RECLAMATION
Managing Water in the West

Biological Assessment
Rio Grande Project Operating Agreement

U.S. Department of the Interior
Bureau of Reclamation, Upper Colorado Region
Albuquerque Area Office

August 19, 2015

MISSION STATEMENTS

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Front Cover - Elephant Butte Dam

ERRATA SHEET

This errata sheet lists errors and their correction for the Biological Assessment (BA), Rio Grande Project Operating Agreement dated August 19, 2015. The BA was submitted by Reclamation to the U.S. Fish and Wildlife Service (Service) on August 20, 2015.

Location	Error	Correction
Page 1-2, Section 1.3, par. 2, lines 4-5	"The reach of the Rio Grande downstream from Percha Diversion Dam has been consulted upon by the IBWC (IBWC 2001, 2004)."	"The reach of the Rio Grande downstream from Percha Diversion Dam has been consulted upon by the IBWC (IBWC 2001, 2004, 2011; Service 2012)."
Page 4-2, Section 4	"International Boundary and Water Control Commission. 2001. Biological Assessment: USIBWC Rio Grande projects, American Dam to Fort Quitman, Texas. International Boundary and Water Control Commission, El Paso, Texas. _____. 2004. Biological Assessment: USIBWC Rio Grande canalization Project and River Management Plan. International Boundary and water Control Commission, El Paso, Texas."	"International Boundary and Water Control Commission. 2001. Biological Assessment: USIBWC Rio Grande projects, American Dam to Fort Quitman, Texas. International Boundary and Water Control Commission, El Paso, Texas. _____. 2004. Biological Assessment: USIBWC Rio Grande canalization Project and River Management Plan. International Boundary and water Control Commission, El Paso, Texas. _____. 2011. Final Biological Assessment, Integrated Land Management for the Long-Term River Management of the Rio Grande Canalization Project, October. Internet website: http://www.ibwc.gov/EMD/documents/Final_IBWC_RGCP_BA2011.pdf "
Page 4-2, section 4.1.4, par. 2, lines 1-3	"As described by IBWC (2001, 2004), the river through this reach to Fort Quitman is mostly channelized and within IBWC's jurisdictional land/river channel vegetation is mowed."	"As described by IBWC (2001, 2004, 2011), the river through this reach to Fort Quitman is mostly channelized. Within IBWC's jurisdictional land/river channel, vegetation has traditionally been mowed."
Page 4-2, section 4.1.4, par. 2, lines 6-7	"The other vegetated areas occur on sand bars in the river channel which would be mowed and sediment removed by IBWC."	"The other vegetated areas occur on sand bars in the river channel which would be mowed and sediment removed by IBWC. Vegetation is maintained to reduce erosion potential, remove potential obstructions that could reduce flood containment capacity, help stabilize stream banks, control weed and brush including saltcedar, and provide

Location	Error	Correction
		wildlife habitat at suitable locations. The ROD for River Management Alternatives for the Rio Grande Canalization Project increased acreage that would be allocated as no-mow zones (IBWC 2009). Ending mowing at restoration sites, riparian fringe, and managed grasslands, along with selective treatment of exotic vegetation, allows native vegetation to establish itself for the improvement and restoration of riparian habitats. The current River Management Plan has specified no-mow zones on 553 acres of habitat restoration sites and 1,983 acres of managed grasslands vegetation to establish itself for the improvement and restoration of riparian habitats (IBWC 2014)."
Page 5-1, Section 5, lines 1-3	"The reaches below Elephant Butte Dam would remain unchanged from the baseline and the effects to listed species that have been previously considered by Reclamation (2013a) or IBWC (2001, 2004)."	"The reaches below Elephant Butte Dam would remain unchanged from the baseline and the effects to listed species that have been previously considered by Reclamation (2013a) or IBWC (2001, 2004, 2011; Service 2012)."
Page 5-1, Section 5, lines 6-8	"Indirect effects would be any long-term changes in vegetation patches or territories of the birds in EBR, or the few patches of vegetation below Caballo Dam previously consulted upon by the IBWC (2001, 2004);…"	"Indirect effects would be any long-term changes in vegetation patches or territories of the birds in EBR, or the few patches of vegetation below Caballo Dam previously consulted upon by the IBWC (2001, 2004, 2011; Service 2012;);…"
Page 5-1, Section 5.1, par. 3, line 1	"Based on hydrologic data collected since 2004,…"	"In conjunction with flycatcher nest monitoring, a hydrology monitoring study was implemented in 2004 and continued through 2011. Data were collected weekly and were used to determine the relationship between flows in LFCC and depth of water within the "core" flycatcher breeding areas of the EBR delta. Based on these data,…"
Page 5-1, Section 5.1, par. 3, line 3	"(Moore 2005, Moore and Ahlers 2005)"	"(Moore 2005, Moore and Ahlers 2012)"

Location	Error	Correction
Page 8-2	"Dudley, R.K., S.P. Platania, and G.C. White.2014. Rio Grande Silvery Minnow population monitoring program results from May to December 2013. Final Report to the Middle Rio Grande Endangered Species Collaborative Program. http://www.asirllc.com/rgsm/pdf/pdf_rg_mon/RGSM_PopulationMonitoring_201 2_Final.pdf (accessed 8 January 2015). Ferrari, R.L. 2008. Elephant Butte Reservoir 2007 Sedimentation Survey. Technical Report SRH-2008-4. Bureau of Reclamation, Technical Service Center, Sedimentation and River Hydraulics Group, Denver, Colorado. 153 pp."	"Dudley, R.K., S.P. Platania, and G.C. White.2014. Rio Grande Silvery Minnow population monitoring program results from May to December 2013. Final Report to the Middle Rio Grande Endangered Species Collaborative Program. http://www.asirllc.com/rgsm/pdf/pdf_rg_mon/RGSM_PopulationMonitoring_201 2_Final.pdf (accessed 8 January 2015). Ellis, L. A., D. M. Weddle, S. D. Stump, H. C. English, and A. E. Graber. 2008. Southwestern Willow Flycatcher Final Survey and Monitoring Report. Arizona Game and Fish Department, Research Technical Guidance Bulletin #10, Phoenix. Internet website: http://sbsc.wr.usgs.gov/cprs/research/projects/swwf/Reports/AGFD_2008_SWWF_Report-Bulletin_10-with_Appendices.pdf. Ferrari, R.L. 2008. Elephant Butte Reservoir 2007 Sedimentation Survey. Technical Report SRH-2008-4. Bureau of Reclamation, Technical Service Center, Sedimentation and River Hydraulics Group, Denver, Colorado. 153 pp."
Page 8-3	"Holste, N. 2013. Geomorphic Assessment of the Rio Grande Upstream of Elephant Butte Reservoir. Bureau of Reclamation, Albuquerque Area Office, Albuquerque, New Mexico. Makar, P., and J. AuBuchon. 2012. Channel Conditions and Dynamics of the Middle Rio Grande River. Bureau of Reclamation, Technical Service Center, Denver, Colorado, and Upper Colorado Region, Albuquerque Area Office, Albuquerque, New Mexico. P. 94."	"Holste, N. 2013. Geomorphic Assessment of the Rio Grande Upstream of Elephant Butte Reservoir. Bureau of Reclamation, Albuquerque Area Office, Albuquerque, New Mexico. IBWC (U.S. International Boundary and Water Commission). 2001. Biological Assessment: USIBWC Rio Grande Projects, American Dam to Fort Quitman, Texas. _____. 2004. Biological Assessment for River Management Alternatives for the Rio Grande Canalization Project. January 2004. Internet website: http://www.ibwc.state.gov/Files/RGCP_BA_final.pdf.

Location	Error	Correction
		_____. 2009. Record of Decision, River Management Alternatives for the Rio Grande Canalization Project, June 20. Internet website: http://www.ibwc.gov/EMD/CanalizationWebpage/ROD_EIS%20June2009.pdf _____. 2011. Final Biological Assessment, Integrated Land Management for the Long-Term River Management of the Rio Grande Canalization Project, October. Internet website: http://www.ibwc.gov/EMD/documents/Final_IBWC_RGCP_BA2011.pdf _____. 2014. Rio Grande Canalization Project, River Management Plan. Internet Website: http://www.ibwc.gov/Files/Canalization_River_Management_Plan_112014. pdf Makar, P., and J. AuBuchon. 2012. Channel Conditions and Dynamics of the Middle Rio Grande River. Bureau of Reclamation, Technical Service Center, Denver, Colorado, and Upper Colorado Region, Albuquerque Area Office, Albuquerque, New Mexico. P. 94."
Page 8-3	"Moore, D. and D. Ahlers. 2014. 2013 Southwestern Willow Flycatcher Study Results – Selected Sites Along the Rio Grande From Bandelier National Monument to Elephant Butte Reservoir, New Mexico. Bureau of Reclamation, Technical Service Center, Fisheries and Wildlife Resources. Denver, CO. Paxton, E.H., T.C. Theimer, and M.K. Sogge. 2011. "Biocontrol of exotic tamarisk: potential demographic consequences for riparian birds in the southwestern United States," in Condor 113:255–265."	"Moore, D. and D. Ahlers. 2014. 2013 Southwestern Willow Flycatcher Study Results – Selected Sites Along the Rio Grande From Bandelier National Monument to Elephant Butte Reservoir, New Mexico. Bureau of Reclamation, Technical Service Center, Fisheries and Wildlife Resources. Denver, CO. Moore, D. and D. Ahlers. 2015. 2014 Southwestern Willow Flycatcher Study Results – Selected Sites Along the Rio Grande From Bandelier National Monument to Elephant Butte Reservoir, New Mexico. Bureau of Reclamation, Technical Service Center, Fisheries and Wildlife Resources. Denver, CO

Location	Error	Correction
		Reclamation. 2009. Elephant Butte Reservoir Five-Year Operational Plan – Biological Assessment. Albuquerque Area Office, Albuquerque, NM. Internet Website: https://www.usbr.gov/uc/albuq/envdocs/bo/ebutte/EB-Ops.pdf Paxton, E.H., T.C. Theimer, and M.K. Sogge. 2011. "Biocontrol of exotic tamarisk: potential demographic consequences for riparian birds in the southwestern United States," in Condor 113:255–265."

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Contents

Page

1. INTRODUCTION AND BACKGROUND 1-1

1.1 Rio Grande Project Background 1-1
1.2 Operating Agreement Background 1-1
1.3 Action Area 1-2

2. PROPOSED ACTION 2-1

2.1 Rio Grande Operating Agreement 2-1
2.1.1 Purpose and Need 2-1
2.2 Projected Water Surface Elevations 2-1

3. LISTED SPECIES HABITAT AND LIFE HISTORY 3-1

3.1 Southwestern Willow Flycatcher 3-1
3.2 Yellow-Billed Cuckoo 3-2
3.3 New Mexico Meadow Jumping Mouse 3-3
3.4 Rio Grande Silvery Minnow 3-4

4. ENVIRONMENTAL BASELINE 4-1

4.1 Environmental Setting 4-2
4.1.1 Elephant Butte Reservoir 4-2
4.1.2 Rio Grande below EBR 4-2
4.1.3 Caballo Reservoir 4-2
4.1.4 Rio Grande Downstream of Caballo Reservoir 4-2
4.2 Current Status of Flycatcher in the Action Area 4-5
4.2.1 Critical Habitat 4-5
4.2.2 Presence 4-5
4.2.3 Reclamation's Actions to Minimize Effects on and Enhance Flycatcher Habitat 4-17
4.2.4 Saltcedar Leaf Beetle (*Diorhabda* spp.) 4-18
4.3 Current Status of Yellow-billed Cuckoo in Action Area 4-18
4.3.1 Critical Habitat 4-18
4.3.2 Presence 4-19
4.3.3 Reclamation's Actions to Minimize Effects on and Enhance Cuckoo Habitat 4-28
4.4 Current Status of New Mexico Meadow Jumping Mouse in Action Area 4-28
4.4.1 Critical Habitat 4-28
4.4.2 Presence 4-30
4.4.3 Reclamation's Actions to Minimize Effects on and to Enhance Mouse Habitat 4-31
4.5 Current Status of Minnow in Action Area 4-31
4.5.1 Critical Habitat 4-31
4.5.2 Presence 4-31

4.5.3 Reclamation's Actions to Minimize Effects on and to Enhance Minnow Habitat 4-32

5. EFFECTS OF THE ACTION 5-1

5.1 Southwestern Willow Flycatcher and Yellow Billed Cuckoo 5-1
5.2 New Mexico Meadow Jumping Mouse 5-5
5.3 Rio Grande Silvery Minnow 5-5

6. DETERMINATION OF EFFECTS 6-1

6.1 Southwestern Willow Flycatcher 6-1
6.2 Yellow-Billed Cuckoo 6-4
6.3 New Mexico Meadow Jumping Mouse 6-7
6.4 Rio Grande Silvery Minnow 6-7

7. CONSERVATION MEASURES 7-1

8. LITERATURE CITED 8-1

APPENDIX A. TECHNICAL INFORMATION FOR LISTED SPECIES 1

APPENDIX B. DISTRIBUTION MAPS SHOWING LOCATIONS OF OBSERVED FLYCATCHERS AND CUCKOOS IN THE RGOA ACTION AREA 1

APPENDIX C. TECHNICAL MEMORANDUM 1

Tables

Page

Table 2-1. Key water-level elevations for EBR. 2-6
Table 2-2. Projected elevations for EBR under climate change. 2-6
Table 4-1. Flycatcher territories in San Marcial Reach (Moore and Ahlers 2014, 2015) 4-6
Table 4-2. Extent of Class 0 habitat within the active floodplain of Lower Rio Grande study reaches (Reclamation 2013b) 4-14
Table 4-3. Hectares of non-zero habitat within the active floodplain of Lower Rio Grande study reaches (Reclamation 2013b). 4-15
Table 4-4. Summary of flycatcher detections within survey sites between Caballo Reservoir, NM and El Paso, TX during 2013 (Reclamation (2013c) 4-16
Table 4-5. Summary of 2014 flycatcher detections within survey sites between Caballo Reservoir, NM and El Paso, TX during 2014 (Reclamation 2015a). 4-17
Table 4-6. River reaches included in the 2013 cuckoo survey area (Ahlers and Moore 2014). 4-21
Table 4-7. Major vegetation community types* within respective river reaches (Siegle et al. 2013) 4-22
Table 4-8. Distribution of 2013 cuckoo detections within the major habitat types. 4-23
Table 4-9. Territory composition by major habitat type of 2013 cuckoo breeding territories (n=119). 4-28
Table 4-10. Minnow densities found during September/October surveys conducted by Reclamation, 2010-2014 (Reclamation 2013a). 4-33

Figures

Page

Figure 1-1. Action Area for Rio Grande Project. 1-3
Figure 1-2. Features of the RGP Action Area referenced in this BA. 1-4
Figure 2-1. Historic EBR surface-water elevation, 1950-2015 2-2
Figure 2-2. Comparison of historical (1950-2010) average annual inflow (AF) to EBR and projected future average annual inflow to EBR for three climate scenarios (Source: Reclamation 2015b). 2-3
Figure 2-3. Model projections for water level elevation in EBR under the RGOA over three modeled climate change scenarios (P25, P50, and P75) to 2050. (Source: Reclamation 2015b) 2-4
Figure 2-4. Model projections for six RGP storage volumes in EBR under the P75 climate change scenario of the 2007-2050 remaining duration of the RGOA (top) compared the model projections of EBR surface elevations, showing highlighted periods of wet and dry weather. (Data source: Reclamation 2015b). 2-5
Figure 2-5. Simulated monthly EBR water surface elevations under continued implementation of the RGOA and three climate change scenarios. 2-6
Figure 4-1. Water level elevations in EBR from initial filling in March 1915 to February 2015. Daily data from http://www.usbr.gov/uc/crsp/GetDateInfo?d0=2684&d1=2685&d2=2686&d3=2688&idCount=4&l=ELEPHANT+BUTTE+RESERVOIR 4-3
Figure 4-2. Elevation contours within the “dry” pool area of EBR. Reservoir levels ranged from 4,300 to 4,330 feet during the summer of 2014. (Source: Moore and Ahlers 2015). 4-4
Figure 4-3. Maximum water elevation during flycatcher nesting season from 2007 through 2014. 4-7
Figure 4-4. Elevational distribution of flycatcher (SWFL) territories within EBR in 2007-2014, with maximum water levels. (Sources: Moore and Ahlers 2014, 2015 and http://www.usbr.gov/uc/elpaso/water/rgreports/faces/Reservoirs.jsp) 4-8
Figure 4-5. River thalweg elevation, groundwater elevation, and river discharge over time near RM 63 (Reclamation 2013e). 4-11
Figure 4-6. Distance-weighted average thalweg elevation over time for the delta channel between EB-28 and EB-50 during recurring channel maintenance (Reclamation 2013e). 4-13
Figure 4-7. Cuckoo detections (blue columns) and territories (red columns) in San Marcial Reach (Ahlers and Moore 2014). Surveys have been conducted since 1998 but methods were not refined or consistent until 2009. 4-20
Figure 4-8. Habitat Composition of 2013 Cuckoo Territories 4-25
Figure 4-9. 2013 Cuckoo Detection Distribution by Dominant Canopy Type 4-25
Figure 4-10. Elevational distribution of cuckoo detections within EBR 2009 to 2013 (source Ahlers and Moore 2014). 4-26
Figure 4-11. Rio Grande silvery minnow densities during September/October surveys conducted by Reclamation (2014). 4-33
Figure 4-12. Reclamation survey sites for Rio Grande silvery minnow in the delta channel since 2010. 4-34
Figure 5-1. Regression results showing a projection of the number of flycatcher nests occurring within the footprint of the full reservoir pool (approximately 4400 ft.) during periods of prolonged drying. 5-3

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1. Introduction and Background

This biological assessment (BA) submitted to the U.S. Fish and Wildlife Service (Service) addresses the potential effects of Reclamation continuing to implement an operating agreement for the Rio Grande Project (RGP and RGOA) on the Southwestern Willow Flycatcher (*Empidonax traillii extimus*; flycatcher), the Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*; cuckoo), the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*; mouse), and the Rio Grande silvery minnow (*Hybognathus amarus*, minnow)

While not assessed in detail, brief consideration is given in Appendix A to two rare migrants: the endangered Interior Least Tern (*Sterna antillarum*) and the Piping Plover (*Charadruis melodus*). There is a lack of suitable habitat for the tern in the action area and the plover is only an occasional potential presence during transitory stopover periods for migrating individuals.

