)	± 104 (42)	Halterman 2009
Lower Colorado River AZ (n=43)	49 (20)	±22 (9)	McNeil et al. 2013

In this same study, the maximum average daily distance traveled (n=10) for both years combined was 0.5 mile (786 meters) (± 0.3 mile (485 meters) SD, range of 204 - 1716 meters (0.13-1.07 mile)), with a maximum average seasonal movement distance of 1 mile (1,599 meters) (± 0.67 mile (1078 meters) SD, range of 365 - 3143 meters (0.23-1.95 miles)) (Sechrist et al. 2013, p. 415). However, the maximum distance traveled by individual cuckoo was highly variable, both daily and seasonally. There was no significant difference in daily or maximum seasonal distance traveled between years; therefore, data for both years were pooled. No significant difference was found in daily or maximum seasonal distance traveled between sexes or between reaches (Sechrist et al. 2013, p. 415). Based on the available information, foraging likely occurs within 0.5 miles from the breeding location. A cuckoo's home range is often irregular (e.g., not circular), and may encompass only part of a 0.5 mile radius from the breeding location. A portion of the vegetation within the home range may be unsuitable for nesting, but may support large insects, frogs, or lizards for foraging.

Presence in Arizona Riparian and Mesquite Woodlands

Many drainages throughout Arizona have not been thoroughly surveyed and it is likely that additional yellow-billed cuckoo locations will be discovered as additional surveys are conducted. In a survey in 1999 that covered 265 mi (426 km) of river and creek bottoms (a subset of statewide cuckoo habitat), 172 yellow-billed cuckoo pairs and 81 single birds were located in Arizona (Corman and Magill 2000). Based on this study, site-specific studies, protocol cuckoo surveys, and incidental detections, we know that drainages with yellow-billed cuckoos during the breeding season include Bill Williams River, lower Colorado River, middle Gila River, Hassayampa River, San Pedro River, Santa Maria River, Verde River, Sonoita Creek, Santa Cruz River, Big Sandy River, Arivaca Cienega and Creek, Altar Valley, Agua Fria River, Roosevelt Lake complex, Upper Tonto Creek, Pinto Creek, Mineral Creek, Oak Creek, Cienega Creek, Babocomari River, Pinal Creek, Bonita Creek, San Bernardino National Wildlife Refuge, Hooker Hot Springs, Big Sandy River, and many smaller drainages (American Birding Association 2014, USFWS 2014a, AGFD 2017, Cornell Lab of Ornithology 2017, USFWS unpubl. data).

Presence in Southeastern Arizona Mountain Ranges

In addition to gallery riparian forest and mesquite woodlands, yellow-billed cuckoos are also using more xero-riparian drainages in the foothills and mountains of southeastern Arizona (Corman and Magill 2000; American Birding Association 2014; WestLand Resources, Inc. 2013a, 2013b, 2015a, 2015b, 2015c; Tucson Audubon 2015; MacFarland and Horst 2015, 2017; AGFD 2017; Cornell Lab of Ornithology 2017; MacFarland 2017 *in litt*.; Marshall 2017 *in litt*.; Moors 2017 *in litt*.).

This kind of habitat is more typical of habitat where cuckoos are found in Sonora, Mexico (Flesch 2008, Russell and Monson 1998). Cuckoos have been detected in at least two years either as a single bird or as pairs in one year during the breeding season in the following areas:

- Santa Rita Mountains: Florida, Madera, Gardner, Chino, Montosa, Box, Walker, Wasp, McCleary, and Barrel Canyons; and in Salero Ranch;
- Huachuca Mountains: Carr, Ash, Garden, Ramsey, and Miller Canyons;
- Canelo Hills: Turkey and O'Donnell Creeks, Collins, Lyle, Merritt, and Korn Canyons;
- Babocomari River;
- Atascosa/Pajarito Mountains: Arivaca Lake and tributaries, Pena Blanca Lake and Canyon, California Gulch, Rock Corral, Scotia, and Sycamore Canyons;
- Baboquivari Mountains: Kitt Peak;
- Patagonia Mountains: Hermosa Creek, Paymaster Spring, Sycamore, Corral, Harshaw, Goldbaum, and Willow Springs Canyons;
- Whetstone Mountains: French Joe and Guindani Canyons;
- Catalina Mountains: Peppersauce Canyon;
- Rincon Mountains: Paige Creek;
- Dragoon Mountains: Slavin Gulch;
- Chiricahua Mountains: Cave Creek.

Yellow-billed cuckoos are likely breeding in a subset of these locations, with nesting confirmed in at least Montosa Florida, Box, and Madera Canyons in the Santa Rita Mountains, Sycamore Canyon and Pena Blanca Lake in the Atascosa/Pajarito Mountains, Peppersauce Canyon in the Catalina Mountains, Paige Creek in the Rincon Mountains, Harshaw Canyon in the Patagonia Mountains, Cave Creek in the Chiricahua Mountains, and Kitt Peak (American Birding Association 2014; Tucson Audubon 2015; MacFarland and Horst 2015, 2017; Cornell Lab of Ornithology 2017).

Threats

The primary threat to the western yellow-billed cuckoo is loss or fragmentation of high-quality riparian habitat suitable for nesting (Corman and Wise-Gervais 2005; USFWS 2014a,b). Habitat loss and degradation results from several interrelated factors, including alteration of flows in rivers and streams, mining, encroachment into suitable habitat from agricultural and other development activities on breeding and wintering grounds, stream channelization and stabilization, diversion of surface and ground water for agricultural and municipal purposes, livestock grazing, wildfire, establishment of nonnative vegetation, drought, and prey scarcity due to pesticides (Ehrlich et al. 1992, USFWS 2014b). Pesticide use is widespread in agricultural areas in the western yellow-billed cuckoo breeding range in the United States and northern Mexico. Yellow-billed cuckoos have also been exposed to the effects of pesticides on their wintering grounds, as evidenced by DDT found in their eggs and eggshell thinning in the United States (Grocki and Johnston 1974, Laymon and Halterman 1987a, Hughes 1999, Cantu-Soto et al. 2011). Because much of the species' habitat is in proximity to agriculture, the potential exists for direct and indirect effects to a large portion of the species in these areas through altered physiological functioning, prey availability, and, therefore, reproductive success, which ultimately results in lower population abundance and curtailment of the occupied range (Laymon 1980, Laymon 1998, Hughes 1999, Colyer 2001 *in litt*., Hopwood et al. 2013, Mineau and Palmer 2013, Mineau and Whiteside 2013, USFWS 2014b).

The ongoing threats, including small isolated populations, cause the remaining populations to be increasingly susceptible to further declines and local extirpations through increased predation rates, barriers to dispersal by juvenile and adult yellow-billed cuckoos, chance weather events, fluctuating availability of prey populations, collisions with tall vertical structures during migration, defoliation of tamarisk by the introduced tamarisk leaf beetle (*Diorhabda* spp.), increased fire risk, and climate change events (Thompson 1961, McGill 1975, Wilcove et al. 1986). The warmer temperatures already occurring in the southwestern United States may alter the plant species composition of riparian forests over time. An altered climate may also disrupt and change food availability for the western yellow-billed cuckoo if the timing of peak insect emergence changes in relation to when the cuckoos arrive on their breeding grounds to feed on this critical food source.

Habitat for the western yellow-billed cuckoo has been modified and reduced, resulting in only remnants of formerly large tracts of native riparian forests, many of which are no longer occupied by western yellow-billed cuckoos. Despite recent efforts to protect existing, and restore additional, riparian habitat in the Sacramento, Kern, and Colorado Rivers, and other rivers in the range of the western yellow-billed cuckoo, these efforts offset only a small fraction

of historical habitat that has been lost. Therefore, we expect the threats resulting from the combined effects associated with small and widely separated habitat patches to continue to affect a large portion of the range of the western yellow-billed cuckoo.