1.1 Rio Grande Project Background

The RGP was authorized by Congress under the authority of the Reclamation Act of 1902 and the Rio Grande Project Act of 1905. The RGP extends from the San Marcial railroad bridge to Fort Quitman, TX **(Figure 1-1**). The RGP includes Elephant Butte and Caballo dams and reservoirs, a power generating plant, and five diversion dams (Percha, Leasburg, Mesilla, American, and International) located on the Rio Grande in New Mexico and Texas. RGP water is provided by Reclamation to the Elephant Butte Irrigation District (EBID), which includes 90,640 acres authorized to receive project water in the Rincon and Mesilla valleys of New Mexico, and the El Paso County Water Improvement District No. 1 (EPCWID), which includes 69,010 acres in the Mesilla and El Paso valleys of Texas.

1.2 Operating Agreement Background

The RGOA is a written description of how Reclamation allocates project water to EBID, EPCWID, and Mexico, consistent with applicable water rights, state and federal laws, and international treaties. The RGP and the RGOA have a long and litigious history, culminating in 2007 with Reclamation and the two districts agreeing on operating procedures. In 2008, they signed a 50-year agreement, the RGOA, and developed a written Operations Manual, which is reviewed annually.

The RGOA largely reflects historical operation of the RGP, with two key changes. First, the RGOA provides carryover accounting for any unused portion of the annual diversion allocations to EBID and EPCWID. The carryover provision allows any unused portion of

a district's annual allocation balance to be carried over to the following year. The carryover provision is designed to encourage water conservation within the RGP by allowing each district to retain their unused allocation up to a specified limit.

Second, the RGOA adjusts the annual allocations by calculating the diversion ratio. The diversion ratio represents the amount of allocation used per unit release of project water from Caballo Dam. While numerous factors affect RGP performance, the adjustments in the diversion ratio (D-2 curve) are predominately driven by actions of individual farmers within EBID, including crop selection and related effects on crop irrigation requirements. These decisions by individual farmers are not part of the Federal action.

In addition to evaluating the effects of the RGOA, this BA evaluates the effects of a Reclamation contract for storage of SJ-C Project water in Elephant Butte Reservoir (EBR) by authority of the Act of December 29, 1981 (Public Law 97-140, 95 Stat. 1717). Currently, only the Albuquerque - Bernalillo County Water Utility Authority (ABCWUA) has a contract for storage of SJ-C water in EBR. In the future, other entities could enter into storage contracts, but the proposed action under consultation here is that Reclamation could contract for storage up to 50,000 acre feet (AF) in the EBR.

1.3 Action Area

The action area, which is defined as all areas affected directly or indirectly by a Federal action (50 CFR 402.02), is subdivided into the following reaches or segments within the RGP:

- Elephant Butte Reservoir, from full pool to dead pool
- The Rio Grande downstream from Elephant Butte Dam to Caballo Reservoir full pool
- Caballo Reservoir, from full pool to dead pool
- The Rio Grande from Caballo Dam downstream to Percha, Leasburg, and Mesilla Diversion Dams, and to American, and International dams.

The following analysis of effects on listed species and critical habitat focuses on EBR storage levels, because there would be no effects below EBR from the RGOA that have not been previously considered by Reclamation (2013a) or the International Boundary and Water Commission (IBWC). The reach of the Rio Grande downstream from Percha Diversion Dam has been consulted upon by the IBWC (IBWC 2001, 2004). In 1936, Congress authorized the IBWC to dredge and channelize the river and they have maintained this channel and adjoining right-of-way from Percha Diversion Dam downstream since then. The IBWC's findings were that their ongoing maintenance of this reach resulted in either "no effect" or "may affect, but is not likely to adversely affect" listed species, and with a full habitat restoration plan for the reach below Caballo Dam

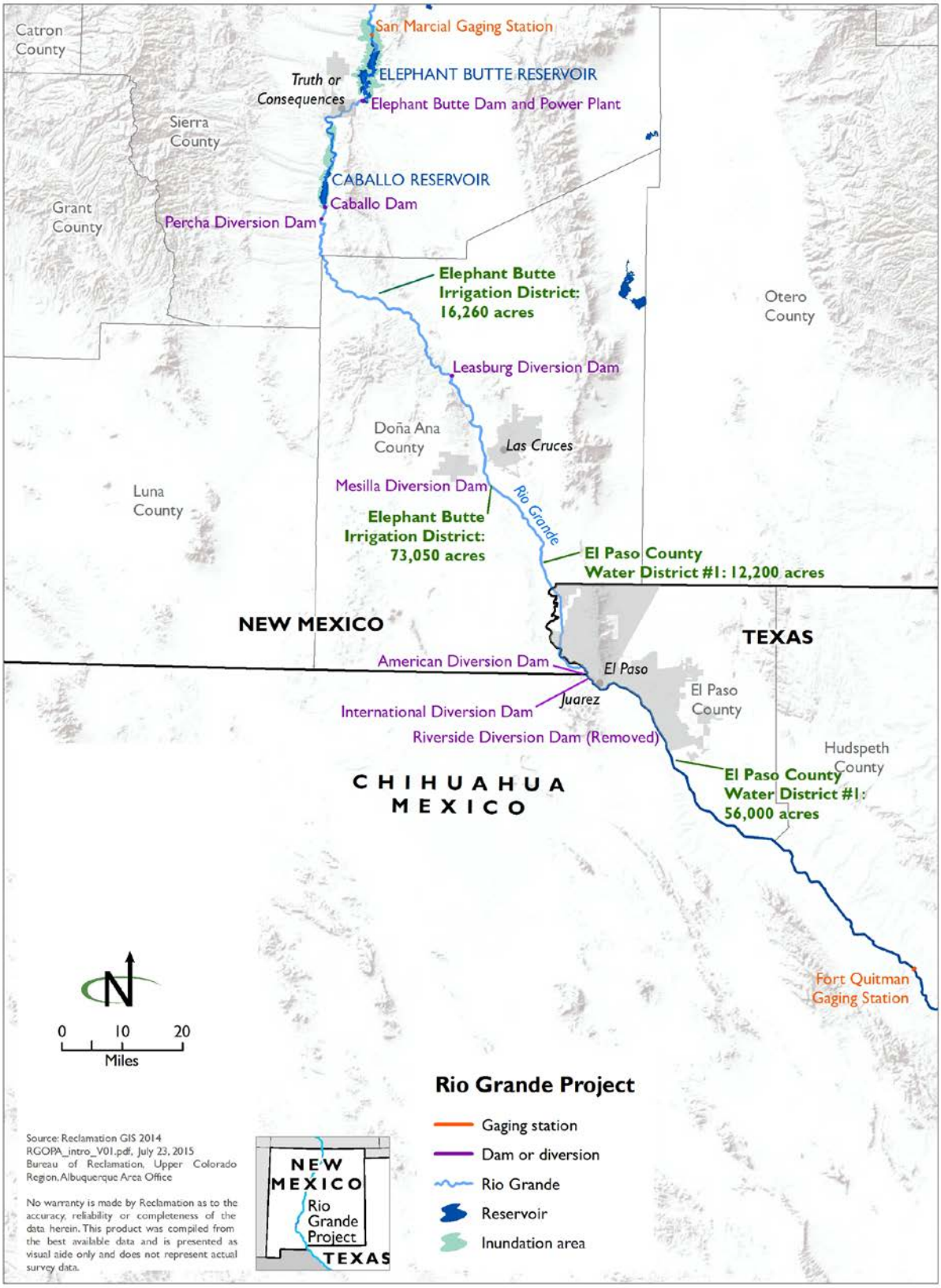

Figure 1-1. Action Area for Rio Grande Project.

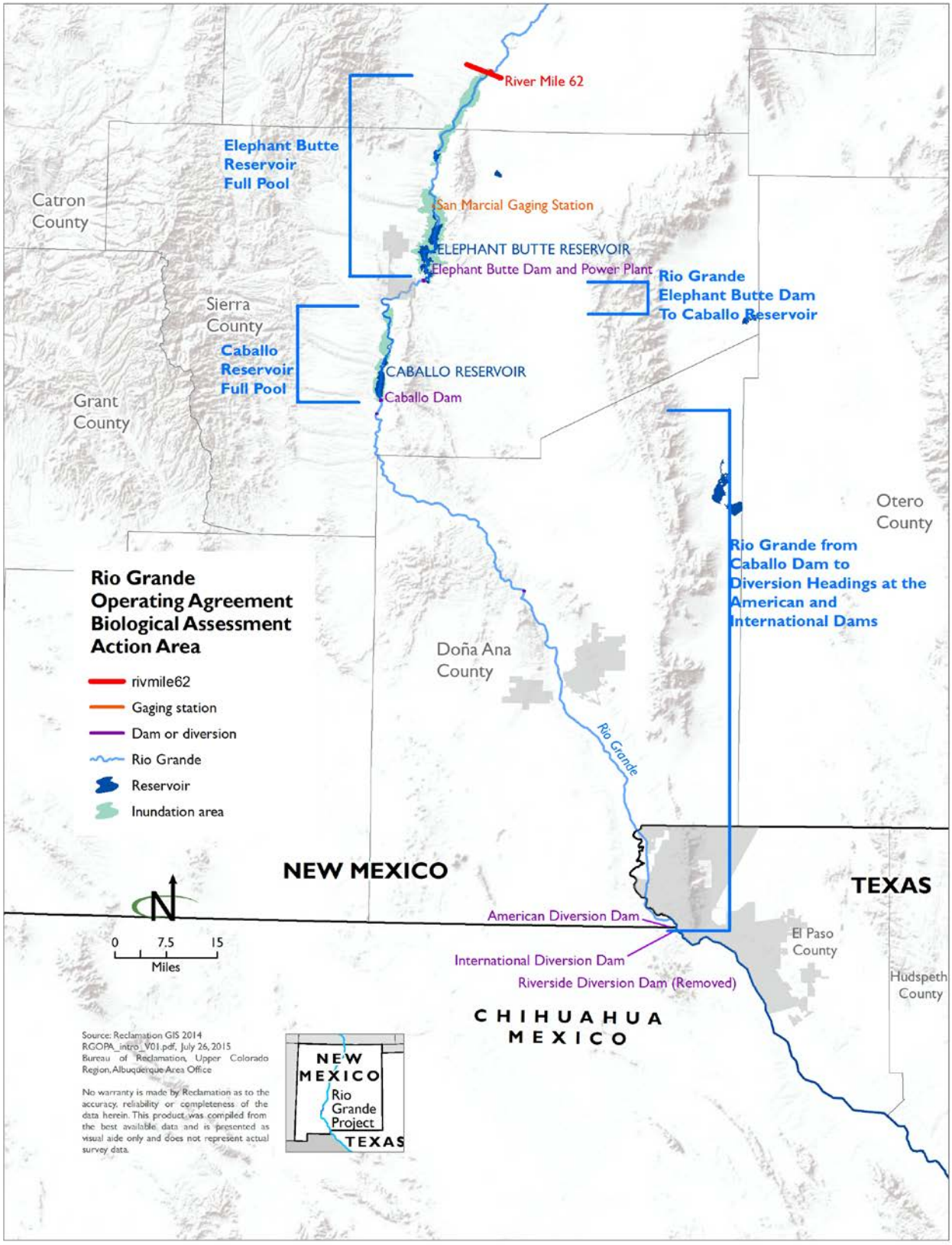

Figure 1-2. Features of the RGP Action Area referenced in this BA.

2. Proposed Action

2.1 Rio Grande Operating Agreement

Reclamation is proposing to continue to implement the 2008 RGOA through 2050 and to continue to contract for storage of up to 50,000 AF of SJ-C Project water in EBR.

2.1.1 Purpose and Need

The purpose and need for the RGOA is to comply with various contracts, court decrees and settlement agreements among Reclamation, EBID, and EPCWID. The purpose and need for action also includes contracting for storage of up to 50,000 AF SJ-C Project water in EBR.

2.2 Projected Water Surface Elevations

Reclamation, in collaboration with the United States Geological Survey (USGS), developed the Rincon and Mesilla Basins Hydrological Model (based on the USGS's MODFLOW model) to project the effects of the RGOA on water surface elevations in EBR. Simulations were carried out using this model for three equally likely projections of future climate scenarios, including a drier scenario (P25), a central tendency scenario (P50), and a wetter scenario (P75). Assuming these scenarios provide a reasonable representation of likely future climatic/hydrological conditions in the Rincon and Mesilla basins through the year 2050, the model results give an estimate of the expected frequency and duration of EBR at particular water surface elevations. From these elevations, we can extrapolate to the effects on listed species.

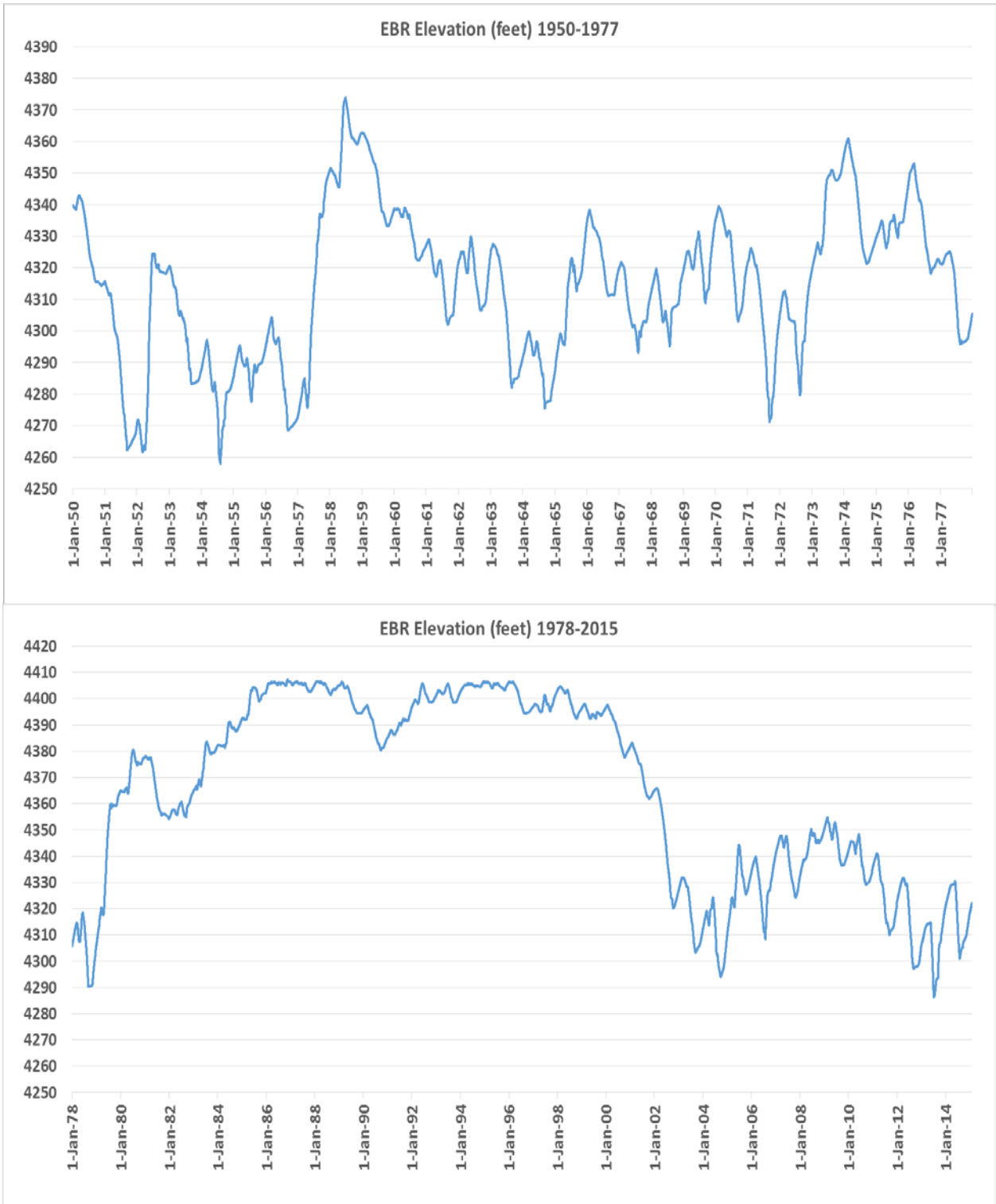

Figure 2-1. Historic EBR surface-water elevation, 1950-2015
(Data source**:** http://www.usbr.gov/uc/elpaso/water/rgreports/faces/Reservoirs.jsp)

It should be noted that the RGOA has no effect on inflows to EBR, but climate change would influence inflows, as shown in below in **Figure 2-2**.