Proposed critical habitat

The primary constituent elements (PCEs) of the physical or biological features essential to the conservation of western yellow-billed cuckoo consist of three components:

(i) Riparian woodlands—Riparian woodlands with mixed willow-cottonwood vegetation, mesquite-thorn-forest vegetation, or a combination of these that contain habitat for nesting and foraging in contiguous or nearly contiguous patches that are greater than 325 feet (100 meters) in width and 200 acres (81 hectares) or more in extent. These habitat patches contain one or more nesting groves, which are generally willow-dominated, have above average canopy closure (greater than 70 percent), and have a cooler, more humid environment than the surrounding riparian and upland habitats.

(ii) Adequate prey base—Presence of a prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies) and tree frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas.

(iii) Dynamic riverine processes—River systems that are dynamic and provide hydrologic processes that encourage sediment movement and deposits that allow seedling germination and promote plant growth, maintenance, health, and vigor (e.g. lower gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams). This allows habitat to regenerate at regular intervals, leading to riparian vegetation with variously aged patches from young to old. These dynamic riverine processes are considered essential for developing and maintaining the primary constituent elements provided in paragraphs (2)(i) and (2)(ii) of this entry.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Status of the species and critical habitat, and factors affecting species environment and critical habitat within the action area

The status of the species and critical habitat within the action area that were described in the December 14, 2010, BO, are updated as follows.

Southwestern willow flycatcher

Areas that meet the description of flycatcher breeding habitat occur in the action area. Most of these areas are dense salt cedar that is ten to fifteen feet high, with occasional willows. There are some fairly large stands of salt cedar, but most are small patches. Other areas along the river provide foraging and migratory habitat. No assessment to determine condition and acres of flycatcher habitat has been completed.

Protocol surveys within some of the action area were completed by the Arizona Game and Fish Department (AGFD) from 2003 to 2010, with no territories being confirmed. One flycatcher was detected in 2008 at the Arlington Wildlife Area. Another detection was an incidental detection in 2002, and two flycatchers were detected in 2010, which were considered migrants. Surveys in the action area downstream of Gillespie Dam (Old Hwy. 80 Bridge) were completed for another project in 2006, 2008, and 2009. Flycatchers were detected in 2006 and 2008, but no territories were confirmed. The BLM conducted surveys for flycatchers within the project area in 2012 and 2015, but did not detect any individuals. No surveys specifically for this project have been conducted since then, although a pair of willow flycatchers was observed on 6/20/17 during protocol surveys approximately 10 miles east of the action area on the Gila River (Herman 2017: survey form).

Based on the available habitat and survey information, we believe that the project area is occasionally used by migrating flycatchers, and may potentially provide habitat for some breeding flycatchers.

No critical habitat for the flycatcher has been designated in the action area.

Yuma Ridgway's rail

Habitat for the rail is scattered along the Gila River in the action area. The area includes cattails and other vegetation that is inundated by water. Habitat location and patch sizes have changed through the years based on river flow and flooding (high flows in 2005 eliminated most of the cattail habitat that was present). No assessment to determine condition and acres of rail habitat has been completed.

The action area is occupied by rails, though the number varies annually. The AGFD conducted surveys from Highway 85 downstream to Gillespie Dam from 2001 to 2009, but effort and specific areas surveyed varied by year. Number of rails detected has ranged from 5 to 37, with the highest detections per year before the high flows in 2005. Surveys in the action area downstream of Gillespie Dam (Old Hwy. 80 Bridge) were completed for another project in 2006, 2008, and 2009, but no rails were detected. While available habitat has been reduced since the early 2000's, sufficient habitat remains to support rails in the action area.

The AGFD conducts annual "Marsh Bird Surveys," including for the Yuma Ridgway's rail. The project area is broken down into several survey areas and the results of rail detections are listed below. Also included are rail detections from USFWS files in or near the action area.

Gila River near Highway 85 – From the BA: 2010, two surveys were conducted and no Yuma Ridgway's rails were detected. From USFWS: 2016, no rails detected.

Gila River, west bank near Arlington – From USFWS: 2017, three surveys conducted, one rail detected on first survey (most likely a migrant).

Gila River at Robbins Butte – 2008, two surveys were conducted and one rail was detected. 2009, two surveys were conducted and one rail was detected. 2011, three surveys conducted and no rails were detected. 2013, two surveys were conducted and no rails were detected. 2015, two surveys were conducted and no rails were detected. USFWS: 2017, two surveys were conducted, two rails detected on second survey (5/10).

Gila River, Power's Butte to Arlington WA – This area was not surveyed between the years 2008-2015. The area "has not been surveyed in recent years because of lack of habitat and poor survey results in 2005 & 2006."

Arlington Drain, Northeast of Arlington WA – 2008, two surveys were conducted and one rail was detected on each survey. 2009, one rail was detected. 2010, two surveys were conducted and on the second survey "a pair of [rails] clatter in response to playing the [rail] portion of the survey at stop #2." 2011, two surveys were conducted and no rails were detected. 2014, two surveys were conducted and no rails were detected. 2015, two surveys were conducted and no rails were detected.

Gila River, upstream of Gillespie Dam – 2008, two surveys were conducted and four YCR were detected on the second survey with one additional individual "incidentally detected between stops." 2009, two surveys were conducted and two individuals were detected on the second survey. 2011, two surveys were conducted and no rails were detected. 2012, two surveys were conducted and one rail was detected. 2013, two surveys were conducted and two rails were detected on one survey. 2014, two surveys were conducted and three rails were detected on the first survey and two rails were detected on the second survey. 2015, two surveys were conducted and no rails were detected. USFWS: 2017, three surveys conducted and two rails were detected (4/13).

Western yellow-billed cuckoo

Given the amount of monotypic tamarisk within the action area, it is unlikely that much western yellow-billed cuckoo breeding habitat is currently present within the action area. However, small areas containing some native vegetation may occur, which may provide breeding opportunities. Small seeps, pools of open water, or moist soil may be hidden amid the vegetation along the Gila River. One of these hidden pools surrounded by a mix of native trees and tamarisk exists 6 miles east of the project area, where cuckoos are likely breeding (Cornell Lab of Ornithology 2017; ebird and USFWS unpub data). Other areas within the action area and along the river provide foraging

and migratory habitat. No assessment to determine the condition and acres of cuckoo habitat has been completed within the action area.

According to the BA, the BLM conducted cuckoo surveys within the project area in 2015 and detected one cuckoo in survey period four. No surveys have been conducted since then, and protocol surveys (Halterman et al. 2016) have not been conducted throughout the entire action area. Other incidental detections within the action area include Heritage Data Management System entries from 8/17/1987, 6/16/1996, and 8/15/2014 (AGFD 2017; the last detection was on the eastern boundary of the action area), and an ebird detection at the Gillespie Dam on 8/2/2008 (Cornell Lab of Ornithology 2017). Due to the lack of surveys, other nearby cuckoo surveys and incidental cuckoo detections can be useful in helping to determine the status of cuckoos within the action area. Many of the cuckoos detected by birders or during protocol surveys likely are migrants, but breeding is likely at more than one site on the Gila River from Phoenix downstream to Painted Rock Dam. Nearby detections include the following:

- More than one individual was documented 6 miles east of the action area on the Gila River and was likely breeding in 2015 and 2016 (Cornell Lab of Ornithology 2017; ebird and USFWS unpub data).
- Cuckoos were documented from 1985 to 7/8/2001 approximately 8.5 miles east of the action area on the Gila River (AGFD 2017: HDMS).
- A cuckoo was observed during protocol surveys on 6/21/17 approximately 10 miles east of the action area on the Gila River (Herman 2017: survey form).
- A cuckoo was observed on 7/14/2012 and 7/9/2016 approximately 14 miles east of the action area on the Gila River (Cornell Lab of Ornithology 2017: ebird).
- Numerous cuckoo detections were documented during the breeding season from 1972 to 2017 approximately 16 miles east of the action area on the Gila River (Cornell Lab of Ornithology 2017: ebird; AGFD 2017: HDMS).
- Additional cuckoo detections have been documented greater than 16 miles east of the action area on the Gila River (Cornell Lab of Ornithology 2017; ebird; AGFD 2017: HDMS).

Based on the available habitat and survey information, we believe that the project area is occasionally used by migrating cuckoos, and may potentially provide habitat for some breeding cuckoos where some native habitat is mixed in with tamarisk, although likely at very low numbers.

Western yellow-billed cuckoo proposed critical habitat

The proposed critical habitat unit (AZ 7 Gila and Salt Rivers) for the western yellow-billed cuckoo occurs along the Gila River in the action area and begins approximately 24 miles upstream of the Highway 85 crossing and continues 8 miles downstream past the crossing. Approximately 5,003 acres of the total 17,581-acre unit occur within the action area. Much of the vegetation within this portion of the unit is monotypic tamarisk, although an extensive survey of the condition of critical habitat within the action area has not been conducted. As mentioned above, small pockets of mixed native and tamarisk habitat likely exist within the project area and suitability changes over time in response to water availability.

Factors affecting the species' environment and critical habitat within the action area

Southwestern willow flycatcher, Yuma Ridgway's rail, and western yellow-billed cuckoo

The lower Gila River has a mix of ownership patterns, from active and fallow farm use on private lands to wildlife habitat areas, managed by the AGFD. The wildlife management areas have management (farming and structure maintenance) and recreation (hiking, wildlife watching, and hunting) actions that may occasionally disturb flycatchers or rails. BLM manages four ephemeral grazing allotments along the Gila River, but livestock access to the river is restricted by fencing: therefore, no effects to flycatchers, rails, or cuckoos are expected. Recreation use in the river consists of fishing, and kayaking, which may occasionally disturb flycatcher or rails. Off-highway vehicle (OHV) use is common in the uplands, but river access is limited by private and state landowners.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, which will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Herbicide Use

The formulations of Tryclopyr salt and Glyphosate herbicides are listed as slightly to moderately toxic to terrestrial and aquatic arthropods, as well as small avian species and are in Class 1 with regard to ecotoxicity. Imazapyr and Tryclopyr ester are listed as virtually nontoxic and are Class 0 with regard to ecotoxicity. These herbicide formulations will not be used within ten feet of any standing water, which is required by BLM policy (BLM 2007) Vegetation Management EIS. Also, herbicides will not be applied within ten feet of rail habitat, and drift-inhibiting agents will be used to assure that the herbicide does not enter adjacent marsh areas. Persistence in the environment for these herbicides is short lived. Glyphosate, Tryclophyr salt and ester, and Imazapyr all photo degrade. Based on the toxicity and persistence of the active ingredients of the pesticides proposed for use, there is little likelihood for direct effects to flycatchers, rails, or cuckoos. In addition, the amounts of herbicide to be used and the locations of the use would not be enough to cause toxic concentrations within prey species of the flycatcher, rail, or cuckoo. The proposed application of these herbicides meets or exceeds the USFWS pesticide guidelines (White 2004).

Western yellow-billed cuckoo proposed critical habitat

The effects to the PCEs of proposed western yellow-billed cuckoo critical habitat due to herbicide use are combined with the effects described in the **Fuel Breaks and WUI Buffers** section, below.

Fuel Breaks and WUI Buffers

Tamarisk eradication can be detrimental to flycatchers and cuckoos in mixed and exotic habitats, especially in or near occupied habitat or where restoration is unlikely to be successful. Risks to flycatchers increase if the tamarisk control projects are implemented in absence of a plan to restore suitable native riparian plant species or if site conditions preclude the re-establishment of native plant species of equal or higher functional value. Threats to cuckoos occur if native vegetation is removed or suddenly exposed to the sun and heat when the surrounding tamarisk is removed. Threats also increase if the eradication projects are large scale in nature (USFWS 2002).

The above effects likely will occur as a result of the proposed action. Fuel breaks and WUI buffers will need to be maintained to ensure their use in preventing the spread of wildfires; therefore, vegetation is not expected to reestablish in these areas. The development of these breaks and buffers will occur on a relatively small scale (50 to 150 acres); however, the creation and maintenance of five to ten fuel breaks of 50 to 300 feet in width in monotypic salt cedar stands will contribute to fragmentation of habitat and may result in a reduced potential for the establishment of flycatcher nest sites and would result in smaller blocks of potential breeding habitat. Monotypic salt cedar stands usually do not provide cuckoo nest sites, although these areas can enhance small patches of native vegetation by ameliorating temperatures and providing foraging and roosting habitat, as well as cover. Fuel breaks would also increase edge, which may result in increased temperatures at nest sites and opportunities for nest predation, as well as nest parasitism for flycatchers, should either species nest near or adjacent to the treatment areas. Edge effects and habitat fragmentation may reduce the suitability of flycatcher and cuckoo migration habitat, but these effects are not expected to reduce the occasional use of the project area by migrating flycatchers and cuckoos that currently occurs. These effects would occur on a relatively small portion of the overall project area (up to 16%, or 1,500 acres of the total 9,416-acre project), and the overall character and function of riparian habitat within the action area will remain unchanged as a result of the proposed activities. Therefore, riparian habitat within the action area will continue to provide potential opportunities for migrating, forging, and nesting flycatchers and cuckoos. Additionally, creating and maintaining fuel breaks is anticipated to decrease the likelihood that fire would spread within habitat areas (both native and non-native) and reduce the occurrence of large-scale fire events, which will protect existing breeding, foraging, and migration habitat and may increase the potential for the development of breeding habitat for flycatchers and cuckoos in the long-term.

No flycatcher or cuckoo territories are known in the action area, although extensive surveys have not been conducted and no surveys will be completed before actions are implemented in or adjacent to potential breeding habitat. As indicated above, cuckoos within the action area were detected incidentally on 8/17/1987, 6/16/1996, and 8/15/2014 (AGFD 2017; the last detection was on the eastern boundary of the action area), and an ebird detection at the Gillespie Dam on 8/2/2008 (Cornell Lab of Ornithology 2017). The proposed action should not directly affect breeding flycatchers or cuckoos because actions will occur outside the breeding season. However, breeding flycatchers and cuckoos, if present, could be disturbed from the increased human disturbance associated with the use of pedestrian backpack sprayers, which may occur

during the breeding season. This action may disturb breeding flycatchers and cuckoos if they are nesting or foraging next to or in the treatment areas. This may result in individuals temporarily leaving the nest or leaving the general area while foraging, but they will return after the sprayers have left the area. We do not expect that this would result in nest abandonment or failure, and would not result in a decrease in reproduction.

Flycatchers and cuckoos may be indirectly affected through habitat removal, however. Studies have shown that most southwestern willow flycatchers return to former breeding areas, although they regularly move among sites within and between years. This could temporarily impact reproduction as returning flycatchers search for and establish new territories. Cuckoos may be less affected by habitat removal, as they may shift use areas within their large home ranges during a season, perhaps in response resource availability or nesting habitat.

Migrating flycatchers and cuckoos may be disturbed by some of the actions, but this is not expected to affect their survival because they will move to untreated sites within the action area (continue their migration to or from their breeding areas).

Project actions are unlikely to occur within rail habitat because fuel breaks are less necessary in areas characterized by open water and marshes. Treated areas may occur near or adjacent to rail habitat (areas inundated with water), or areas that once were inundated with water. This may reduce foraging habitat adjacent to rail habitat, but some of the treated areas could still be foraging habitat in the future because all vegetation will not be removed and management will favor the re-establishment of native vegetation species. Opening up areas as a result of creating fuel breaks and WUI buffers in proximity to rail habitat areas may also increase opportunities for predation. Creating and maintaining fuel breaks and WUI buffers is anticipated to decrease the spread of fire to areas of rail habitat and reduce the occurrence of catastrophic fire events, which may maintain more habitat for rails in the long-term.

Rails are resident in portions of the action area (surveys have documented 5 to 37 rails, varying by year), but specific locations in relation to possible treatment areas were not documented for this project. Rail habitat is continually changing in both extent and location based on climate, land use, and vegetation conditions. No surveys in or adjacent to habitat will be completed before actions are implemented. Even so, the proposed action is likely to have very little effect on nesting rails because most actions will occur outside the breeding season. Nesting rails, if near or adjacent to where actions occur, could be disturbed from the increased human disturbance associated with the use of pedestrian backpack sprayers, but considering that applications during the breeding season will be subject to appropriate buffers in relation to nesting habitat, this disturbance is expected to be minimal. Nesting rails are not expected to leave a nest, but foraging rails may leave the general area. We do not expect that this would result in nest failure, and would not result in a decrease in reproduction. In other times of the year, foraging rails may be disturbed by the use of heavy machinery, chainsaws, and other equipment. Again, appropriate buffers around rail habitat will be established, but rails may move to other foraging areas in response to this disturbance. However, this is not anticipated to result in them leaving the general area or result in mortality.