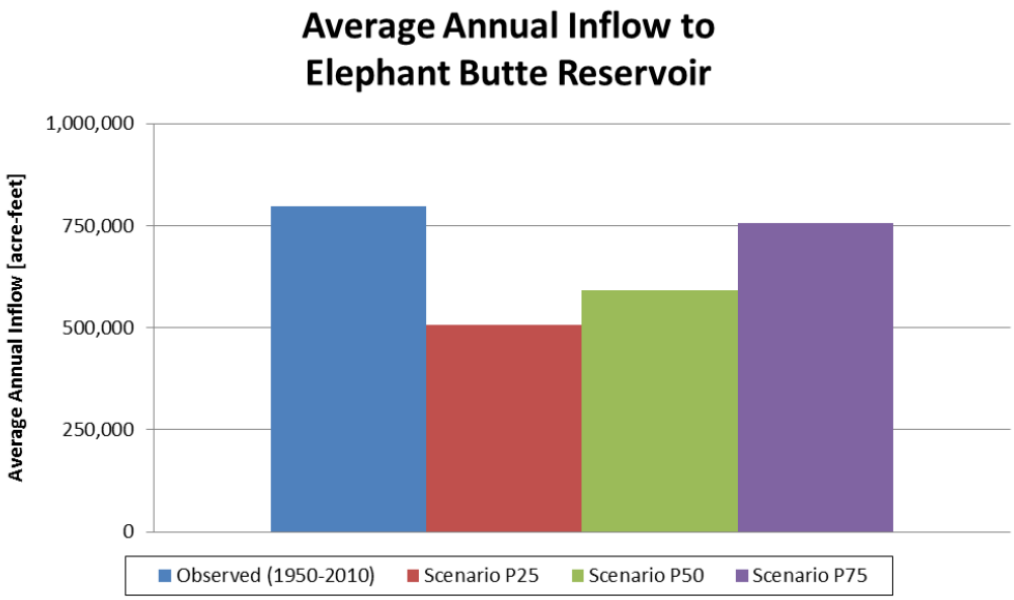

Figure 2-2. Comparison of historical (1950-2010) average annual inflow (AF) to EBR and projected future average annual inflow to EBR for three climate scenarios (Source: Reclamation 2015b).

Figure 2-3 and **Figure 2-4** show the projected model fluctuations over time (516 simulated start-of-month elevations through 2050) of EBR water surface under each of the three climate change scenarios. These figures show the projected sequence of occurrence of EBR water surface elevations.

Figure 2-5 presents the same monthly data as a cumulative frequency curve, showing the percent of months when the water surface elevation is projected to be equal to or less than that shown. The duration at which EBR is projected to be at a given elevation can be determined by looking at the figure. For example, reservoir elevations would be less than 10% exceedance values 10% of the time or 52 out of 516 simulated future months. Reservoir elevations in feet above mean sea level are shown on the *y*-axis in this figure.

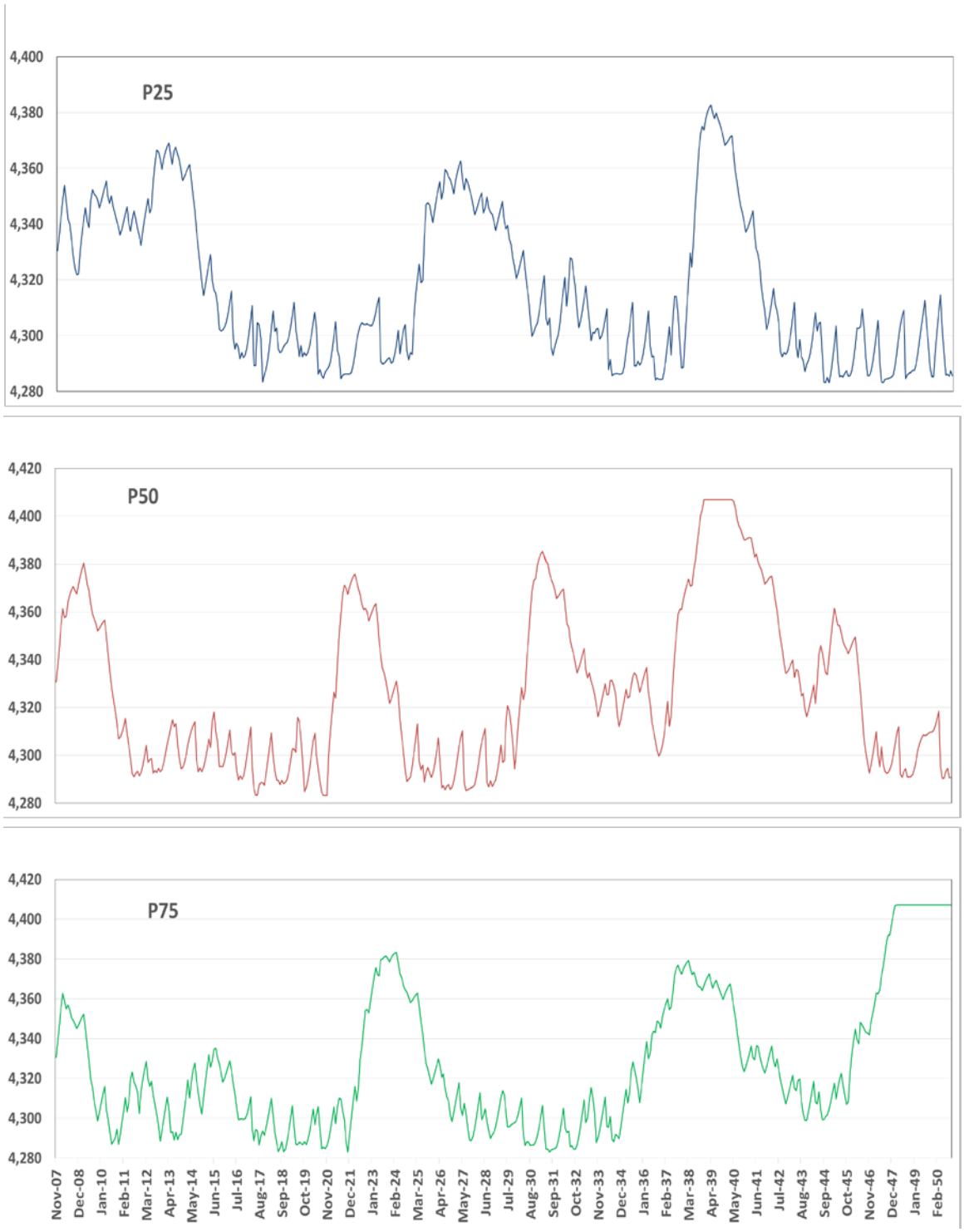

Figure 2-3. Model projections for water level elevation in EBR under the RGOA over three modeled climate change scenarios (P25, P50, and P75) to 2050. (Source: Reclamation 2015b)

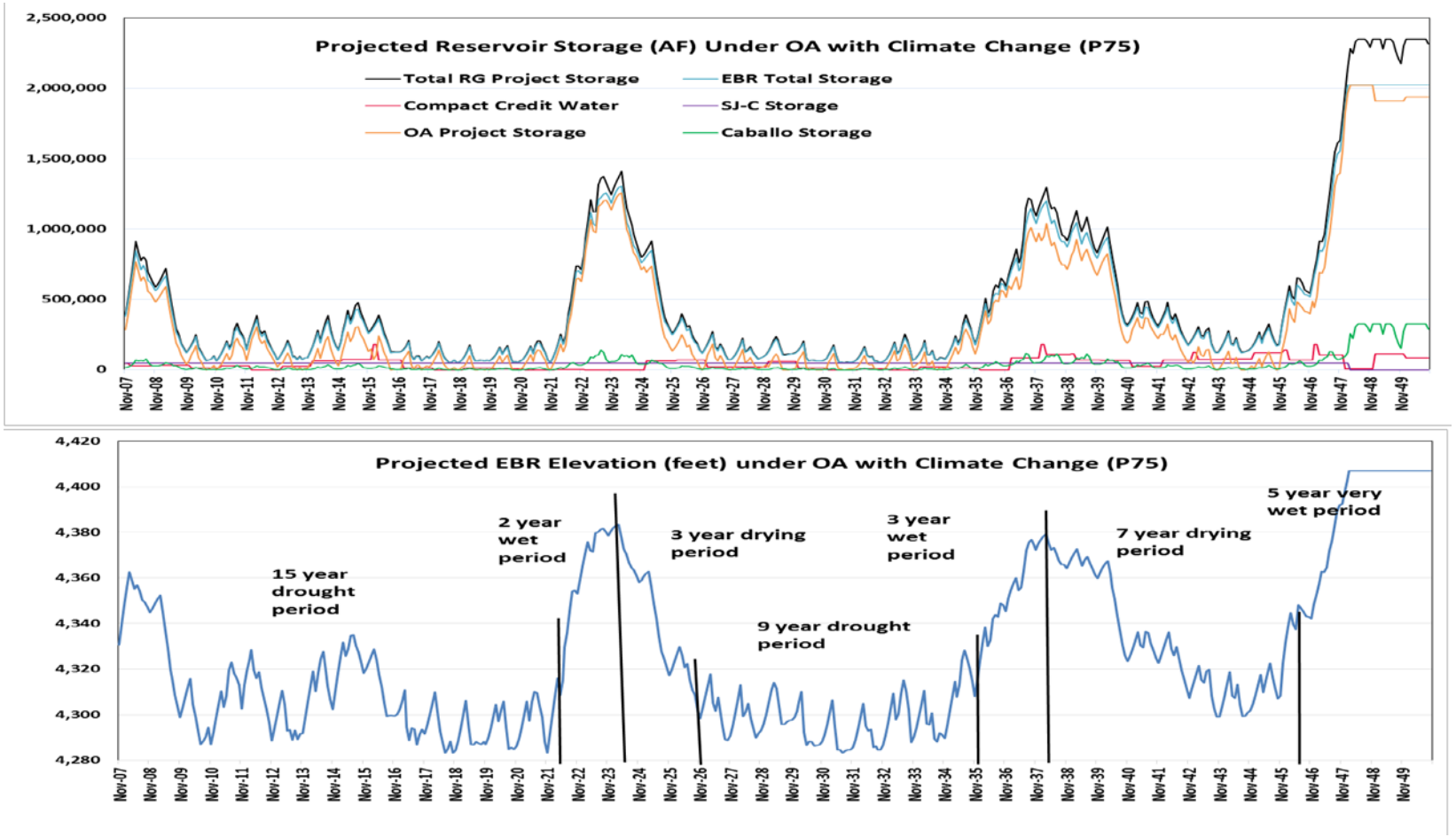

Figure 2-4. Model projections for six RGP storage volumes in EBR under the P75 climate change scenario of the 2007-2050 remaining duration of the RGOA (top) compared the model projections of EBR surface elevations, showing highlighted periods of wet and dry weather. (Data source: Reclamation 2015b).

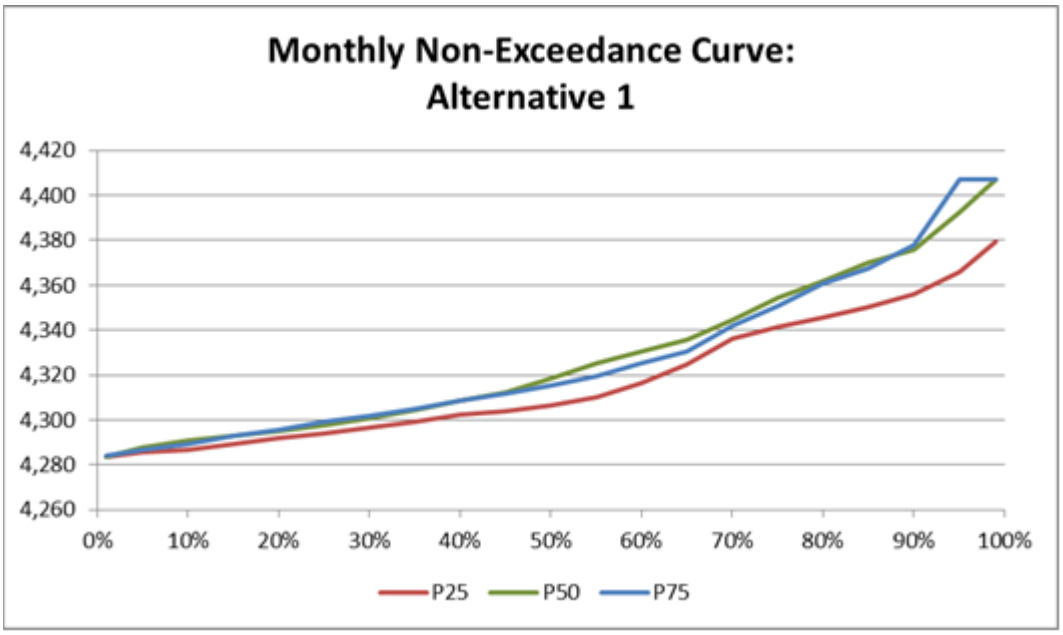

Figure 2-5. Simulated monthly EBR water surface elevations under continued implementation of the RGOA and three climate change scenarios.

Table 2-1. Key water-level elevations for EBR.

Reservoir Location	**Elevation**
Spillway Crest	4,414.0 ft.
Top of Active Conservation Pool	4,407.0 ft.
Top of Inactive Conservation Pool	4,282.2 ft.
Top of Dead Storage Pool	4,231.5 ft.
Streambed at Dam Axis	4,210.0 ft.
Source: (Accessed 6.16.2015) http://www.usbr.gov/projects/Facility.jsp?fac_Name=Elephant+Butte+Dam&groupName=Dimensions	

For this analysis, the interpretation of model results is that the most likely future reservoir elevations would be at or below the 50th non-exceedance levels, but it is reasonably foreseeable that future elevations would fluctuate within the ranges bracketed by the 20th and 80th percentiles shown in **Figure 2-5** and **Table 2-2**.

Table 2-2. Projected elevations for EBR under climate change.

	20% Percentile	**50% Percentile**	**80% Percentile**
Drier Climate	4,292	4,306	4,346
Central Tendency	4,295	4,318	4,362
Wetter Climate	4,296	4,316	4,361

3. Listed Species Habitat and Life History

3.1 Southwestern Willow Flycatcher

Information pertaining to the habitat needs and life history of southwestern willow flycatchers (flycatchers) is incorporated by reference from the following documents. Recently, the Service (2015) concurred with Reclamation's determinations that a proposed delta channel maintenance project in the upstream delta reach of EBR "may affect, but is not likely to adversely affect," the flycatcher. The delta channel maintenance area is located within the revised designated flycatcher critical habitat that extends through the EBR area to RM 54 (Service 2013a).

Ahlers, D., V. Johanson, S. Ryan, R. Siegle. 2010. Southwestern Willow Flycatcher Habitat Suitability, 2008. Highway 60 Downstream to Elephant Butte Reservoir, NM. U.S. Department of the Interior - Bureau of Reclamation, Denver, Colorado, and Albuquerque Area Office, New Mexico, P. 271.

Moore, D. and D. Ahlers. 2012. 2012 Southwestern Willow Flycatcher study results: selected sites along the Rio Grande from Bandelier National Monument to Elephant Butte Reservoir, New Mexico. U.S. Bureau of Reclamation, Denver, CO. P. 111.

_____. 2014. 2013 Southwestern Willow Flycatcher Study Results – Selected Sites Along the Rio Grande From Bandelier National Monument to Elephant Butte Reservoir, New Mexico. Bureau of Reclamation, Technical Service Center, Fisheries and Wildlife Resources. Denver, CO.

_____. 2015. 2014 Southwestern Willow Flycatcher Study Results – Selected Sites Along the Rio Grande From Bandelier National Monument to Elephant Butte Reservoir, New Mexico. Bureau of Reclamation, Technical Service Center, Fisheries and Wildlife Resources. Denver, CO.

Tetra Tech, Inc. 2015. Habitat Relationships along the Middle Rio Grande in New Mexico for the Endangered Southwestern Willow Flycatcher. Final Report to the Albuquerque District, U.S. Army Corps of Engineers, Albuquerque, NM.

U.S. Bureau of Reclamation. 2013a. Southwestern Willow Flycatcher Habitat Classification – Lower Rio Grande from Caballo Dam, NM to El Paso, TX. U.S. Department of the Interior, Bureau of Reclamation, Fisheries and Wildlife Resources, Denver, Colorado.

_____. 2013b. Southwestern willow flycatcher habitat suitability 2012. U.S. Department of the Interior, Bureau of Reclamation, Technical Service Center, Fisheries and Wildlife Group, Denver, Colorado.

U.S. Fish and Wildlife Service. 2002. Final Southwestern Willow Flycatcher Recovery Plan. U.S. Fish and Wildlife Service, Albuquerque, N. M. 210 pp. + appendices (15).

_____. 2005a. Designation of Critical Habitat for the Southwestern Willow Flycatcher (*Empidonax traillii extimus*), Federal Register 70:60886-61009.

_____. 2013a. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Southwestern Willow Flycatcher, Final Rule. Federal Register 78:343-534.

The flycatcher was originally listed as "endangered" due to the "extensive loss of habitat, brood parasitism, and lack of adequate protective regulations" (Service 1995:10694). Activities that could potentially harm the flycatcher and result in ''take'' included: (1) Unauthorized handling or collecting of the species; (2) Destruction/alteration of the species' habitat by discharge of fill material, draining, ditching, tiling, pond construction, stream channelization or diversion, or diversion or alteration of surface or ground water flow into or out of the wetland (i.e., due to roads, impoundments, discharge pipes, stormwater detention basins, etc.); (3) Livestock grazing that results in direct or indirect destruction of riparian habitat; (4) Activities such as continued presence of cattle and fragmentation of flycatcher habitat that facilitate brood parasitism by the brown-headed cowbird; and (5) Pesticide applications in violation of label restrictions" (Service 1995:10714).

Currently, the two greatest ongoing threats to flycatchers along the Rio Grande are the decline in the quality of critical nesting habitat related to ongoing drought and reduced annual water supply; and the invasion of saltcedar leaf beetle (*Diorhabda* spp.; beetle). Dry conditions and the beetle have caused a loss of important nesting substrate and opening of the nesting canopy habitat that in turn have produced nest failure (Bagne and Finch 2013; Moore and Ahlers 2015, Tetra Tech 2015b). In some areas, nest predation by brown-headed cowbird (*Molothrus ater*) is a third threat.

3.2 Yellow-Billed Cuckoo

Information pertaining to the habitat needs and life history of cuckoos is incorporated by reference from the following documents.

Ahlers, D. and D. Moore. 2014. Yellow-billed Cuckoo Study Results – 2013 Survey Results from New Mexico State Highway 60 to EBR: Middle Rio Grande, NM. Bureau of Reclamation, Technical Service Center, Fisheries and Wildlife Resources. Denver, CO.

U.S. Fish and Wildlife Service. 2013b. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (*Coccyzus americanus*); Final Rule. Federal Register 79:5999260038.

U.S. Fish and Wildlife Service. 2014c. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Western Distinct Population Segment of the Yellow-Billed Cuckoo; Proposed Rule. Federal Register 79:48548-48652.