Critical habitat for the flycatcher will not be affected because none is designated in the action area.

Western yellow-billed cuckoo proposed critical habitat

The PCEs of proposed western yellow-billed cuckoo critical habitat as described in the status of the species section are those habitat elements that provide sufficient riparian habitat for breeding, non-breeding, territorial, dispersing, and migrating cuckoos, and to cuckoos throughout their range, and provide those habitat components essential for conservation of the subspecies. Effects on PCEs 1 and 2 are expected due to the creation and maintenance (including herbicide use) of up to 1,500 acres of fuel breaks and WUI buffers. Decreased cover due to clearing of tamarisk adjacent to patches of mixed native and tamarisk habitat may increase rates of nest predation, reducing the suitability of nesting habitat. Creating gaps in vegetation may increase temperatures and lower relative humidity in the habitat patches, reducing the productivity of insects and therefore the suitability of foraging habitat. Overall, however, fuel breaks and WUI buffers are expected to minimize the risk of large-scale fires within the action area, thereby also minimizing the risk of large-scale losses of western yellow-billed cuckoo proposed critical habitat**.**

Restoration Activities

Restoration and management for native species establishment are a part of the proposed action; however, these projects will occur only as funding becomes available. Restoration activities may occur in fuels breaks and/or WUI buffers if the conditions are appropriate, as well as in areas where wildfires have previously occurred within the action area. Because these areas have been cleared of vegetation (including in some cases by fire and fire suppression activities), habitat for flycatchers, rails, and cuckoos has been eliminated or greatly reduced at these sites. Some of the most intense actions within this proposed project are associated with restoration activities. These actions include the use of heavy equipment, ground disturbance, installation of irrigation systems, and planting and seeding. However, because these areas do not support habitat for flycatchers, rails, or cuckoos, we do not anticipate any effects from these actions.

Western yellow-billed cuckoo proposed critical habitat

Effects on PCEs 1 and 2 from restoration activities are expected to improve native habitat along the Gila River, and additional gains of cuckoo habitat (including breeding, foraging, and migrating) within the action area, as funding becomes available, could be expected**.**

Fire

Fire will only be used as part of the proposed project to burn slash piles associated with the mechanical removal of vegetation for fuel breaks and WUI buffers. Burning of slash piles will occur away from areas of habitat for the flycatcher, rail, and cuckoo. We do not anticipate any effects to any of the species as a result of burning slash piles.

Western yellow-billed cuckoo proposed critical habitat

We do not anticipate any effects to western yellow-billed cuckoo proposed critical habitat as a result of burning slash piles.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The lower Gila River has a mix of ownership patterns, from active and fallow farm use on private lands to wildlife habitat areas, managed by the AGFD. BLM manages four ephemeral grazing allotments along the Gila River. Livestock access to the river is restricted by fencing.

Recreation use in the river consists of hunting, fishing and kayaking. Off highway vehicle (OHV) use is common in the uplands but access too much of the river is controlled by private and state landowners.

Development of private lands, sale and development of state lands, groundwater pumping for domestic and commercial use, agricultural use including clearing and herbicide/pesticide application, alteration of flood flows related to management and operation of dams along the upper and middle Gila River, livestock grazing, recreation use, transportation planning, renewable energy development, spread of invasive weed species, are continuing threats to the species.

Adaptation and expansion of the tamarisk leaf beetle (*Diorhabda carinulata*) could eventually defoliate much of the tamarisk in the Gila River, reducing potential habitat and/or making occupied habitat unsuitable.

CONCLUSION

Southwestern willow flycatcher

After reviewing the current status of the southwestern willow flycatcher and its critical habitat, the environmental baseline for the action area, the effects of the proposed Hazardous Fuels Reduction and Vegetation Restoration along the Lower Gila River, and the cumulative effects, it is our biological opinion that the Lower Gila River project, as proposed, is not likely to jeopardize the continued existence of the southwestern willow flycatcher. We base this conclusion on the following:

- Implementation of most of the proposed action will be conducted outside of the southwestern willow flycatcher breeding season (backpack sprayers may be used during the breeding season – see bullet below), thus minimizing direct and indirect effects to migrating, nesting, and dispersing birds.

- The use of backpack sprayers during the breeding season will not result in nest abandonment or failure because of the short-term, low-disturbance nature of the action.

- Established and maintained fuel breaks should reduce the threat of fire in breeding and migration habitat.

- Restoration efforts in areas previously burned by wildfire may improve the quality and extent of some habitat in the action area.

Yuma Ridgway's rail

After reviewing the current status of the Yuma Ridgway's rail, the environmental baseline for the action area, the effects of the proposed Hazardous Fuels Reduction and Vegetation Restoration along the Lower Gila River, and the cumulative effects, it is our biological opinion that the Lower Gila River project, as proposed, is not likely to jeopardize the continued existence of the Yuma Ridgway's rail. We base this conclusion on the following:

- Most actions will not occur in rail habitat due to the natural fuel break conditions that exist in rail habitat (e.g. open water, inundated vegetation).

- Most actions will occur outside the breeding season, and the actions that may occur during the breeding season will not result in nest abandonment due to the short-term, low-disturbance nature of the actions.

- The use of backpack sprayers during the breeding season will not result in nest failure because of the use of buffer zones and the short-term, low-disturbance nature of the action.

- Established and maintained fuel breaks may minimize the threat of fire in breeding and foraging rail habitat.

Western yellow-billed cuckoo

After reviewing the current status of the Western yellow-billed cuckoo and its proposed critical habitat, the environmental baseline for the action area, the effects of the proposed Hazardous Fuels Reduction and Vegetation Restoration along the Lower Gila River, and the cumulative effects, it is our biological opinion that the Lower Gila River project, as proposed, is not likely to jeopardize the continued existence of the western yellow-billed cuckoo. We base this conclusion on the following:

- Implementation of most of the proposed action will be conducted outside of the western yellow-billed cuckoo breeding season (backpack sprayers may be used during the breeding season – see bullet below), thus minimizing direct and indirect effects to migrating, nesting, and dispersing birds.

- The use of backpack sprayers during the breeding season will not result in nest abandonment or failure because of the short-term, low-disturbance nature of the action.

- Established and maintained fuel breaks should reduce the threat of fire in breeding and migration habitat.

- Restoration efforts in areas previously burned by wildfire may improve the quality and extent of some habitat in the action area.

- We anticipate effects to proposed PCEs 1 and 2 of up to 1,500 acres, or approximately 8.5% of the 17,581 acres of riparian habitat along the Gila River in the Gila River proposed Critical Habitat Unit 15 and 0.3% of the 546,335 acres of proposed critical habitat rangewide. These effects will mainly occur in stands of monotypic tamarisk that do not provide breeding habitat, although they may provide some foraging and migrating habitat. Additionally, as funding is available, restoration activities in areas burned by wildfire will focus on establishing native vegetation, which may increase some cuckoo habitat in the long-term. Thus, while there is a measurable impact, the overall effect, considering the status of the western yellow-billed cuckoo and amount of acreage in the proposed critical habitat unit, does not approach a level of significance to impact the function of proposed critical habitat or affect its role in recovery of the taxon.

The conclusions of this BO are based on full implementation of the project as described in the **DESCRIPTION OF THE PROPOSED ACTION** section of this document, including any Conservation Measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined (50 CFR § 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined (50 CFR § 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The USFWS and the National Marine Fisheries Service (NMFS) published a Final Rule on May 11, 2015 (80 FR 26832- 26845; USFWS and NMFS 2015), amending the incidental take statement provisions of the implementing regulations for section 7 of the Act (50 CFR 402.02 and 402.14) to: (1) to refine the basis for development of incidental take statements for programmatic actions; and (2) address the use of surrogates to express the amount or extent of anticipated incidental take. With respect to the use of surrogate measures of incidental take, we amended 402.14(i)(1)(i) of the regulations to clarify that surrogates may be used to express the amount or extent of anticipated take, provided the biological opinion or the incidental take statement: (1) Describes the causal link between the surrogate and take of the listed species; (2) describes why it is not practical to express the amount of anticipated take or to monitor take

related impacts in terms of individuals of the listed species; and (3) sets a clear standard for determining when the amount or extent of the taking has been exceeded.

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

Amount of Extent of Take

Southwestern willow flycatcher

We do not anticipate that incidental take of the southwestern willow flycatcher is reasonably certain to result from this action because we have not been provided with survey or habitat information that would allow us to evaluate the abundance and distribution of this species, or its available habitat, within the action area.

Yuma Ridgway's rail

The USFWS does not anticipate that the proposed action will result in incidental take of any rails because:

- the proposed action will primarily occur outside of rail habitat (areas inundated with water);
- most actions will occur outside the breeding season, eliminating the potential take of nests or eggs;
- buffer zones will be established around rail habitat to avoid disturbance of rails and their habitat during the non-breeding season.

A logical case can be made that incidental take of Yuma Ridgway's rails may occur due to subsequent maintenance activities, but the likelihood is very low. Maintenance treatments could occur at any time of the year, but would be directed outside the breeding seasons for rails to the extent possible. Maintenance treatments could result in the disturbance of rails during the nesting season; however, the extent of habitat affected and the short-term, low-disturbance nature of the action in combination with buffer-area implementation, reduces the likelihood of take to below a reasonable certainty.

Western yellow-billed cuckoo

We do not anticipate that incidental take of the western yellow-billed cuckoo is reasonably certain to result from this action because we have not been provided with survey or habitat information that would allow us to evaluate the abundance and distribution of this species, or its available habitat, within the action area.

Pursuant to 50 CFR 402.16, reinitiation of consultation would be required to the extent BLM retains discretion over the proposed action. The USFWS will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. § 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. § 668-668d), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species initial notification must be made to the USFWS's Law Enforcement Office, 4901 Paseo del Norte NE, Suite D, Albuquerque, NM 87113; 505-248-7889) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care and in handling dead specimens to preserve the biological material in the best possible state.

Certain project activities may also affect species that are protected under the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. sec. 703-712) and/or bald and golden eagles protected under the Bald and Golden Eagle Protection Act (BGEPA). The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the USFWS. BGEPA prohibits anyone, without a permit issued by the USFWS, from taking (including disturbing) eagles, and including their parts, nests, or eggs. If you believe migratory birds will be affected by the project, we recommend you contact our Migratory Bird Permit Office, P.O. Box709, Albuquerque, NM 87103, (505) 248-7882, or permitsR2mb@fws.gov. For more information regarding the MBTA, please visit the following websites: Migratory Bird Program web site and Migratory Bird Treat Act permits web site.

For information on protections for bald eagles under the BGEPA, please refer to the USFWS's National Bald Eagle Management Guidelines (72 FR 31156) and regulatory definition of the term "disturb" (72 FR 31132) that were published in the Federal Register on June 5, 2007. Existing take authorizations for bald eagles issued under the Act became covered under the BGEPA via a final rule published in the Federal Register on May 20, 2008 (73 FR 29075). Our office is also available to provide technical assistance to help you with compliance.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and

threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. We recommend that your agency participate in the implementation of the recovery plan for the southwestern willow flycatcher and in the development of the new recovery plan for the rail.

2. We recommend that you coordinate with other landowners in the action area in fire and fuel management in order to benefit flycatchers, rails, and other resources in the area.

3. We recommend that you conduct protocol surveys for all three species in and adjacent to the action area.

4. We recommend that you quantify habitat for all three species in the action area. For southwestern willow flycatchers this could include working with USGS to refine and implement the habitat model developed by Hatten (2016).

In order for the USFWS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the USFWS requests notification of the implementation of any conservation recommendations. Follow-up monitoring and reporting will be crucial in assessing a) the success and cost/effectiveness of this project in producing habitat superior to that which currently exists and b) whether or not these methods should be considered for future vegetation management and fire-related projects.

REINITIATION NOTICE

This concludes both the formal and conference opinion for the Hazardous Fuels Reduction and Vegetation Restoration along the Lower Gila River as outlined by the BLM. You may ask the USFWS to confirm the conference opinion (yellow-billed cuckoo proposed critical habitat) as a biological opinion issued through formal consultation if the proposed critical habitat is designated. The request must be in writing. If the USFWS reviews the proposed action and finds there have been no significant changes in the action as planned or in the information used during the conference, the USFWS will confirm the conference opinion as the biological opinion for the project and no further section 7 consultation will be necessary.

As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

In keeping with our trust responsibilities to American Indian Tribes, we encourage you to coordinate with the Bureau of Indian Affairs in the implementation of this consultation and, by copy of this BO, are notifying affected Tribes of its completion (Ak-Chin Indian Community, Colorado River Indian Tribes, Fort Mohave Indian Tribe, Hopi Tribe, Pascua Yaqui Tribe, Quechan Tribe, Salt River Pima-Maricopa Indian Community, Tohono O'odham Nation, Yavapai-Apache Nation, and Yavapai-Prescott Indian Tribe). We also encourage you to coordinate the review of this project with AGFD.

We appreciate the BLM's efforts to identify and minimize effects to listed species from this project. Please refer to the consultation number, 22410-2009-F-0509-R001, in future correspondence concerning this project. Should you require further assistance or if you have any questions, please contact Marit Alanen at (520) 670-6150 (x234) or Scott Richardson at (520) 670-6150 (x242).

Steven L. Spangle

cc (electronic):

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LITERATURE CITED

American Birding Association. 2014. Birding News. Arizona cuckoo records.

American Ornithologists Union (AOU). 1957. Checklist of North American birds. 5th ed. American Ornithologists' Union, Baltimore, MD.

Anderson, B.W. and R.D. Ohmart. 1985. Habitat use by clapper rails in the Lower Colorado River Valley. Condor 87(1): 116-126.

AOU. 1983. Checklist of North American birds. 6th ed. American Ornithologists' Union, Washington, D.C.

AOU. 1998. Checklist of North American birds. 7th ed. American Ornithologists' Union, Washington, D.C.

Arizona Game and Fish Department (AGFD). 2017. Yellow-billed Cuckoo records. Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ.

Brown, D.E. 1994. Biotic communities of the Southwestern United States and northwestern Mexico. University of Utah Press, Salt Lake City, 342 pp.

Brown, D.E., T.C. Brennan, and P.J. Unmack. 2007. A digitized biotic community map for plotting and comparing North American Plant and Animal Distributions. Arizona State University. CANOTIA Vol. 3 (1)

Brown, D.E. and C.H. Lowe. 1982. Biotic Communities of the Southwest [map]. Scale1:1,000,000. General Technical Report RM-78. U.S. Forest Service, Fort Collins. Reprinted (and revised) 1994 by University of Utah Press, Salt Lake City.

Browning, M.R. 1993. Comments on the taxonomy of *Empidonax traillii* (willow flycatcher). *Western Birds* 24:241-257.

Bureau of Land Management (BLM). 2007. Final Environmental Impact Statement, Vegetation Treatment on BLM Lands in seventeen Western States.

Cantu-Soto, E; M. Meza-Montenegro, A. Valenzuela-Quintanar; A. Félix-Fuentes; P. Grajeda-Cota; J. Balderas-Cortes; C. Osorio-Rosas; G. Acuña-García; and M. Aguilar-Apodaca. 2011. Residues of Organochlorine Pesticides in Soils from the Southern Sonora, Mexico. Bulletin of Environmental Contamination and Toxicology 87:556–560.

Cardinal S.N. and E. H. Paxton. 2005. Home range, movement, and habitat use of the southwestern willow flycatcher at Roosevelt Lake, AZ – 2004. U.S. Geological Survey Report to the U.S. Bureau of Reclamation, Phoenix, AZ.