Threats to cuckoos include a decrease in habitat availability and suitability from loss and degradation of riparian habitat and habitat regeneration. Major factors contributing to habitat loss are the disruption of hydrological processes necessary to maintain a healthy riparian system, including fluctuating reservoir levels; poorly managed grazing, development activities and extractive uses, expansion of nonnative vegetation and uncontrolled wildfire. In addition to habitat loss, another major threat to the cuckoo is reduction of prey insect abundance due to the use of pesticides (Service 2014c).

3.3 New Mexico Meadow Jumping Mouse

Information pertaining to the habitat needs and life history of New Mexico meadow jumping mouse (mouse) is incorporated by reference from the following documents.

Frey, J.K. and G.D. Wright. 2012. Multiple Scale Habitat Selection by a Small Mammal Habitat Specialist (*Zapus hudsonius luteus*) in a Managed Floodplain Landscape. Final Report submitted to U.S. Fish and Wildlife Service, Cooperative Agreement 201819J806, 16 March 2012, P. 109.

Frey, J.K. 2013. Draft survey protocol for the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*). Final report submitted to Non-game and T& E Mammal Program, New Mexico Department of Game and Fish, 28 June 2013, P. 53.

Frey, J.K. and D.A. Kopp. 2014. Preliminary Assessment of Jumping Mouse Habitat Associate with the Middle Rio Grande Project. Final Report: Contract R12PX43055. Report to the U.S. Bureau of Reclamation, Albuquerque, NM. P. 21+ appendices.

U.S. Fish & Wildlife Service. 2013c. Draft species status assessment report: New Mexico meadow jumping mouse (*Zapus hudsonius luteus*). 30 May 2013, P. 131.

U.S. Fish & Wildlife Service. 2014a. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the New Mexico Meadow Jumping Mouse throughout Its Range; Final Rule. Federal Register 79:33119-33137.

U.S. Fish & Wildlife Service. 2014b. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the New Mexico Meadow Jumping Mouse; Proposed Rule. Federal Register 78:37327-37363.

The most significant threats to the mouse are: excessive grazing pressure, water use and management, highway reconstruction, development, severe wildland fires, unregulated recreation, the reduction in the distribution and abundance of beaver ponds (Service 2014b).

3.4 Rio Grande Silvery Minnow

Information pertaining to life history and habitat relationships of the minnow is incorporated by reference from the following documents.

Dudley, R.K., A.L. Barkalow, and S.P. Platania. 2012. Spawning periodicity of Rio Grande Silvery Minnow during 2012. Final Report to the Middle Rio Grande Endangered Species Collaborative Program. http://www.asirllc.com/rgsm/pdf/2012%20Final%20RGSM%20Spawning%20Report.pdf (accessed 8 January 2015).

Dudley, R.K. and S.P. Platania. 1997. Habitat use of the Rio Grande silvery minnow. Report to the U.S. Bureau of Reclamation, Albuquerque, NM. P. 88.

Dudley, R.K. and S.P. Platania.2012. Rio Grande Silvery Minnow population monitoring program results from December 2010 to October 2011. Final Report to the Middle Rio Grande Endangered Species Collaborative Program. http://www.asirllc.com/rgsm/pdf/pdf_rg_mon/RGSM_PopulationMonitoring_2011_Final.pdf (accessed 8 January 2015).

Dudley, R.K., and S.P. Platania. 2013. Spawning periodicity of Rio Grande Silvery Minnow during 2013. Final Report to the Middle Rio Grande Endangered Species Collaborative Program. http://www.asirllc.com/rgsm/pdf/2013%20Final%20RGSM%20Spawning%20Report.pdf (accessed 8 January 2015).

Dudley, R.K., S.P. Platania, and G.C. White. 2013. Rio Grande Silvery Minnow population monitoring program results from December 2011 to October 2012. Final Report to the Middle Rio Grande Endangered Species Collaborative Program. http://www.asirllc.com/rgsm/pdf/pdf_rg_mon/RGSM_PopulationMonitoring_2012_Final.pdf (accessed 8 January 2015).

Dudley, R.K., and S.P. Platania.2014. Spawning periodicity of Rio Grande Silvery Minnow during 2014. Final Report to the Middle Rio Grande Endangered Species Collaborative Program. http://www.asirllc.com/rgsm/pdf/2014%20Final%20RGSM%20Spawning%20Report.pdf (accessed 8 January 2015).

Dudley, R.K., S.P. Platania, and G.C. White. 2014. Rio Grande Silvery Minnow population monitoring program results from May to December 2013. Final Report to the Middle Rio Grande Endangered Species Collaborative Program. http://www.asirllc.com/rgsm/pdf/pdf_rg_mon/RGSM_PopulationMonitoring_2012_Final.pdf (accessed 8 January 2015).

Hatch, M.D., and E. Gonzales. 2010. Los Lunas Habitat Restoration Fisheries Monitoring – 2009. SWCA Project No. 15009. Report prepared for U.S. Bureau of Reclamation, Albuquerque Area Office, Albuquerque, NM. P. 103.

Massong, T.M. 2004. Rio Grande river maintenance priority sites on the Pueblo of Cochiti: U.S. Department of the Interior, Bureau of Reclamation, Albuquerque Area Office, P. 10.

Medley, C.N., and P.D. Shirey. 2013. Review and reinterpretation of Rio Grande silvery minnow reproductive ecology using egg biology, life history, hydrology, and geomorphology information. Ecohydrology. 6(3):491-505.

Tetra Tech, Inc. 2014. Ecohydrological Relationships along the Middle Rio Grande of New Mexico for the Endangered Rio Grande Silvery Minnow. Final Report to the Albuquerque District, U.S. Army Corps of Engineers, Albuquerque, NM.

U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants; final rule to list the Rio Grande Silvery Minnow as an endangered species. Federal Register 59: 36988-36995.

_____. 2003. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Rio Grande Silvery Minnow; Final Rule. Federal Register 68: 8087-8135.

_____. 2010. Rio Grande Silvery Minnow (*Hybognathus amarus*) Recovery Plan, First Revision. Albuquerque, NM. viii + P. 210.

In listing the minnow as endangered, the Service stated:

> "Threats to the species include dewatering, channelization and regulation of river flow to provide water for irrigation; diminished water quality caused by municipal, industrial, and agricultural discharges; and competition or predation by introduced non-native fish species." [Service 1994:36988]

Currently, other threats include: (1) channel drying and the lack of suitable perennial refugia habitat during the irrigation season and during periods of drought, leading to complete desiccation of potential habitat for minnows; (2) lack of abundant feeding habitat consisting of channel flows less than a half a foot per second (greater flow velocities suspend and scour away potential benthic and other attached food supplies for minnows, decreasing survival); and (3) lack of floodplain connectivity during the larval

drift period; (4) lack of water stranding minnow eggs and developing fry within the high-velocities channel flows (Bovee et al. 2008, Medley and Shirey 2013, Tetra Tech 2015b); and (5) high velocity channel flood flows that result in high to total mortality of eggs and developing fry (Harvey 1987).

4. Environmental Baseline

This section describes the effects of past and ongoing human and natural factors leading to the current status of the species and their habitat within the action area. It includes the past and present impacts of all Federal, State, or private actions in the action area. Pertinent baseline information is incorporated by reference from the following documents:

U.S. Fish and Wildlife Service. 2012. Biological and conference opinion (Opinion) on the effects of the United States Section of the International Boundary and Water Commission (IBWC) proposed action of an Integrated Land Management Alternative for Long-Term Management (Land Management Alternative) of the Rio Grande Canalization Project (RGCP) in Sierra County and Doña Ana County, New Mexico, and El Paso County, Texas. Fish and Wildlife Service, New Mexico Ecological Services Field Office, Albuquerque, New Mexico.

_____. 2013. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Southwestern Willow Flycatcher, Final Rule. Federal Register 78:343-534.

_____. 2013b. Endangered and Threatened Wildlife and Plants; Proposed Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (*Coccyzus americanus*); Proposed Rule. Federal Register 78:61621-61666.

_____. 2014. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the New Mexico Meadow Jumping Mouse throughout Its Range; Final Rule. Federal Register 79:33119-33137.

For the years 2008 through 2015, Reclamation considered the effects of the RGOA on listed species using a preliminary model, and concluded that it would have “no effect” on listed species or any adverse modification of critical habitat. In conjunction with the critical habitat designation process for the flycatcher, and consideration of effects on listed species, Reclamation developed a flycatcher management plan which has already been submitted to the Service, and which will be updated to include the cuckoo for the RGP area

Reclamation. 2013. Supplemental Environmental Assessment, Implementation of Rio Grande Project, New Mexico and Texas. Albuquerque Area Office, Albuquerque.

_____. 2012. Southwestern Willow Flycatcher Management Plan for the Rio Grande Project. Bureau of Reclamation, Albuquerque Area Office, Albuquerque, New Mexico.

In addition, the IBWC has completed consultations on its actions that overlap portions of this action area.

International Boundary and Water Control Commission. 2001. Biological Assessment: USIBWC Rio Grande projects, American Dam to Fort Quitman, Texas. International Boundary and Water Control Commission, El Paso, Texas.

_____. 2004. Biological Assessment: USIBWC Rio Grande Canalization Project and River Management Plan. International Boundary and Water Control Commission, El Paso, Texas.

4.1 Environmental Setting

4.1.1 Elephant Butte Reservoir

EBR and Caballo reservoirs, as well as the downstream diversion dams are elements of the environment baseline. **Figure 4-1** shows water surface elevations in EBR have historically fluctuated from 4,409 feet in 1942 down to 4,258 feet in 1954. Since about 1995, water storage in EBR has decreased, allowing vegetation to grow within the reservoir pool and become suitable habitat for birds, as described below.

4.1.2 Rio Grande below EBR

Between Elephant Butte Dam and Caballo Dam lies 42.5 km (26.5 miles) of the Rio Grande. Saltcedar with a few overstory cottonwoods grow along the upper 12 km (7.5 miles) (Reclamation 2012). Some of these patches of vegetation along the Rio Grande provide moderately suitable flycatcher habitat.

4.1.3 Caballo Reservoir

Caballo Reservoir is the third reach included in this consultation. Caballo Reservoir has a total capacity of 324,934 AF, comprising 224,934 AF of storage capacity and 100,000 AF of flood control space. Under a 1996 court order, Reclamation is restricted to storing no more than 50,000 AF (elevation 4,146.11 feet) in Caballo Reservoir during the non-irrigation season.

4.1.4 Rio Grande Downstream of Caballo Reservoir

The RGOA will not change the volumes or pattern of releases from Caballo Reservoir from what has occurred under the baseline. Water is released when there are calls for water delivery by the downstream users, principally irrigators and Mexico.

As described by IBWC (2001, 2004), the river through this reach to Fort Quitman is mostly channelized and within IBWC's jurisdictional land/river channel vegetation is mowed. Most of the farms in this reach have allowed a very narrow vegetated buffer zone to grow between farmland and the river bank. There are some areas where the river is adjacent to upland slopes, and those areas have no farming and the riparian vegetation is wider. The other vegetated areas occur on sand bars in the river channel which would be mowed and sediment removed by IBWC.

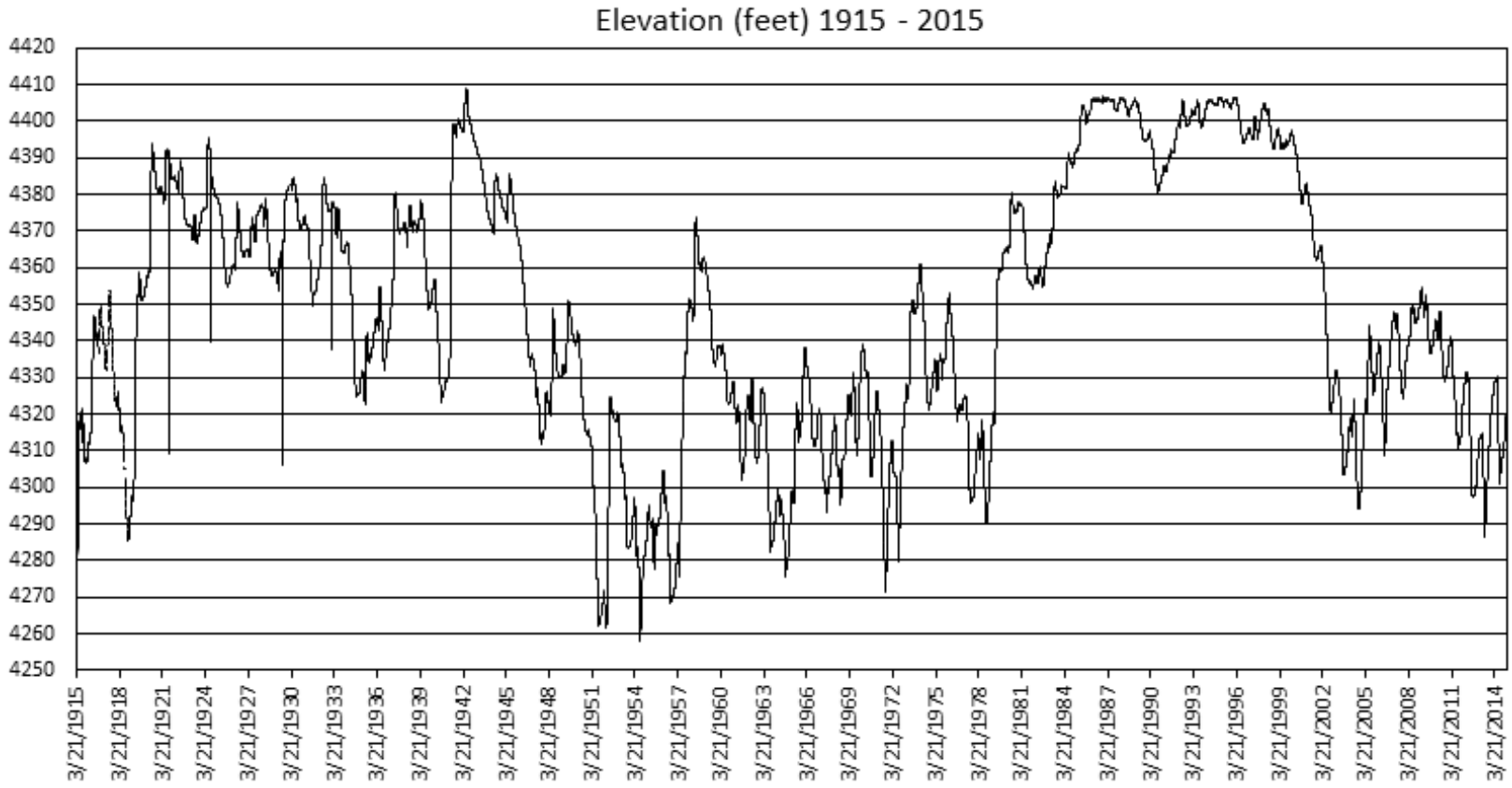

Figure 4-1. Water level elevations in EBR from initial filling in March 1915 to February 2015. Daily data from http://www.usbr.gov/uc/crsp/GetDateInfo?d0=2684&d1=2685&d2=2686&d3=2688&idCount=4&l=ELEPHANT+BUTTE+RESERVOIR .

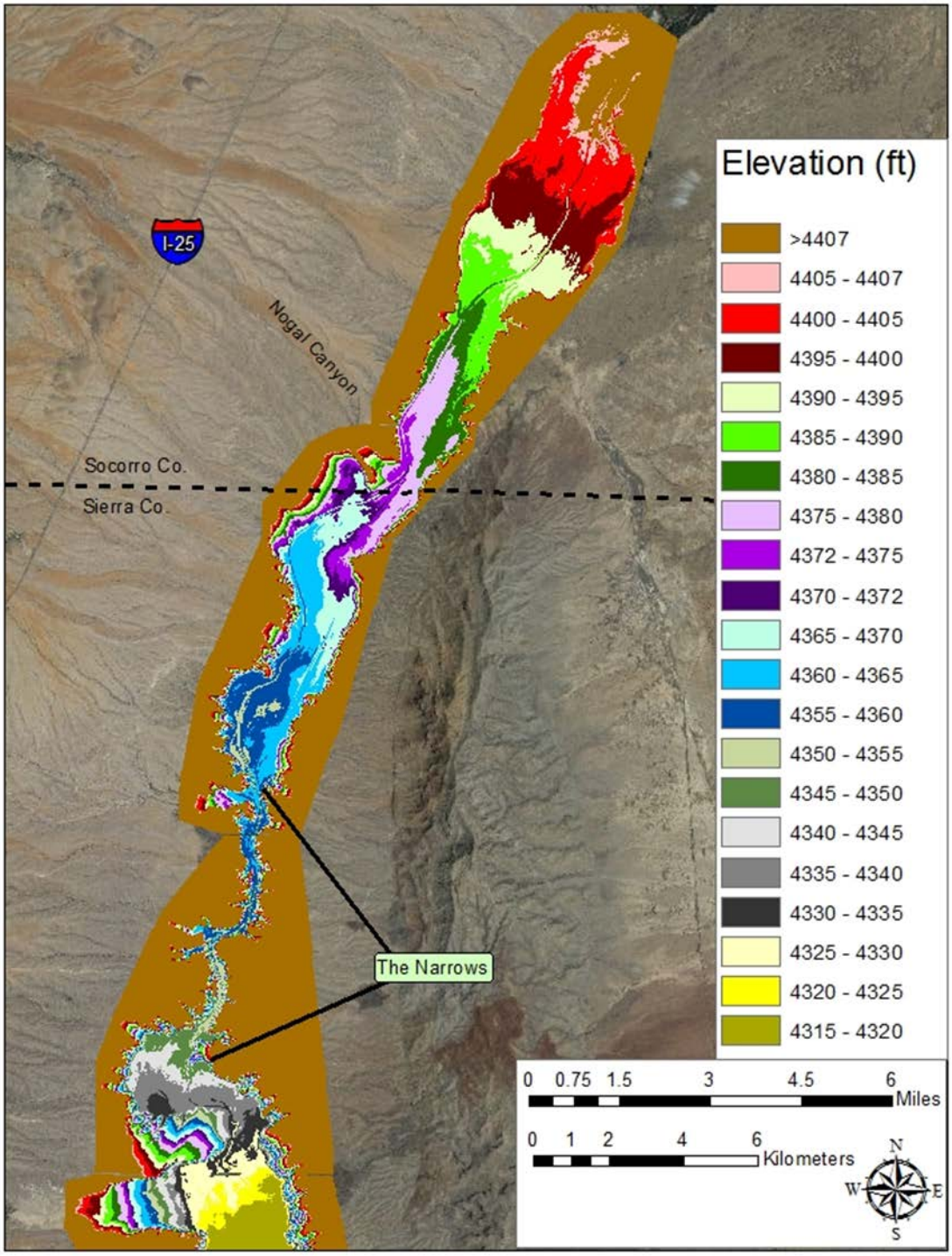

Figure 4-2. Elevation contours within the "dry" pool area of EBR. Reservoir levels ranged from 4,300 to 4,330 feet during the summer of 2014. (Source: Moore and Ahlers 2015).

4.2 Current Status of Flycatcher in the Action Area

4.2.1 Critical Habitat

In their designation of critical habitat for the flycatcher (Service 2013a:365), the Service stated that "Over time, as the lake at Elephant Butte has declined, there has been an increase of willows and other trees in the delta of EBR, and also an increase in flycatcher territories within the reservoir pool and north of the reservoir pool where the habitat is supported by the low-flow conveyance channel. The area within and north of EBR supports the largest known population of flycatchers in the range of the subspecies." [Service 2013a: 365]

The Service designated the upper portion of the EBR as part of critical habitat. This extends into the upper part of EBR ending in Socorro County about 3.2 km (2.0 mi) north of the Sierra County line, New Mexico (about 14.4 km, 9.0 mi of the upper part of Elephant Butte Reservoir" (Service 2013a: 380).

The Service rejected the southern portion of EBR as critical habitat, because, while it has some primary constituent element of critical habitat for the flycatcher, the few patches of vegetation were not essential to flycatcher conservation (Service 2013a, P. 349).

Under the flycatcher recovery plan, the Lower Rio Grande Management Unit includes the river segment from Elephant Butte Dam to the New Mexico-Texas state line; the recovery plan includes no reaches in Texas (Service 2002, p. 92). The reach from Caballo Dam to Leasburg Dam (74.2 km, 46.1 mi) had been proposed in the draft as flycatcher critical habitat. However, as a result of the commitment to comprehensively manage flycatcher habitat, through the existing development and protection of habitat and water transaction agreements, the Service excluded this segment from the final designation of revised flycatcher critical habitat. As such, no critical habitat for flycatcher exist within the RGP area south of EBR Dam (Service, 2013, p. 380). Instead, as part of the lower Rio Grande Canalization and Conservation Project, IBWC will work with EBID and other partners to implement a flycatcher management plan for the lower reach of the Rio Grande, which requires flycatcher habitat goals be maintained throughout the reach (Service, 2013). The goals include, in part, establishing 30 riparian improvement sites by 2019, 12 of which specifically designed to create flycatcher nesting habitat across 69 ha (171 ac). In addition, EBID and EPCWID are voluntarily working with the National Fish and Wildlife Foundation (NFWF) to develop a water transaction program that will allow IBWC and other partners to purchase or lease water that can be used to flood flycatcher riparian habitat similar to an agricultural crop.

4.2.2 Presence

Patches of vegetation at the northern-most extent within the historic reservoir (considered south of RM 62) began to reach suitability for flycatchers in the mid-1990s. While only 16 territories existed in the San Marcial survey reach in 1996, **Table 4-1** shows the changes in number of flycatcher territories from 2000 to 2014 in the reach from the San Marcial railroad trestle (RM 68.6) downstream to the reservoir pool (Moore and Ahlers

Table 4-1. Flycatcher territories in San Marcial Reach (Moore and Ahlers 2014, 2015)

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
23	25	63	86	113	107	142	197	235	319	298	318	252	266	307

2014). Of the total territories in the riparian areas adjacent to the delta channel in 2011 (152) and 2012 (103), 85 and 47 (sites DL 6-10), respectively, were 0.25 miles or further from the delta channel, with several territories along the unmaintained portion of the LFCC (Moore and Ahlers 2012). The remaining territories are within 0.25 miles of the delta channel, and mostly south of RM 55. Appendix B shows general locations of territories; for more specific locations of recent territories in the action area, see Moore and Ahlers (2014, 2015).

The length of the San Marcial flycatcher survey reach has tripled since 1995 because flycatcher habitat developed in new areas made available as the reservoir level dropped. It continues to be the most productive survey reach of the Rio Grande, with some of the best native habitat within the subspecies' range (Moore and Ahlers 2014). The majority of the territories are within the delta reach of EBR, with seven and four territories in 2012 and 2013, respectively, between the railroad bridge (RM 68.6) and the power lines (approx. RM 62). South of the EBR Narrows, high-quality flycatcher habitat that has developed as a result of more recent reservoir recession continues to improve and is providing new habitat for nesting and migrant flycatchers (Moore and Ahlers 2014, 2015).

During 2014 surveys, 598 resident flycatchers were documented throughout the MRG management unit, which included resident birds forming 234 pairs and establishing 364 territories (Moore and Ahlers 2015). Consistent with previous years, the San Marcial Reach was the most productive with 307 territories and 205 pairs. 2014 was the second consecutive year having increased territory numbers, after a large drop in 2012. The 2014 monitoring included nesting success rates, productivity, and Brown-headed Cowbird (*Molothrus ater*) parasitism. The San Marcial Reach was again most productive, producing 255 nests and fledging 151 flycatcher young. Overall, nesting success for all of the MRG was the lowest observed in the past 16 years of monitoring, with the majority of failures due to depredation (Moore and Ahlers 2015).

Flycatcher habitat is dynamic system, with the birds' requiring dense patches of vegetation with tall trees. These conditions are enhanced when the reservoir water surface elevations are low, and these conditions are diminished when the reservoir is at full pool (Moore and Ahlers 2015). **Figure 4-3** presents the maximum reservoir water elevation during the nesting season during 2007 through 2014.

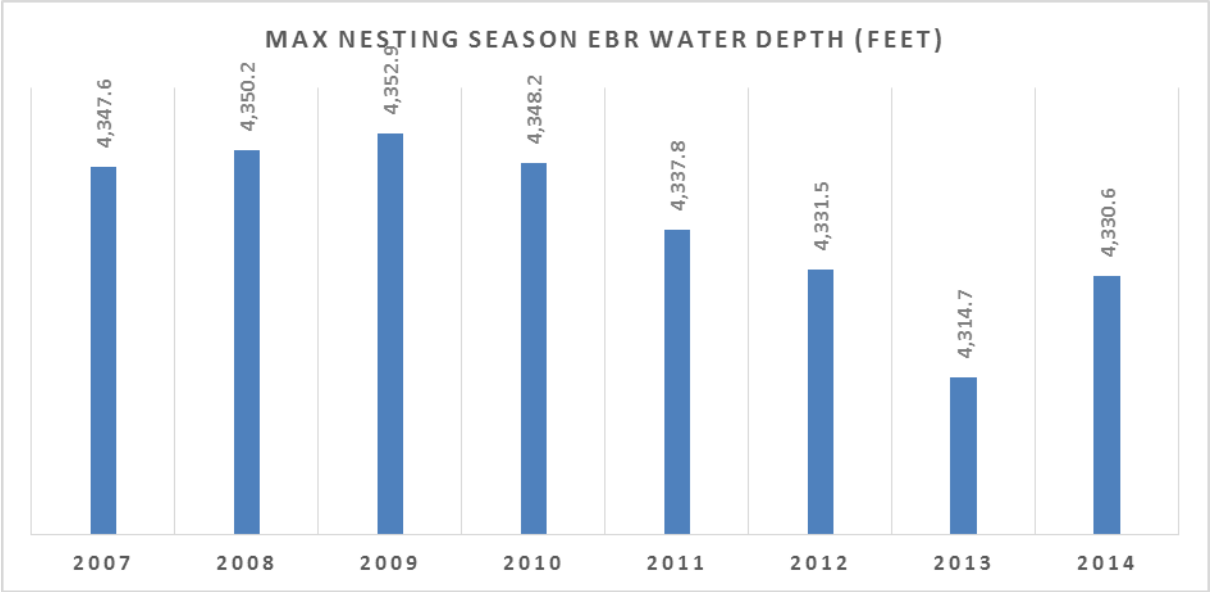

Figure 4-3. Maximum water elevation during flycatcher nesting season from 2007 through 2014.

The importance of water levels in EBR has been documented by Reclamation's studies of flycatcher territories associated with the EBR pool during the past eleven years. As described by Moore and Ahlers (2015):

> "For several years, much of this habitat was continually flooded and began to decline in quality presumably due to this prolonged flooding. Conversely, during the past several years, drought conditions have reduced flow in the LFCC that sustains the high-quality habitat on the western side of the reservoir pool to the point that this habitat has dried significantly. This has allowed saltcedar to encroach into formerly native habitat. Although the more drought-tolerant saltcedar can provide habitat during times of drought, if sufficient hydrology is not restored to the native habitat, it will eventually be lost."

Another concern regarding hydrology within the reservoir pool is rising reservoir levels and inundation of potential/occupied habitat. Habitat created by reduced reservoir elevations could be stressed and/or killed if flooded for an extended period (greater than five years [Reclamation 2009]). Occupied flycatcher habitat within "The Narrows" and downstream (e.g., sites EB-13 through 17) has already been periodically flooded by a rising reservoir during the past several years. This has only benefitted this habitat so far, as the reservoir level has annually declined and not adversely impacted habitat. **Figure 4-4** shows the [2007 – 2014] elevational distribution of flycatcher (SWFL) territories within EBR. In 2014, 49 percent of flycatcher territories were within seven feet of the spillway elevation. This is down from 51 percent in 2013 and 73 percent in 2012.

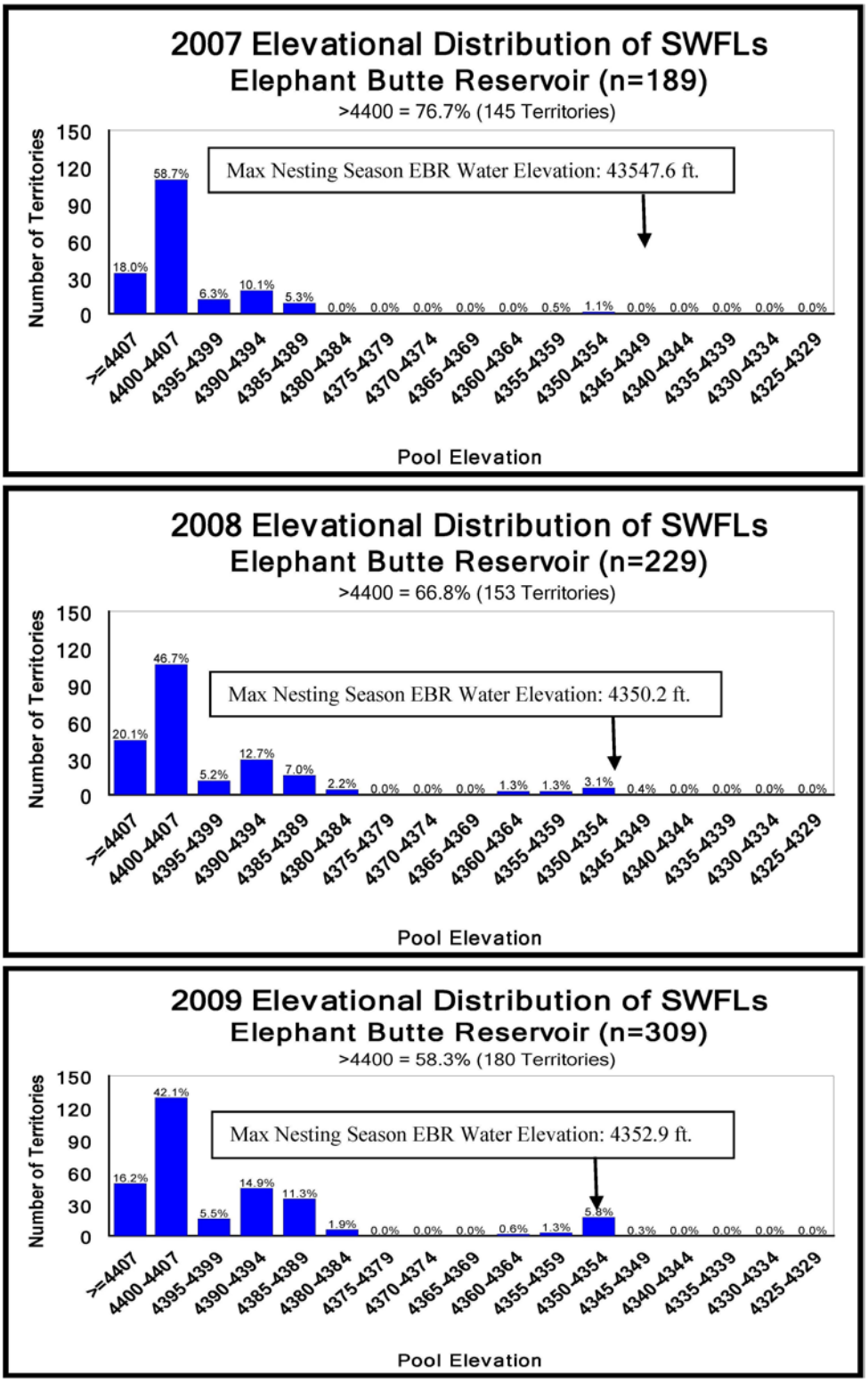

Figure 4-4. Elevational distribution of flycatcher (SWFL) territories within EBR in 2007-2014, with maximum water levels. (Sources: Moore and Ahlers 2014, 2015 and http://www.usbr.gov/uc/elpaso/water/rgreports/faces/Reservoirs.jsp)

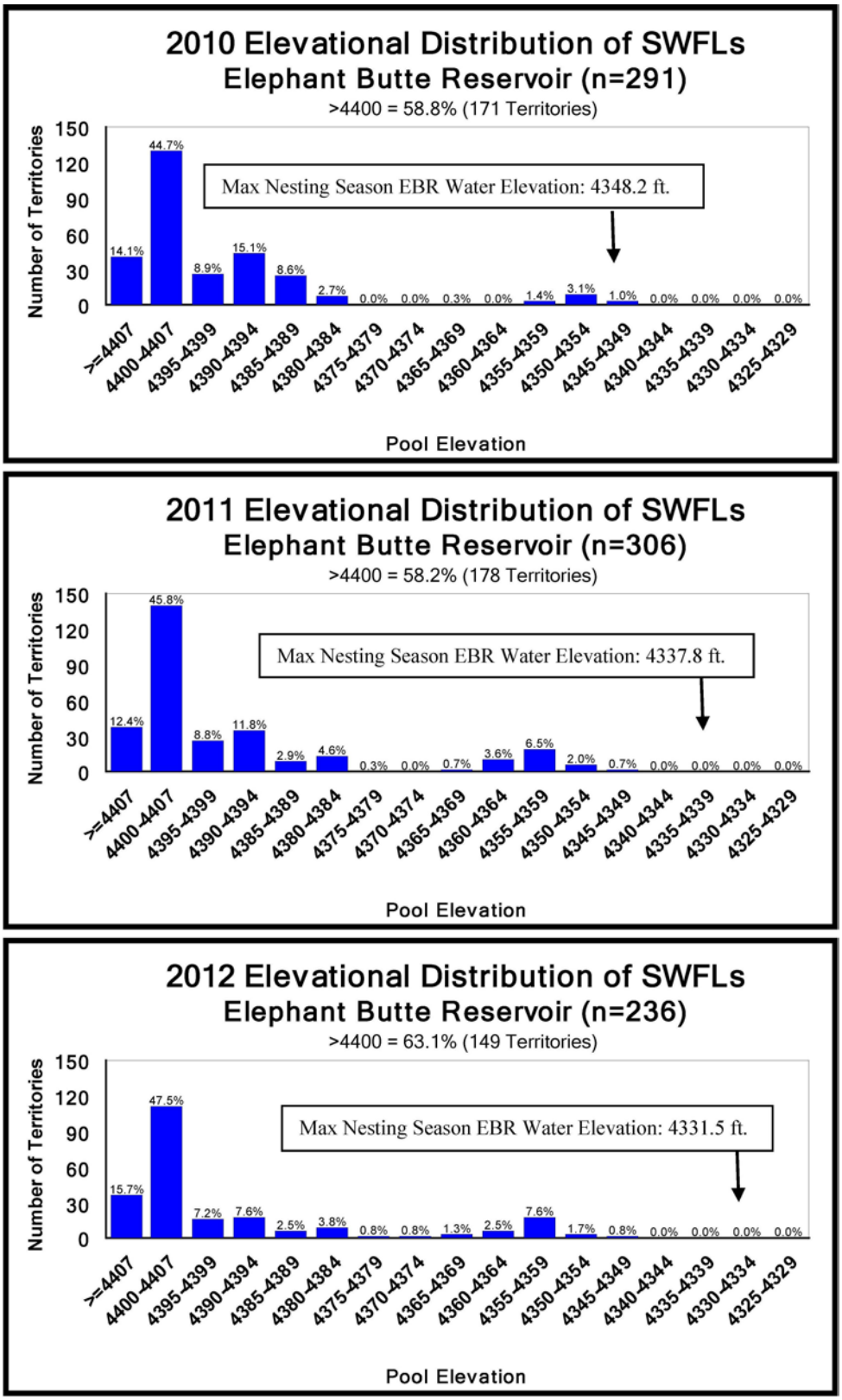

Figure 4-4. (Continued).