Carstensen, D., D. Ahlers, D. Moore. 2015. Yellow-billed Cuckoo Study Results – 2014, Middle Rio Grande from Los Lunas to Elephant Butte Reservoir, New Mexico. Prepared for Albuquerque Area Office, Bureau of Reclamation, Albuquerque, NM. Technical

Service Center, Fisheries and Wildlife Resources Group, Bureau of Reclamation, Denver, CO.

Colyer, M. *in litt*. 2001. Letter from Marilyn Colyer to Wayne White regarding yellow-billed cuckoos distribution in southwestern Colorado. 5 February 2001.Durst, S.L., M.K. Sogge, H.C. English, H.A. Walker, B.E. Kus, and S.J. Sferra. 2008. Southwestern willow flycatcher breeding site and territory summary – 2007. U.S. Geological Survey, Colorado Plateau Research Station, Flagstaff, AZ.

Conway, C.J. 1990. Seasonal changes in movements and habitat use by three sympatric species of rails. M.S. Thesis, University of Wyoming, Laramie. 58 pp.

Conway, C.J., W.R. Eddleman, S.H. Anderson, and L.R. Hanebury. 1993. Seasonal changes in Yuma clapper rail vocalization rate and habitat use. Journal of Wildlife Management 57(2):282-290.

Corman, T. E., and R. T. Magill. 2000. Western yellow-billed cuckoo in Arizona: 1998 and 1999 survey report. Nongame and Endangered Wildlife Program, Tech. Rept. 150, Arizona Game and Fish Dept., Phoenix, AZ. 49pp.

Corman, T. E., and C. Wise-Gervais, eds. 2005. Arizona breeding bird atlas. University of New Mexico Press, Albuquerque, NM. 636pp.

Cornell Lab of Ornithology. 2017. E-bird web site.

Dettling, M.D., and C.A. Howell. 2011. Status of the Yellow-billed Cuckoo along the Sacramento River in 2010. Report to California Department of Fish and Game. PRBO Contribution #1794. 47 pp.

DeLoach, C.J. 1991. Biological control of weeds in the United States. Natural Areas Journal 11:129-142.

Durst, S.L. 2004. Southwestern willow flycatcher potential prey base and diet in native and exotic habitat. Masters Thesis. Northern Arizona University, Flagstaff, AZ.

Durst, S.L., M.K. Sogge, H.C. English, H.A. Walker, B.E. Kus, and S.J. Sferra. 2008. Southwestern willow flycatcher breeding site and territory summary – 2007. U.S. Geological Survey, Colorado Plateau Research Station, Flagstaff, AZ.

Eddleman, W.R. 1989. Biology of the Yuma clapper rail in the southwestern U.S. and northwestern Mexico. Final Report. Intra-Agency Agreement No. 4-AA-30-02060. Wyoming Cooperative Research Unit, University of Wyoming, Laramie. 127 pp.

Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1992. Birds in jeopardy. Stanford University Press, Stanford, CA.

English, H.C., A.E. Graber, S.D. Stump, H.E. Telle, and L.A. Ellis. 2006. Southwestern willow flycatcher 2005 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 248. Arizona Game and Fish Department, Phoenix, AZ.

Finch, D.M. and S.H. Stoleson, eds. 2000. Status, ecology, and conservation of the southwestern willow flycatcher. Gen. Tech. Rep. RMRS-GTR-60. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 131 p.

Flesch, A.D. 2008. Distribution and status of breeding landbirds in northern Sonora Mexico. Studies in Avian Biology 37:28–45.

Franzreb, K. E., and S. A. Laymon. 1993. A reassessment of the taxonomic status of the yellow-billed cuckoo. Western Birds 24:17-28.

Gaines, D. 1974. Review of the status of the yellow billed Cuckoo in California: Sacramento Valley populations. Condor 76:204–209.

Gaines, D., and S. A. Laymon. 1984. Decline, status, and preservation of the yellow-billed cuckoo in California. Western Birds 15:49–80.

Glenn, E., R. Felger, A. Burquez, and D. Turner. 1992. Cienega de Santa Clara: endangered wetland in the Colorado River delta, Sonora, Mexico. Nat. Resources J. 32:817-824.

Glenn, E., C. Lee, R. Felger, and S. Zengel. 1996. Effects of water management on the wetlands of the Colorado River delta, Mexico. Conservation Biology 10(4):1175-1186.

Gould, G. 1975. Yuma clapper rail study-censuses and distribution. California Department of Fish and Game, Wildlife Management Report, 75-2. Sacramento. 12 pp.

Griffin, D.J. 2015. Surveys for Yellow-billed Cuckoos at Buenos Aires National Wildlife Refuge, Pima County, Arizona, 2015. Prepared for: Buenos Aires National Wildlife Refuge, U.S. Fish and Wildlife Service, P.O. Box 109, Sasabe, Arizona.

Grocki, D.R.J. and D.W. Johnston. 1974. Chlorinated hydrocarbon pesticides in North American cuckoos. Auk 91:186–187.

Groschupf, K. 1987. Status of the yellow billed cuckoo (Coccyzus americanus occidentalis) in Arizona and west Texas. Report prepared for the U.S. Fish and Wildlife Service, under contract no. 20181–86–00731. 34 pp.

Groschupf, K. 2015. in litt. Email from Kathy Groschupf, biologist, to Susan Sferra, Service biologist with attachment, 8/28/15, entitled “YB Cuckoo information for you.”Aug 28, 2015.

Halterman, M.D. 2001. Population status of the yellow-billed cuckoo at the Bill Williams River NWR and Alamo Dam, Arizona and southern Nevada: summer 2000. Bureau of Reclamation, Boulder City, NV. 45pp.

Halterman, M.D. 2002. Surveys and life history studies of the yellow-billed cuckoo: Summer 2001. Admin. Rept. , Bureau of Reclamation, Boulder City, NV and Bureau of Land Management, Sierra Vista, AZ. 37pp.

Halterman, M. D. 2003. Surveys and life history studies of the yellow-billed cuckoo: summer 2002. Administrative report to the Bureau of Reclamation, Boulder City, NV and Bureau of Land Management, Sierra Vista, AZ. 45pp.

Halterman, M. D. 2004. Surveys and life history studied of the yellow-billed cuckoo: summer 2003. Admin. Rept., Bureau of Reclamation, Boulder City, NV and Bureau of Land Management, Sierra Vista, AZ. 43pp.

Halterman, M. D. 2005. Surveys and life history studies of the yellow-billed cuckoo: summer 2004. Administrative report to the Bureau of Reclamation, Boulder City, NV and Bureau of Land Management, Sierra Vista, AZ. 23pp.

Halterman, M. D. 2006. Surveys and life history studies of the yellow-billed cuckoo: summer 2005. Admin. Rept., Bureau of Reclamation, Boulder City, NV. 24pp.

Halterman, M.D. 2007. Surveys and life history studies of the yellow-billed cuckoo: summer 2006. Admin. Rept. , Bureau of Reclamation, Boulder City, NV. 13pp.

Halterman, M. D. 2009. Sexual dimorphism, detection probability, home range, and parental care in the yellow-billed cuckoo. Ph.D. Dissertation, Univ. of Nevada, Reno, NV.

Halterman, M.D., M.J. Johnson, J.A. Holmes and S.A. Laymon. 2016. A Natural History Summary and Survey Protocol for the Western Distinct Population Segment of the Yellow-billed Cuckoo: U.S. Fish and Wildlife Techniques and Methods, 45 p.

Hamilton, W. J., III, and M. E. Hamilton. 1965. Breeding characteristics of yellow-billed cuckoos in Arizona. Proc. California Academy of Sciences, 4th Series, 32:405–432.

Hinojosa-Huerta, O. 2008. J.J. Rivera-Diaz, H. Iturribarría-Rojas, A. Calvo-Fonseca. 2008. Population trends of Yuma clapper rails in the Colorado River Delta, Mexico. Studies in Avian Biology 37:69-73.

Hinojosa-Huerta, O., E. Soto-Montoya, M. Gómez-Sapiens, A. Calvo-Fonseca, R. Guzmán-Olachea, J. Butrón-Méndez, J.J. Butrón-Rodríguez, and M. Román-Rodríguez. 2013. The Birds of the Cienega de Santa Clara, a wetland of international importance within the Colorado River Delta. Ecological Engineering, 59: 61-73.

Holmes, J. A., C. Calvo, and M. J. Johnson. 2008. Yellow-billed cuckoo distribution, abundance, habitat use, and breeding ecology in the Verde River watershed of Arizona, 2004–2005 Final Report. Admin Rept., Arizona Game and Fish Dept. 34pp.

Hopwood, J., S.H. Black, M. Vaughan, and E. Lee-Mader. 2013. Beyond the birds and bees: Effects of Neonicotinoid insecticides on agriculturally important beneficial invertebrates. The Xerces Society. 25 pp.

Howell, S.N.G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press, New York, New York. 851 pp.

Hubbard, J.P. 1987. The Status of the Willow Flycatcher in New Mexico. Endangered Species Program, New Mexico Department of Game and Fish, Sante Fe, New Mexico. 29 pp.

Hughes, J. M. 1999. Yellow-billed cuckoo (*Coccyzus americanus*), the birds of North America online. *In* Poole, A., ed., Ithaca, Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: Cornell Lab of Ornithology yellow-billed cuckoo web site.

Inman, T.C., P.C. Marsh, B.E. Bagley, and C.A. Pacey. 1998. Survey of crayfishes of the Gila River Basin, Arizona, and New Mexico, with notes on occurrences in other Arizona drainages and adjoining States. Report for Contract 5-FG-32-00470 to Bureau of Reclamation, Phoenix, AZ by Arizona State University, Tempe. 46 pp.

Johnson, M. J., S. L. Durst, C. M. Calvo, L. Stewart, M. K. Sogge, G. Bland, and T. Arundel. 2008. Yellow-billed cuckoo distribution, abundance, and habitat use along the lower Colorado River and its tributaries, 2007 annual report. USGS Open-file report 2008–1177. 284pp.

Kenwood, K. E. and E. H. Paxton. 2001. Survivorship and movements of Southwestern Willow Flycatchers at Roosevelt Lake, Arizona—2001. U.S. Geological Survey report to the U.S. Bureau of Reclamation, Phoenix, AZ.

Kingsley, K. J. 1989. Biological and social repercussions of irrigated pecan agriculture in southern Arizona. Pages 131–150. In J. O. Schmidt, editor. Special biotic relationships in the arid southwest. University of New Mexico Press, Albuquerque, New Mexico.

Launer, A.E, D.D. Murphy, S.A. Laymon, and M.D. Halterman. 1990. 1990 distribution and habitat requirements of the Yellow-billed Cuckoo in California. Admin. Rept. The Nature Conservancy.

Laymon, S. A. 1980. Feeding and nesting behavior of the yellow-billed cuckoo in the Sacramento Valley. Admin Rep. 80-2, Wildlife Management Branch, California Dept. of Fish and Game, Sacramento, CA.

Laymon, S. A. 1998. Yellow-billed Cuckoo (*Coccycus americanus*). In The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. The Riparian Bird Conservation Plan web site.

Laymon, S. A., and M. D. Halterman. 1987a. Can the western subspecies of the yellow-billed cuckoo be saved from extinction? Western Birds 18:19-25.

Laymon, S. A., and M. D. Halterman. 1987b. Distribution and status of the yellow billed cuckoo in California. Final report to the California Department of Fish and Game, Contract #C–1845, Sacramento, CA. 35pp.

Laymon, S. A., and M. M. Halterman. 1989. A proposed habitat management plan for yellow-billed cuckoos in California. U.S. Department of Agriculture, Forest Service General Technical Report PSW-110: 272-277.

Luff, J.A., E.H. Paxton, K.E. Kenwood, and M.K. Sogge. 2000. Survivorship and movements of southwestern willow flycatchers in Arizona - 2000. U.S. Geological Survey report to the U.S. Bureau of Reclamation, Phoenix. USGS Forest and Rangelend Ecosystem Science Center, Colorado Plateau Field Station at Northern Arizona University, Flagstaff. 46 pp.

MacFarland, J. and J. Horst. 2015. Yellow-billed Cuckoo surveys on the Coronado National Forest, 2015. Report to Coronado National Forest. Tucson, AZ.

MacFarland, J. and J. Horst. 2017. Yellow-billed Cuckoo surveys on the Coronado National Forest, 2016. Report to Coronado National Forest. Tucson, AZ.

MacFarland, J. 2017. *in litt.* September 6, 2017 email to Angela Barclay entitled "Summary of 2017 TAS Cuckoo Surveys."

Marshall, B. 2017. *in litt*. June 29, 2017 email to Susan Sferra entitled "RE: WILDFIRE UPDATE: Frye Fire, MSO and YBCU work in Pinalenos."

McCarthey, T.D., C.E. Paradzick, J.W. Rourke, M.W. Sumner, and R.F. Davidson. 1998. Arizona Partners In Flight southwestern willow flycatcher 1997 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 130. Arizona Game and Fish Department, Phoenix, Arizona. 81 pp.

McGill, R. R. 1975. Land use changes in the Sacramento River riparian zone, Redding to Colusa. State of California Water Resources. 23pp.

McKernan R.L. and G. Braden. 2001. Status, distribution, and habitat affinities of the southwestern willow flycatcher along the lower Colorado River: year 5 – 2000. Report submitted to the U.S. Bureau of Reclamation, Boulder City, NV.

McLeod, M.A., T.J. Koronkiewicz, B.T. Brown, and S.W. Carothers. 2005. Southwestern willow flycatcher surveys, demography, and ecology along the lower Colorado River and tributaries. Annual report submitted U.S. Bureau of Reclamation, Boulder City, NV, by SWCA Environmental Consultants, Flagstaff, AZ.

McNeil, S.E., D. Tracy, J.R. Stanek, and J.E. Stanek. 2013. Yellow-billed cuckoo distribution, abundance and habitat use on the lower Colorado River and tributaries, 2008–2012 summary report. Bureau of Reclamation, Multi-Species Conservation Program, Boulder City NV, by SSRS. Lower Colorado River Multi-Species Conservation Program Yellow-Billed Cuckoo 2008-2012 Summary Report.

Meanley, B. 1985. The marsh hen: a natural history of the clapper rail if the Atlantic coast salt marsh. Tidewater Publications, Centreville, Maryland. 123 pp.

Mineau, P. and C. Palmer. 2013. The impact of the Nation's most widely used insecticides on birds. American Bird Conservancy. 96 pp.

Mineau, P. and M. Whiteside. 2013. Pesticide acute toxicity is a better correlate of U.S. grassland bird declines than agricultural intensification. PLOS One (February 2013, e57457) 8:1–8

Moors, A. 2017. *in litt*. 2017 Yellow-billed cuckoo survey in Slavin Gulch, Dragoon Mountains. Globe, AZ

Netter, M.R., E.H. Paxton, and M.K. Sogge. 1998. Banding and movements of the southwestern willow flycatcher at Roosevelt Lake and San Pedro River/Gila River confluence, Arizona - 1998. USGS Forest and Rangeland Ecosystem Science Center, Colorado Plateau Field Station, Flagstaff, Arizona. Funded by the U.S. Bureau of Reclamation, Phoenix, Interagency Agreement #98-AA-32-0010. 48 pp.

Ohmart, R.D. and R.E. Tomlinson. 1977. Foods of western clapper rails. Wilson Bulletin 89: 332-336.

Owen, J.C. and M.K. Sogge. 1997. Banding and Genetic Sampling of Willow Flycatchers in Colorado-1996 & 1997 Summary Report. U.S. Geological Survey Colorado Plateau Field Station: Flagstaff, Arizona.

Owen, J.C. and M.K. Sogge. 2002. Physiological condition of southwestern willow flycatchers in native and saltcedar habitats. U.S. Geological Survey report to the Arizona Department of Transportation.

Paxton, E., J. Owen and M.K. Sogge. 1996. Southwestern willow flycatcher response to catastrophic habitat loss. U.S.G.S. Colorado Plateau Research Station/Northern Arizona University report. 12 pp.