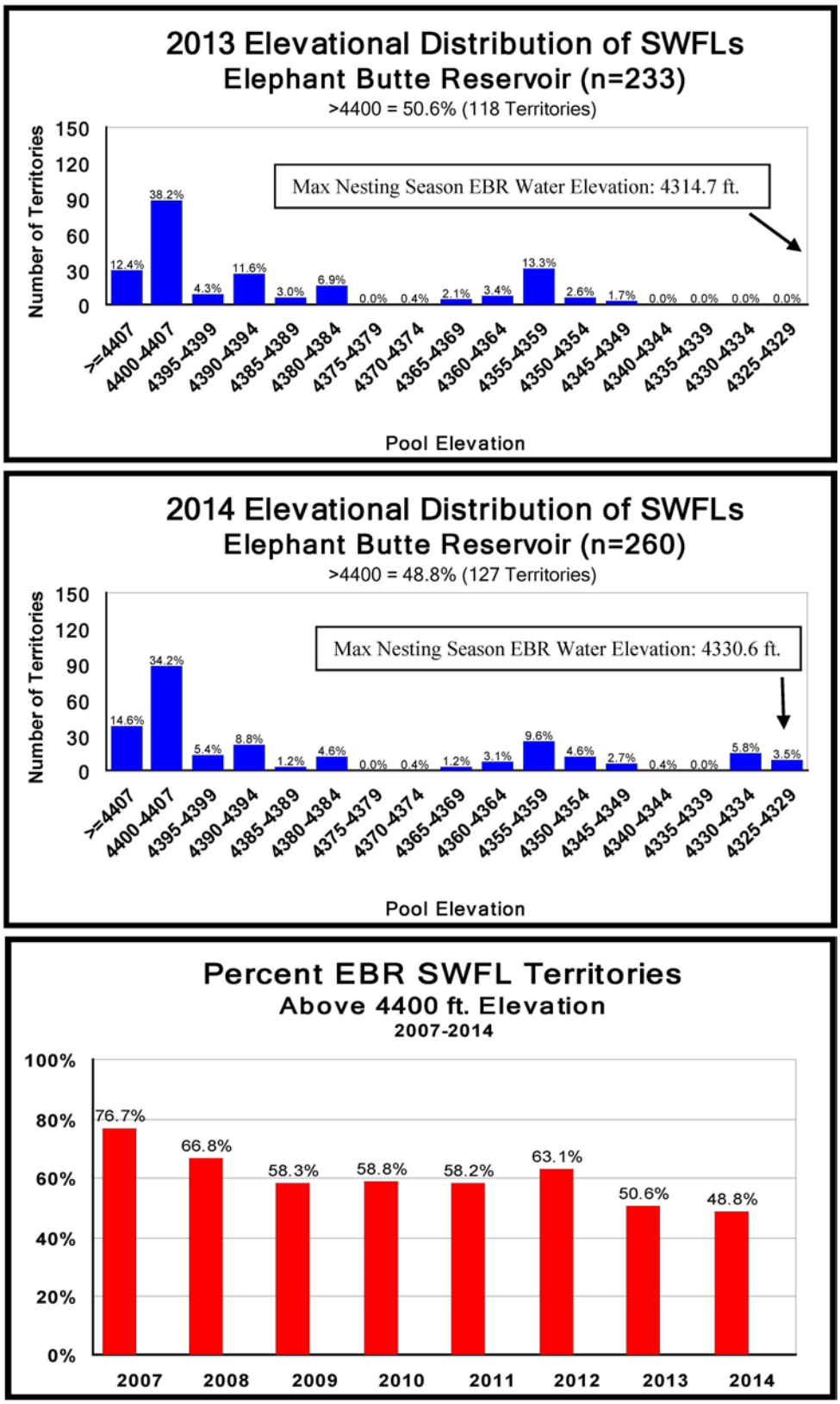

Figure 4-4. (Continued).

Flycatchers and their habitat are present in areas that are adjacent to the delta channel, outside of the berms, where vegetation is not removed. In one specific area, sites DL-03 and DL-04 (just north of RM 58), vegetative decline followed an apparent drop in alluvial groundwater levels and subsequent water stress on the willows (Holste 2013). At these sites, prior to and during 2005, groundwater levels were near the surface, oftentimes with moist soils present. Under such conditions, trees likely had a very shallow root system. Beginning in 2006, observations during annual flycatcher surveys reported soils were no longer moist at these sites (V. Ryan, pers. comm. in Reclamation 2014). It is likely there was a rapid drop in groundwater below the root zone of the trees, resulting from the combined effects of bed degradation and recurring dry conditions. Drought conditions in New Mexico have ranged from abnormally dry to extreme drought from 2006 to recent years, contributing to the effects of previously dry conditions since 2000 (U.S. Drought Monitor 2013). A decline in vegetative health was observed to begin in 2006 and by 2008 only 3 nests were found at these sites. The remaining vegetation in this area is now mainly saltcedar instead of Goodding's willow, as previously existed. Nesting has not occurred at these sites since 2008.

In other areas, the reasons for declines in groundwater level are not clear-cut because groundwater levels are complex and can be highly variable across time and space. Near the river, groundwater levels show an influence from water surface elevations (Tetra Tech 2010), but data at different locations suggest a complicated interaction. Groundwater peaks occur during spring runoff or other high flow events, while low groundwater elevation corresponds to periods of low river discharge. **Figure 4-5** shows river thalweg elevation, groundwater elevation, and river discharge near RM 63 (Reclamation 2013e).

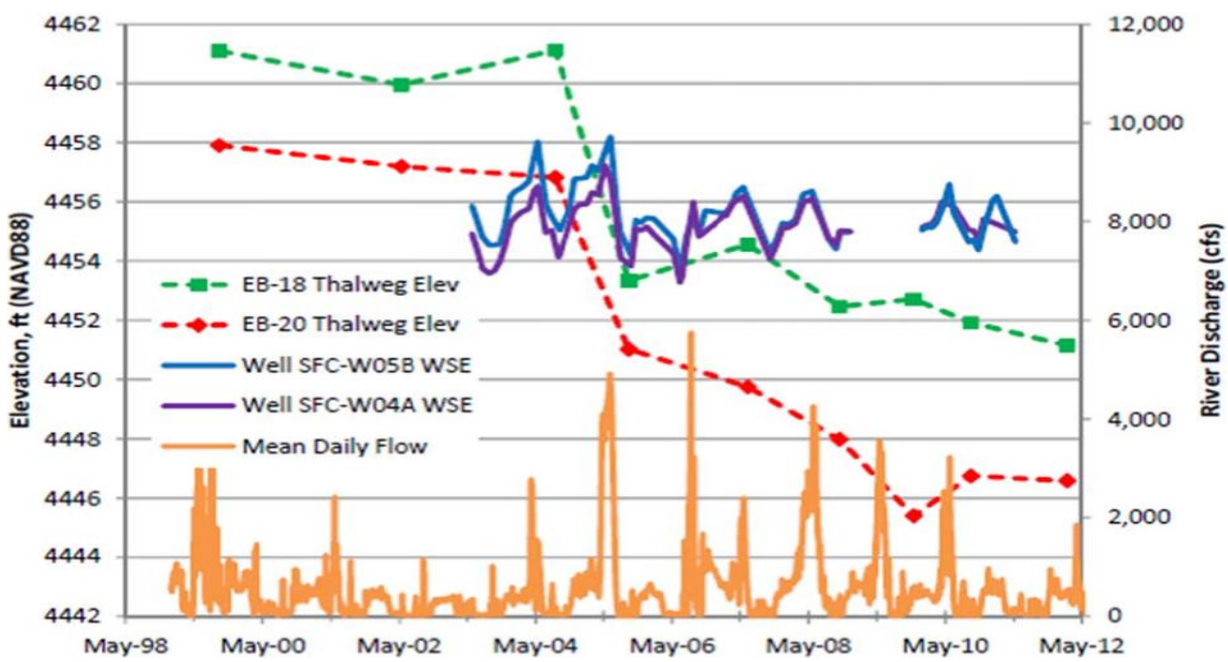

Figure 4-5. River thalweg elevation, groundwater elevation, and river discharge over time near RM 63 (Reclamation 2013e).

It appears that groundwater levels are "primarily a function of river discharge (or river water surface elevation) and nearby groundwater controls (i.e. LFCC and ponded areas). River thalweg elevation trends over time and space can influence, but may not directly correspond to, trends in groundwater elevation" (Holste 2013). While the vegetation in areas such as DL-03, DL-04 and other sites has clearly shown decreased health and mortality probably due to lowered water tables, it is difficult to separate the impacts of extended drought (reduced discharge) and river channel degradation on groundwater levels.

Similar to groundwater levels, the causes of river channel degradation are also complicated. Using the best available information and data, Reclamation (2013e) summarized that river channel degradation along and upstream of the EBR delta channel occurred when the average pool elevation dropped about 90 feet between 1998 and 2004. Both excavation and reservoir pool levels decreases were estimated to be responsible for steepening the local slope (~RM 58 to RM 46) with about 8- to 12-percent, slope changes. The headcut upstream from the delta channel formed in 1999 (prior to the original delta channel construction in 2000), not in 2003, and migrated upstream about 3 miles between 1999 and 2004. Then, during the 2005 spring runoff, the headcut migrated about 10 miles upstream due to the primary drivers in alluvial channel morphology, flow regime and sediment load (Schumm 1977, Watson et al. 2007) as controlled by the base level of the stream system plus channel and floodplain characteristics. Collectively, such controls can either constrain or amplify the effect that the drivers have on river channel adjustment (Makar and AuBuchon 2012). Of note, the delta channel aggraded by a cumulative average of almost 3 feet from 2004 to 2010, with maintenance occurring every year (Holste 2013).

Figure 4-6 shows a distance-weighted, reach-average thalweg elevation for the delta channel between 2004 and 2012, illustrating the aggradation that occurred even though sediment was frequently removed to maintain channel capacity (Reclamation 2013e). Also, this figure clearly highlights the similar trends in average thalweg elevation and reservoir water surface elevation.

During the summer of 2012, Reclamation personnel classified the suitability of riparian habitat for breeding flycatchers within the active floodplain of the Rio Grande between Caballo Dam, New Mexico and El Paso, Texas (Reclamation 2013b). Six different study reaches were delineated based on geographic landmarks, habitat characteristics and ongoing surveys for the endangered flycatcher (**Table 4-2**). All ground within the active floodplain (i.e. not separated from the river channel by roads, levees, etc.) was visually classified based on its suitability as habitat. Classification was performed either via kayak or on foot by biologists familiar with habitat requirements of the species. Habitat classes ranged from zero (unsuitable) to five (highly suitable) and took into consideration patch width, vegetation height, structural diversity and hydrology:

- Class 0 (Unsuitable) = Woody vegetation is absent, very sparse, or generally less than 3 meter (m) in height (i.e. bare ground, herbaceous vegetation, scoured river bars or islands).

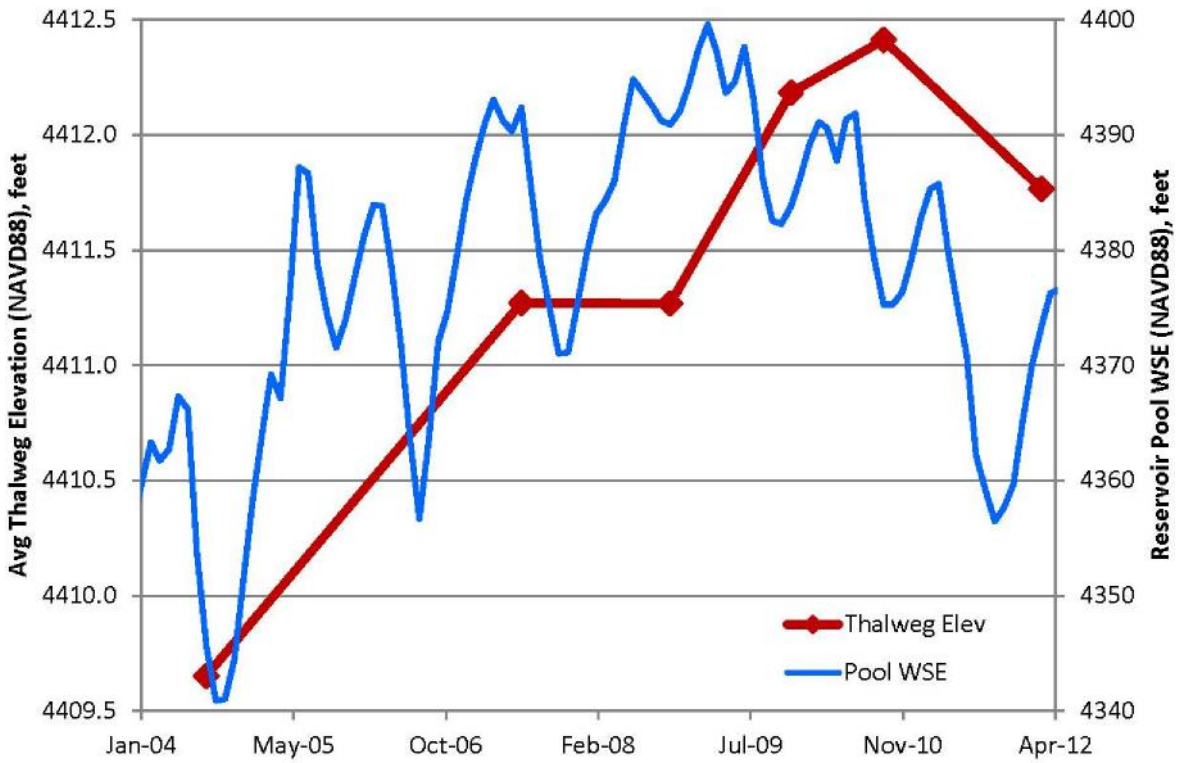

Figure 4-6. Distance-weighted average thalweg elevation over time for the delta channel between EB-28 and EB-50 during recurring channel maintenance (Reclamation 2013e).

- Class 1 (Unsuitable) = Vegetation height is greater than 3 m and patch width is less than 10 m (i.e. patch width is limiting factor). Habitat of this class generally consists of narrow bands of coyote willow or saltcedar within the river channel prism.
- Class 2 (Unsuitable) = Vegetation height is greater than 3 m and patch width is greater than 10 m but vegetation lacks sufficient structure and density (i.e. patch size and vegetation height are sufficient; vegetation lacks overall structure/density; relatively dry and not subject to overbank). Habitat of this class generally consists of older, drier patches of saltcedar scattered throughout the study area.
- Class 3 (Moderately suitable) = Habitat meets minimum suitable vegetation height (3 m) and patch width (10 m) and has sufficient density/structure (i.e. patch size and height are moderately sufficient; vegetation density is adequate). This class is typically comprised of smaller river bars and islands with young to mid-aged vegetation.
- Class 4 (Suitable) = Vegetation height is between 3 m and 7 m and patch width is between 10 m and 30 m (i.e. all necessary habitat characteristics are present; overbank flooding somewhat common; relatively high water table). This class is comprised generally of coyote willow dominated patches of

sufficient height and width that are seasonally flooded or with a high water table.

- Class 5 (Highly suitable) = Structurally diverse vegetation between 3 m and 10 m in height with a patch width greater than 30 m (i.e. all necessary habitat characteristics are present; large patch size; high water table with backwater channels). This class has the same general characteristics as Class 4, but is more structurally diverse and contains openings with marsh and/or backwater habitat. Patches may also be larger in aerial extent than those in Class 4.

Within the study area's 173 km of riparian corridor, approximately 42 percent of the linear distance of riverbank was classified as zero (**Table 4-2**). The most downstream (and closest to the international border) reaches had the highest percentage of non-habitat due to ongoing and historic habitat management activities (**Table 4-3**). Overall, almost 82 hectares of suitable habitat was located within the study area, with the bulk of it being moderately suitable Class 3. Only 6.6 hectares of highly suitable habitat was documented and almost all of it was located within the vicinity of Hatch, New Mexico. This reach was also home to the majority of resident flycatchers detected during the 2012 surveys.

Table 4-2. Extent of Class 0 habitat within the active floodplain of Lower Rio Grande study reaches (Reclamation 2013b).

Reach	Reach length (km)	Total linear length of Class 0 (km – both banks)	Percentage of Class 0
Percha	24.0	16.1	33.5
Hatch	29.6	21.4	36.1
Rincon Valley	11.3	8.5	37.6
Radium Springs	8.4	3.6	21.4
Las Cruces	31.7	28.5	45
Mesilla	68.2	66.3	48.6
Total	**173.2**	**144.4**	**41.7**

Note: Percentage of Class 0 calculated by dividing the total length of 0's by the doubled reach length, accounting for both banks.

Table 4-3. Hectares of non-zero habitat within the active floodplain of Lower Rio Grande study reaches (Reclamation 2013b).

Reach	Class 1 (Unsuitable)	Class 2 (Unsuitable)	Class 3 (Moderately Suitable)	Class 4 (Suitable)	Class 5 (Highly Suitable)	Sum classes 3,4,5
Percha	25.6	21.4	4.0	1.1	0	5.1
Hatch	28.8	8.6	37.0	9.2	6.2	52.4
Rincon Valley	16.5	13.6	0.2	0	0	0.2
Radium Springs	6.3	24.9	8.6	6.0	0	14.6
Las Cruces	27.2	30.4	0.9	0.3	0	1.2
Mesilla	52.5	29.2	4.8	2.9	0.4	8.1
Total	**156.9**	**128.1**	**55.5**	**19.5**	**6.6**	**81.6**

During the summer of 2013, Reclamation (2013c) surveyed for flycatcher at 21 selected sites within approximately 215 km of the Rio Grande from Caballo Reservoir, NM to El Paso, TX (**Table 4-4**). Surveys during 2014 identified only 13 sites to be delineated (**Table 4-5**; Reclamation 2015a). Sites selection for the surveys was based on reviews of habitat and survey needs. All potentially suitable habitat within each site was surveyed five times each year. Surveys were conducted under an Interagency Agreement with the IBWC to comply with endangered species consultation and supplement existing data for this reach in the range-wide database.

During 2013 surveys, 73 flycatchers were documented within this reach. These included 6 migrant flycatchers, nine unpaired male flycatcher territories, and 29 flycatcher pairs. Twenty-six of these pairs were confirmed by nesting and produced 37 nests. Of these, 25 failed and 12 successfully fledged young. The recovery goal for the Lower Rio Grande Management Unit was exceeded.