Paxton, E., K. Day, T Olson, P. Wheeler, M. MacLeod, T. Koronkiewicz, and S. O'Meara. 2010. Tamarisk biocontrol impacts occupied breeding habitat of the endangered southwestern willow flycatcher. Poster presentation at Tamarisk Coalition annual conference. Reno, NV.

Peterson, R.T. 1990. A field guide to western birds. Third edition. Houghton Mifflin Company, Boston, Massachusetts. 432 pp.

Phillips, A.R. 1948. Geographic variation in *Empidonax traillii*. *The Auk* 65:507-514.

Phillips, A.R., J. Marshall, and G. Monson. 1964. The Birds of Arizona. University of Arizona Press, Tucson, Arizona. 212 pp.

Poff, N. L., J .D. Allan, M. B. Bain, J. R. Karr, K .L. Prestegaard, B. D. Richter, R. E. Sparks, and J. C. Stromberg. 1997. The natural flow regime: a paradigm for river conservation and restoration. BioScience 47:769–784.

Ridgely, R.S. and G. Tudor. 1994. The Birds of South America: Suboscine Passerines. University of Texas Press, Austin, Texas. 25 pp.

Rosenberg, K. V., R. D. Ohmart, W. C. Hunter, and B. W. Anderson. 1991. Birds of the lower Colorado River Valley. University of Arizona Press, Tucson.

Russell, S. M., and G. Monson. 1998. The birds of Sonora. University of Arizona Press, Tucson, AZ.

Sechrist, J., V. Johanson, and D. Ahlers. 2009. Western yellow-billed cuckoo radio telemetry study results, middle Rio Grande, New Mexico: 2007–2008. Bureau of Reclamation, Technical Services Center, Denver, CO. 58pp.

Sechrist, J.D., D.D. Ahlers, K. Potak Zehfuss, R.H. Doster, E.H. Paxton, and V.M. Ryan. 2013. Home range and use of habitat of western yellow-billed cuckoos on the Middle Rio Grande, New Mexico. Southwestern Naturalist 58(4):411-419.

Smith, P.M. 1975. Habitat requirements and observations on the clapper rail, *Rallus longirostris yumanensis*. M.S. Thesis. Arizona State University, Tempe. 35 pp.

Smith, A.B., C.E. Paradzick, A.A. Woodward, P.E.T. Dockens, and T.D. McCarthey. 2002. Southwestern willow flycatcher 2001 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report #191. Arizona Game and Fish Department, Phoenix, Arizona.

Sogge, M.K., R. M. Marshall, S. J. Sferra, and T. J. Tibbitts. 1997. A southwestern willow flycatcher survey protocol and breeding ecology summary. National Park Service/Colorado Plateau Res. Station/N. Arizona University, Tech. Rept. NRTR-97/12. 37 pp.

Sogge, M.K., E.H. Paxton, and A.A Tudor. 2005. Saltcedar and southwestern willow flycatchers: lessons from long-term studies in central Arizona. As published on CD ROM in: Aguirre-Bravo, Celedonio, and others. Eds. 2005. Monitoring science and technology symposium: unifying knowledge for sustainability in the Western Hemisphere. 2004 September 20-24; Denver, CO. Proceedings RMRS-P037CD. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Stiles, F. G., and A. F. Skutch. 1989. A guide to the birds of Costa Rica. Comstock, Ithaca, New York. 364 pp.

Thompson, K. 1961. Riparian forests of the Sacramento Valley, California. Annals of the Association of American Geographers 51:294–315.

Tibbitts, T.J., M.K. Sogge, and S.J. Sferra. 1994. A survey protocol for the southwestern willow flycatcher (*Empidonax traillii extimus*). Technical Report NPS/NAUCPRS/NRTR-94-04. National Park Service, Colorado Plateau Research Station at Northern Arizona University, Flagstaff. 24 pp.

Todd, R.L. 1986. A saltwater marsh hen in Arizona: a history of the Yuma clapper rail (*Rallus longirostris yumanensis*). Arizona Game and Fish Department, Federal Aid Project W-95-R. Completion Report. 290 pp.

Tomlinson, R.E. and R.L. Todd. 1973. Distribution of two western clapper rail races as determined by responses to taped calls. Condor. 75(2):177-183.

Tucson Audubon. 2015. March 13, 2015 Comment letter on Proposed Western Yellow-billed Cuckoo Critical Habitat Designation. Tucson, AZ. Via the Federal eRulemaking Portal, Docket No. Attn: Docket No. FWS–R8–ES–2013–0011; 4500030114, Public Comments Processing, U.S. Fish and Wildlife Service, Arlington, VA 22203.

Unitt, P. 1987. *Empidonax traillii extimus*: An endangered subspecies. *Western Birds* 18:137-162.

U.S. Fish and Wildlife Service (USFWS). 1995. Final rule determining endangered status for the southwestern willow flycatcher. *Federal Register* 60:10694-10715.

USFWS. 1997a. Final determination of critical habitat for the southwestern willow flycatcher. *Federal Register* 62(140):39129-39146.

USFWS. 1997b. Correction; final determination of critical habitat for the southwestern willow flycatcher. *Federal Register* 62 (161): 44228.

USFWS. 2002. Southwestern Willow Flycatcher Recovery Plan, Region 2, Albuquerque, NM.

USFWS. 2005. Designation of Critical Habitat for the Southwestern Willow Flycatcher: Final Rule. *Federal Register* 70 (201): 60886.

USFWS. 2011. Designation of Revised Critical Habitat for the Southwestern Willow Flycatcher: Proposed Rule. *Federal Register* 76 (157): 50542.

USFWS. 2013a. Final Revised Southwestern Willow Flycatcher Critical Habitat Designation. *Federal Register* 78 (2): 344.

USFWS. 2013b. Proposed rule to list the yellow-billed cuckoo (*Coccyzus americanus*) as a threatened species in the western continental United States. FR 78:61622.

USFWS. 2014a. Designation of Critical Habitat for the Western Distinct Population Segment of the Yellow-Billed Cuckoo: Proposed Rule. Federal Register 79 (158): 48548.

USFWS. 2014b. Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (*Coccyzus americanus*): Final Rule. Federal Register 79 (192): 59992.

USFWS and NMFS. 2015. Interagency Cooperation - Endangered Species Act of 1973, as Amended; Incidental Take Statements. Department of the Interior Fish and Wildlife Service Department of Commerce National Oceanic and Atmospheric Administration 50

CFR Part 402 [Docket No. FWS–R9–ES–2011–0080; NOAA–120106024–5048–02; FF09E–31000– 156–FXES–1122–0900000] RIN 1018–AX85; 0648–BB81.

WestLand Resources, Inc. 2013a. Revised 2012 Survey For Yellow-Billed Cuckoo (*Coccyzus americanus*) in the Patagonia Mountains, Near Harshaw, Arizona. April. Prepared for Arizona Minerals, Inc. Tucson, AZ.

WestLand Resources, Inc. 2013b. 2013 Survey for Yellow-Billed Cuckoo (*Coccyzus americanus*) In The Patagonia Mountains, near Harshaw, Arizona. Prepared for Arizona Minerals, Inc. Tucson, AZ.

WestLand Resources, Inc. 2015a. 2013 Survey for Yellow-billed Cuckoo (*Coccyzus americanus*). Rosemont Project. Prepared for HudBay. Tucson, AZ.

WestLand Resources, Inc. 2015b. 2014 Yellow-Billed Cuckoo (*Coccyzus americanus*) survey. Rosemont Project. Prepared for HudBay. Tucson, AZ.

WestLand Resources, Inc. 2015c. 2015 Yellow-billed Cuckoo survey data sheets for Barrel, McCleary, and Wasp canyons. Prepared for HudBay. Tucson AZ.

White, J.A. 2004. Recommended protection measures for pesticide applications in Region 2 of the U.S. Fish and Wildlife Service. U.S. Fish and Wildlife Service Environmental Contaminants Program, Region 2, Albuquerque, N.M. 203 pp.

Wilcove, D. S., C. H. McLellan, and A. P. Dobson. 1986. Habitat fragmentation in the temperate zone. Pages 237–256 in Soulé, M., ed., Conservation Biology: Science of Scarcity and Diversity, Sinauer Associates, Sunderland, MA. 584 pp.