During the 2014 surveys, 66 flycatchers established 41 territories within this reach. These included 16 unpaired male flycatcher territories and 25 flycatcher pairs. Twenty-one of these pairs were confirmed by nesting and produced 30 nests. Of these, nine failed, six successfully fledged young, and the fates of 15 were unknown. For the third straight year, the recovery goal of 25 territories for the Lower Rio Grande Management Unit was exceeded.

Table 4-4. Summary of flycatcher detections within survey sites between Caballo Reservoir, NM and El Paso, TX during 2013 (Reclamation (2013c).

Site Name	WIFLs Observed[1]	Est. Number of Pairs	Est. Number of *E.t. extimus*[2]	Est. Number of Territories[3]	Nest(s) Found	Nest Success	Comments	County
Las Palomas	1	0	0	0	N/A	N/A	1 migrant	Sierra
Caballo Delta North	11	4	8	4	Yes (7)	5 Failed 2 Successful	3 migrants; 4 pairs w/ nests	Sierra
Caballo Delta South	2	0	0	0	N/A	N/A	2 migrants	Sierra
HA-01	15	6	15	9	Yes (10)	9 Failed 1 Successful	3 unpaired males; 6 pairs w/ nests	Dona Ana
HA-02	25	12	25	13	Yes (14)	7 Failed 7 Successful	1 unpaired male; 1 pair; 11 pairs w/ nests	Dona Ana
HA-03	3	1	3	2	Yes (1)	Failed	1 unpaired male; 1 pair w/ nest	Dona Ana
HA-04	6	2	6	4	Yes (2)	2 Failed	2 unpaired males; 2 pairs w/ nests	Dona Ana
HA-06	3	1	3	2	Yes (2)	1 Failed 1 Successful	1 unpaired male; 1 pair w/ nest	Dona Ana
Selden Canyon	3	1	3	2	No	N/A	1 unpaired male; 1 pair	Dona Ana
Radium Springs	4	2	4	2	Yes (1)	Successful	1 pair; 1 pair w/ nest	Dona Ana
2013 TOTALS	**73**	**29**	**67**	**38**	**37**	**25 Failed 12 Successful**	**6 Migrants; 9 Unpaired males; 3 Pairs; 26 Pairs w/ nests**	

[1] When a single WIFL responded to the recorded call, and there was no evidence of pairing, it was considered to be an unpaired male. It is possible that some WIFLs counted as males may have been females, especially during the migration period.

[2] A WIFL was considered to be a resident *Empidonax traillii extimus* if it was documented on or after June 10 and exhibited behavioral characteristics typical of a territorial WIFL or nesting activity could be confirmed.

[3] A SWFL territory consists of a resident Southwestern Willow Flycatcher male defending a home range, unpaired or paired.

Migrant – any WIFL detected only during the period prior to June 10th, and where breeding was neither confirmed nor suspected.

Unpaired Male – a resident SWFL that was documented on or after June 10th and exhibited behavioral characteristics typical of a territorial flycatcher, however breeding was neither suspected nor confirmed

Pair – a SWFL territory where breeding was confirmed or behavioral evidence strongly suggested that pairing had occurred

Pair w/ nest – a SWFL territory where breeding was confirmed by the discovery of an active nest.

Table 4-5. Summary of 2014 flycatcher detections within survey sites between Caballo Reservoir, NM and El Paso, TX during 2014 (Reclamation 2015a).

Site Name	Flycatchers Observed[1]	Est. Number of Pairs	Estimated. Number of Flycatchers [2]	Estimated Number of Territories[3]	Nest(s) Found	Nest Success	Comments	County
Las Palomas	3	1	3	2	Yes (1)	Successful	1 unpaired male; 1 pair w/ nest	Sierra
Caballo Delta North	21	6	18	12	Yes (5)	1 failed, 4 unknown	3 migrants; 6 unpaired males; 2 pairs; 4 pairs w/ nests	Sierra
Caballo Delta South	7	0	1	1	N/A	N/A	6 migrants; 1 unpaired male	Sierra
Caballo Reach[4] Summary	31	7	22	15	6	1 successful, 1 failed, 4 unknown	9 migrants; 8 unpaired males; 2 pairs; 5 pairs w/ nests	
HA-01	6	1	4	3	Yes (1)	Failed	2 migrants; 2 unpaired males; 1 pair w/ nest	Dona Ana
HA-02	29	12	28	16	Yes (20)	5 successful, 7 failed, 8 unknown	1 migrant; 4 unpaired males; 12 pairs w/ nests	Dona Ana
HA-03	2	0	1	1	N/A	N/A	1 migrant; 1 unpaired male	Dona Ana
HA-04	5	1	3	2	Yes (1)	Unknown	2 migrants; 1 unpaired male; 1 pair w/ nest	Dona Ana
Hatch Reach Summary[5]	42	14	36	22	22	5 successful, 8 failed, 9 unknown	6 migrants; 8 unpaired males; 14 pairs w/ nests	
Selden Canyon	4	1	2	1	No	N/A	2 migrants; 1 pair	Dona Ana
Radium Springs	10	3	6	3	Yes (2)	2 unknown	4 migrants; 1 pair; 2 pairs w/ nests	Dona Ana
Radium Springs Reach[6] Summary	14	4	8	4	2	2 unknown	6 migrants; 2 pairs; 2 pairs w/ nests	
2014 Totals	**87**	**25**	**66**	**41**	**30**	**6 successful, 9 failed, 15 unknown**	**21 migrants; 16 unpaired males; 4 pairs; 21 pairs w/ nests**	

[1] When a single WIFL responded to the recorded call, and there was no evidence of pairing, it was considered to be an unpaired male. It is possible that some WIFLs counted as males may have been females, especially during the migration period.

[2] A WIFL was considered to be a resident *Empidonax traillii extimus* if it was documented on or after June 10 and exhibited behavioral characteristics typical of a territorial WIFL or nesting activity could be confirmed.

[3] A SWFL territory consists of a resident Southwestern Willow Flycatcher male defending a home range, unpaired or paired.

[4] Caballo Reach = Within the conservation pool of Caballo Reservoir.

[5] Hatch Reach = From Hwy 185 bridge south of Arrey, NM downstream to the mouth of Coyote Canyon (5.5 miles upstream of Leasburg Dam).

[6] Radium Springs Reach = From the mouth of Coyote Canyon to Leasburg Dam.

Migrant – any WIFL detected only during the period prior to June 10th, and where breeding was neither confirmed nor suspected.

Unpaired Male – a resident SWFL that was documented on or after June 10th and exhibited behavioral characteristics typical of a territorial flycatcher, however breeding was neither suspected nor confirmed

Pair – a SWFL territory where breeding was confirmed or behavioral evidence strongly suggested that pairing had occurred

Pair w/ nest – a SWFL territory where breeding was confirmed by the discovery of an active nest.

4.2.3 Reclamation's Actions to Minimize Effects on and Enhance Flycatcher Habitat

Reclamation will continue to conduct population and habitat surveys for the species (this applies to all species as appropriate), to manage EB and Caballo Reservoirs, to manage the diversion dams, to work cooperatively with IBWC and EBID as part of their restoration program, to work with all stakeholders, and to use the flycatcher/cuckoo management plan to conduct habitat restoration work below Caballo Reservoir. In their flycatcher recovery plan, the Service (Service 2013a, p. 366) noted that Reclamation "provided a conservation plan for the flycatcher during the comment period for the proposed critical habitat designation. The plan includes provisions to monitor flycatcher populations and their habitat, to maintain at least 100 territories, and to proceed with future habitat creation and restoration plans over the next 10 years."

Reclamation's (2012) *Southwestern Willow Flycatcher Management Plan for the Rio Grande Project* established, in part, a plan for Reclamation to continue annual flycatcher presence/absence surveys in cooperation with IBWC. Additional mapping or vegetation inventories will be completed every two to three years until the vegetation is stabilized and mature, thereby allowing managers to identify areas with higher suitability as flycatcher habitat. Also, Reclamation stated that it will maintain goals from the recovery plan for the target number of territories in both the MRG and Lower Rio Grande Management Units through a diversity of restoration projects (Reclamation 2012):

In addition to the above, terms and conditions in the BOs for the delta channel through the delta reach of EBR and the RGOA action area, included the planning, implementation, and monitoring of a restoration project, working with state agencies and local stakeholders on a flycatcher habitat restoration project north of Las Cruces. Additionally, Reclamation continues to monitor the vegetation from EBR south, monitors the river bed elevation north to the south boundary of BDA, and New Mexico Interstate Stream Commission (ISC) staff monitor groundwater levels in the area. Additionally, significant flycatcher habitat exists outside of the berms of the EBR delta channel due to seasonal breaks in the berms and high groundwater, this habitat will be allowed to follow a natural succession process.

4.2.4 Saltcedar Leaf Beetle (*Diorhabda* spp.)

The *Diorhabda* beetle was released in 2001 (DeLoach et al. 2003) to control saltcedar. The beetle is present in the action area and has defoliated saltcedars (BEMP 2013, Tamarisk Coalition 2014; and Reclamation 2013c). Flycatchers use saltcedar as a nesting substrate, which is a concern due to the inevitable expansion of the beetle. However, the majority of flycatcher territories are in stands dominated by native vegetation (willows-cottonwoods), and the defoliation or mortality of saltcedar trees within those stands likely would not reduce overall habitat quality (Moore and Ahlers 2012). The latest information for this summer has the beetle in Caballo Reservoir.

4.3 Current Status of Yellow-billed Cuckoo in Action Area

4.3.1 Critical Habitat

The Service (Service 2014c) has proposed the designation of critical habitat for cuckoos in unit NM-8 which includes a portion of the action area to RM 54. NM-8 is an approximately 170-mi (273-km)-long continuous segment of the lower Rio Grande from EBR in Sierra County at approximately RM 54, upstream through Socorro, Valencia, and Bernalillo Counties to below Cochiti Dam in Cochiti Pueblo in Sandoval County, NM. This unit includes 61,959 acres (ac) (25,074 hectares [ha]) and is consistently occupied by the largest breeding group of the species north of Mexico. The site also provides a movement corridor for western yellow-billed cuckoos moving farther north.

As described in the proposed critical habitat designation (Service 2014c), cuckoos require large tracts of willow-cottonwood or mesquite (*Prosopis* sp.) forest or woodland for their nesting habitat. They rarely nest at sites less than 50 acres (20 ha) in size, with sites less

than 37 acres (15 ha) considered unsuitable habitat; patches from 50 to 100 acres (20 to 40 ha) are considered marginal habitat and patches between 100 acres (40 ha) and 200 acres (81 ha), although considered suitable, are not consistently used by the species. It appears that the optimal size of habitat patches for the species are greater than 200 acres (81 ha) with a dense canopy closure and high foliage volume of willows (*Salix* sp.) and cottonwoods (*Populus* sp.). Saltcedar is often a component of the habitat in Arizona and New Mexico. But, as the proportion of saltcedar increases, the suitability of the habitat for cuckoo decreases. Sites with a monoculture of saltcedar are unsuitable habitat for the species. Sites with strips of habitat less than 325 feet (100 m) in width are rarely occupied, which indicates that edge effects in addition to overall patch size influence cuckoo habitat selection for nesting. Individual home ranges during the breeding season average over 100 acres (40 ha), and home ranges up to 500 acres (202 ha) have been recorded (Service 2014c).

The proposed critical habitat designation included three primary constituent elements for the cuckoo (Service 2014c):

1. Riparian woodlands. Riparian habitats with mixed willow-cottonwood vegetation, mesquite-thorn forest vegetation, or a combination of these contain habitat for nesting and foraging in contiguous or nearly contiguous patches that are greater than 325 feet (100 m) in width and 200 ac (81 ha) 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.
2. Adequate prey base. Presence of a prey base consists 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.
3. Dynamic riverine processes. River systems are dynamic and provide hydrologic processes that encourage sediment movement and deposits 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.

4.3.2 Presence

Moore and Ahlers (2013) surveyed for cuckoos in the MRG from State Highway 60 downstream through the San Marcial Reach and the exposed portion of the EBR conservation pool. They found one of the largest remaining cuckoo populations in the Southwestern United States. Their survey results indicate that the number of cuckoos detected and the number of territories occupied was also the highest and most consistent during a period of time in this reach. In 2013, the exposed pool of EBR constituted 86 percent of all cuckoo detections and 86 percent of all territories found within the San

Marcial Reach. The San Marcial subset also contained 48 percent of all cuckoo detections, and 50 percent of all territories found in the entire MRG Study Area. A total of 189 cuckoo detections, comprising an estimated 60 territories, were discovered within EBR delta reach during the 2013 survey season. The San Marcial reach is the only reach that has maintained a fairly large and consistent population of cuckoos during the past 5 years, ranging from 57 to 70 territories, annually. In contrast, nearly all other reaches have experienced substantial annual variability over the same period. These results suggest the distribution of breeding territories along the Rio Grande can vary annually among reaches. This is likely influenced by the availability of preferred habitat, vegetation, and hydrological characteristics. Population variability may possibly be linked to availability of an abundant prey base. **Figure 4-7** shows the numbers of detections and territories during the last five years in the San Marcial Reach. Appendix A shows general locations of territories. For more specific locations of recent territories in the action area, see Moore and Ahlers (2014).

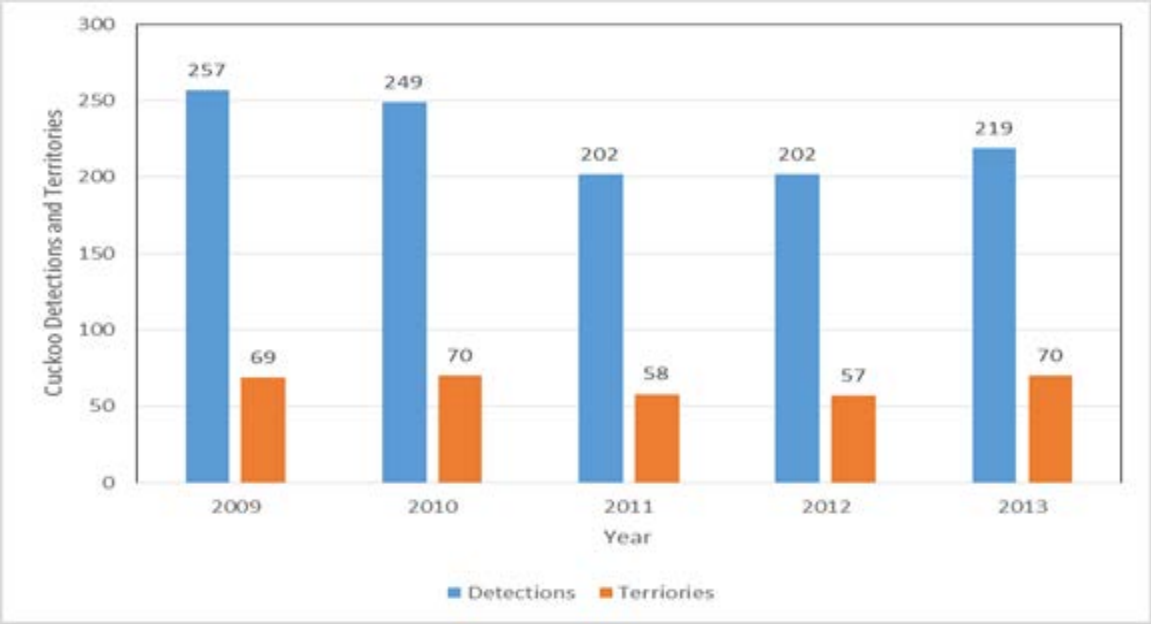

Figure 4-7. Cuckoo detections (blue columns) and territories (red columns) in San Marcial Reach (Ahlers and Moore 2014). Surveys have been conducted since 1998 but methods were not refined or consistent until 2009.

Breeding cuckoos have been known to inhabit suitable flycatcher breeding habitat in the MRG. Therefore, during Reclamation's surveys for flycatchers in suitable habitat from Caballo Reservoir, NM to El Paso, TX, surveyors periodically played cuckoo vocalizations in an effort to elicit responses. These casual detections cannot be considered formal survey results but were recorded as detection waypoints in the comments section of the flycatcher survey form for the particular survey site (Reclamation 2013c).

While conducting these 2012 flycatcher surveys, a total of 12 casual cuckoo detections were recorded. All detections occurred between June 23 and July 19 and, as such, were

assumed to be resident birds. Due to habitat characteristics, all but three detections occurred in the delta of Caballo Reservoir – five were documented in the Caballo Delta North site, three were heard in the Caballo Delta South site, and one was located in the Las Palomas site. The other three birds were located in the Selden Canyon (two detections) and HA-02 (one detection) sites (Reclamation 2013c).

The San Marcial Reach is the longest reach (27.5 river miles) in Reclamation's study area from Highway 60 downstream to EBR. It contains the greatest abundance of suitable cuckoo habitat when compared to all other reaches within the study area (**Table 4-6** and **Table 4-7**). This reach encompasses sites immediately upstream and within EBR and supports nearly 6,000 ha of riparian vegetation (**Table 4-7**). Native dominated canopy covers 29 percent of the reach, while exotic or mixed canopy dominated areas account for only about 22 percent of the reach. Vegetation in the upstream portion of the reach and outside the active floodplain consists almost entirely of decadent stands of saltcedar.

Upstream of the reservoir, but within the active floodplain, the vegetation has also become increasingly decadent during the past several years and is dominated by exotics. These areas, which once supported vigorous stands of native coyote and Goodding's willow, have recently converted to saltcedar, and overbank flooding is essentially nonexistent due primarily to a degraded river channel. The portion of this reach that lies within the reservoir pool, however, is dominated by native vegetation, particularly to the west of the delta channel, which is typically flooded or wetted by flows from the LFCC outfall. This area supports some of the best native riparian habitat within the entire study area, and currently also supports the largest population of flycatchers within their range. These areas were colonized by native willows as the reservoir receded during the late-1990s to the early 2000s and are watered by the LFCC outfall. Vast expanses of multiple-age classes of Goodding's and coyote willow habitat have developed from the upper end of the reservoir pool (sites LF-17 and LF-17a) through "The Narrows." These stands provide high-quality breeding habitat for both cuckoos and flycatchers. This reach has been surveyed annually since 2006 (Ahlers and Moore 2014).

Table 4-6. River reaches included in the 2013 cuckoo survey area (Ahlers and Moore 2014).

River Reach	River Miles	Length
Belen	130.5 to 126.5	4.0 river miles
Sevilleta NWR/La Joya	126.5 to116.0	10.5 river miles
San Acacia	116.0 to 104.0	12.0 river miles
Escondida	104.0 to 84.0	20.0 river miles
Bosque del Apache NWR	84.0 to 74.0	10.0 river miles
Tiffany	74.0 to 68.5	5.5 river miles
San Marcial	68.5 to 38.5	27.5 river miles
Total	**130.5 to 41.0**	**90.5 river miles**

Table 4-7. Major vegetation community types* within respective river reaches (Siegle et al. 2013).

Riparian Community Type	Hectares/River Reach													
	Belen		Sevilleta NWR/La Joya		San Acacia		Escondida		Bosque del Apache NWR		Tiffany		San Marcial	
	Ha	%	Ha	%	Ha	%	Ha	%	Ha	%	Ha	%	Ha	%
Native Canopy[1]/Native Understory[2]	5.7	1%	7.3	1%	22.3	2%	27.1	2%	40.9	3%	14.2	1%	338.7	6%
Native Canopy/Mixed Understory	3.2	1%	29.5	4%	42.1	5%	106.4	6%	196.3	14%	57.9	4%	665.3	11%
Native Canopy/Exotic Understory	33.6	9%	28.7	3%	122.2	13%	117.4	7%	333.9	24%	91.5	7%	462.2	8%
Mixed Canopy/Native Understory	6.1	2%	21.4	3%	0.0	0%	5.7	<1%	6.9	<1%	0.0	0%	5.7	<1%
Mixed Canopy/Mixed Understory	38.9	10%	69.2	8%	135.6	15%	84.6	5%	37.6	3%	32.0	2%	164.3	3%
Mixed Canopy/Exotic Understory	3.2	1%	86.2	10%	18.6	2%	106.0	6%	59.9	4%	193.0	15%	170.4	3%
Exotic Canopy/Native Understory	0.0	0%	0.8	<1%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
Exotic Canopy/Mixed Understory	0.8	<1%	4.0	<1%	29.1	3%	12.5	1%	0.0	0%	0.0	0%	10.1	<1%
Exotic Canopy/Exotic Understory	15.0	4%	45.3	5%	137.2	15%	85.4	5%	111.7	8%	569.0	44%	722.8	12%
Native Canopy – No Understory	14.2	4%	38.0	5%	22.7	2%	67.6	4%	4.0	<1%	0.8	<1%	228.7	4%
Mixed Canopy – No Understory	1.6	<1%	26.3	3%	6.1	1%	0.0	0%	0.0	0%	53.0	4%	57.1	1%
Exotic Canopy – No Understory	1.6	<1%	7.3	1%	25.9	3%	95.9	5%	2.0	<1%	104.0	8%	182.5	3%
No Canopy - Native Understory	43.3	11%	42.1	5%	74.5	8%	89.0	5%	79.3	6%	0.4	<1%	289.0	5%
No Canopy - Mixed Understory	29.1	8%	46.5	6%	48.6	5%	218.9	12%	215.3	16%	29.1	2%	473.1	8%
No Canopy - Exotic Understory	188.2	49%	383.2	46%	234.3	25%	783.9	44%	286.5	21%	163.1	12%	2231.9	37%
TOTALS	**384.5**		**836.1**		**919.1**		**1800.9**		**1373.9**		**1308.0**		**6002.4**	

*Vegetation data based on 2011 aerial photography and 2012 ground truthing/classification using modified Hink and Ohmart (1984) method. [1]Canopy = vegetation greater than 6m in height.
[2]Understory = vegetation less than 6m in height

During 2013 surveys, there were 391 total cuckoo detections, and 381 detections were recorded in various habitat types consisting of woody riparian vegetation. Ten detections were recorded in areas classified as "non-habitat" and were excluded from analysis. **Table 4-8** summarizes these detections and their associated major habitat types. More than half of 2013 detections were located in areas with a native canopy component. Additionally, more than 80 percent of detections were located in habitat with one of the three canopy classes (native, exotic, or mixed). Only 7.3 percent were located in habitat dominated by exotic canopy, and 19 percent of detections were located in habitat lacking any canopy, with 9.4 percent being located in exotic understory (primarily saltcedar) (Ahlers and Moore 2014).

Table 4-8. Distribution of 2013 cuckoo detections within the major habitat types.

Major Plant Community Type	Number of Cuckoo Detections*	Percent Distribution
Native Canopy/Native Understory	49	12.9%
Native Canopy/Exotic Understory	73	19.2%
Native Canopy/Mixed Understory	80	21.0%
Exotic Canopy/Native Understory	0	0.0%
Exotic Canopy/Exotic Understory	15	3.9%
Exotic Canopy/Mixed Understory	1	0.3%
Mixed Canopy/Native Understory	3	0.8%
Mixed Canopy/Exotic Understory	21	5.5%
Mixed Canopy/Mixed Understory	34	8.9%
Native Canopy – No Understory	14	3.7%
Exotic Canopy – No Understory	12	3.1%
Mixed Canopy – No Understory	6	1.6%
Native Understory – No Canopy	15	3.9%
Exotic Understory – No Canopy	36	9.4%
Mixed Understory – No Canopy	22	5.8%
TOTAL	**381**	**100%**

* YBCU detections within non-habitat areas were excluded (n=10).

During 2013 surveys, there were 391 total cuckoo detections, and 381 detections were recorded in various habitat types consisting of woody riparian vegetation. Ten detections were recorded in areas classified as "non-habitat" and were excluded from analysis. **Table 4-8** summarizes these detections and their associated major habitat types. More than half of 2013 detections were located in areas with a native canopy component. Additionally, more than 80 percent of detections were located in habitat with one of the three canopy classes (native, exotic, or mixed). Only 7.3 percent were located in habitat dominated by exotic canopy, and 19 percent of detections were located in habitat lacking any canopy, with 9.4 percent being located in exotic understory (primarily saltcedar) (Ahlers and Moore 2014).

When comparing the habitat of delineated territories to areas where the cuckoo detections were made, similar trends emerge. Almost 50 percent of cuckoo territories were

composed of habitat dominated by a native canopy (**Figure 4-8**, **Figure 4-9**, and **Table 4-9**). Nearly 74 percent of land occupied by cuckoo territories contained a canopy component. Exotic canopy-dominated habitat comprised just 8.9 percent of the core area of cuckoo territories and a total of 26.1 percent of the territory area lacked a canopy layer (Ahlers and Moore 2014).

Although the prolonged drought conditions over the past several years have significantly reduced the structure and density of younger age classes of vegetation within the San Marcial Reach, the more mature stands occupied by the cuckoos do not appear to have experienced the same fate. The roots from the trees comprising the canopy have likely been able to reach the current water table and been able to sustain themselves. However, if the drought persists, even the more mature canopy trees would likely suffer (Ahlers and Moore 2014).

Following the recession in EBR water levels from 1995 to 2004, several vast stands of native Goodding's willow-dominated habitat were established. In the upstream portion of EBR, this habitat is maintained on the west side by flows from the LFCC and is typically flooded during normal years. Habitat, particularly within the southern portion of the exposed reservoir, continues to improve and is likely to support an increasing number of cuckoos in the near future. Conversely, habitat in the upper portion of the exposed reservoir associated with both the Rio Grande and the LFCC outfall, has begun to decline in quality due to either a reduced groundwater table or extended flooding. These areas become less attractive to both cuckoos and flycatchers as they are converted to either cattail marsh or dry, sparse saltcedar (Ahlers and Moore 2014).

Based on monitoring data collected by Reclamation staff (Reclamation 2009), young Goodding's willow are more flood tolerant than saltcedar, with Goodding's willow densities and height increasing following a period of 6 months of inundation with 18-24 inches over the terminal bud primarily during the dormant season . Similar observations have been reported by Ellis et al. (2008), who reported a die-off of saltcedar understory and survival of Goodding's willow at Roosevelt Lake in AZ. They also found that most species were not able to survive more than one year of complete inundation. Since the vast majority of the flycatcher territories within EBR are dominated by Goodding's willow, the flood tolerance of this species could have a major influence in the short and long-term impacts of a rising pool.

During the summer of 2013, EBR dropped to an elevation not seen since 1972. The reservoir pool elevation of 4,286 feet in July 2013 was approximately 120 vertical feet and nearly 2 million AF from full capacity. The receded pool exposed 12,950 ha spread across 30 river miles of floodplain and suitable habitat above an elevation of 4,345 feet is relatively abundant. **Figure 4-10** shows the elevational distribution of cuckoos within EBR from 2009 to 2013. The elevational range of 4,355 to 4,360 feet has consistently supported the greatest density of cuckoos within EBR during the past five years.

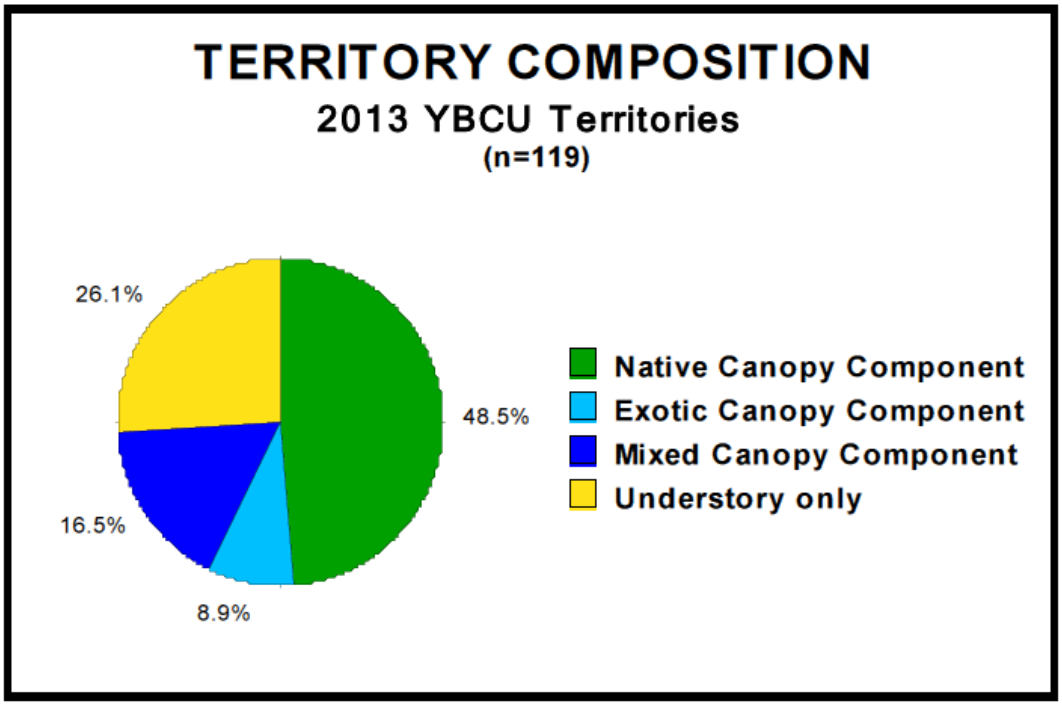

Figure 4-8. Habitat Composition of 2013 Cuckoo Territories

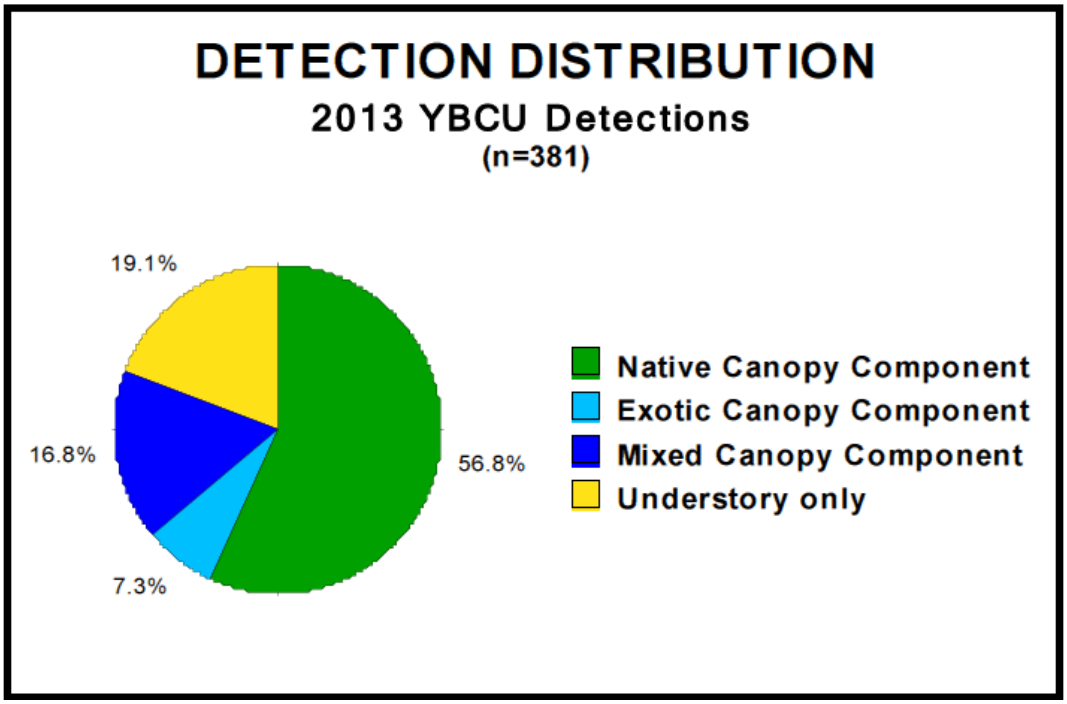

Figure 4-9. 2013 Cuckoo Detection Distribution by Dominant Canopy Type

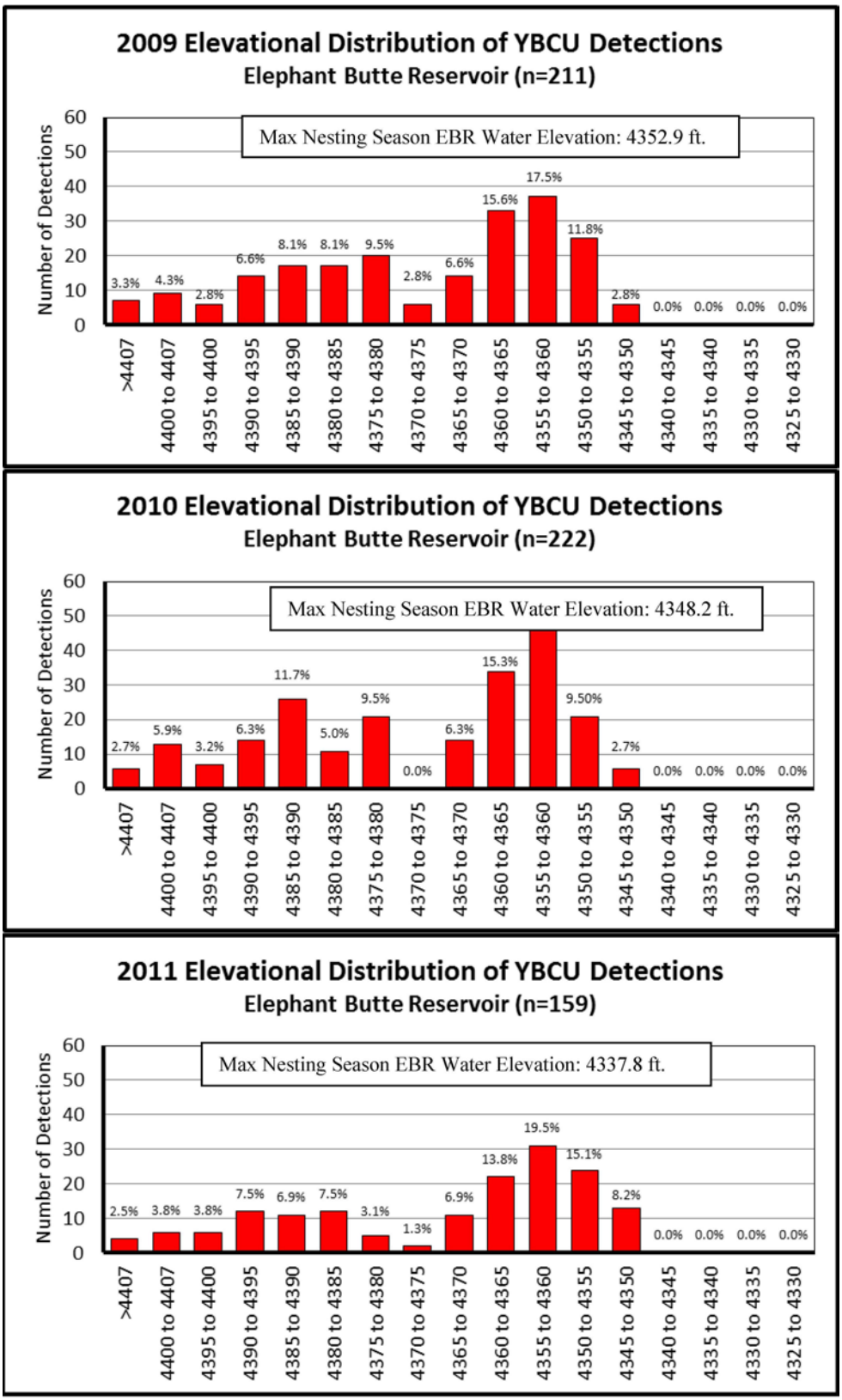

Figure 4-10. Elevational distribution of cuckoo detections within EBR 2009 to 2013 (source Ahlers and Moore 2014).

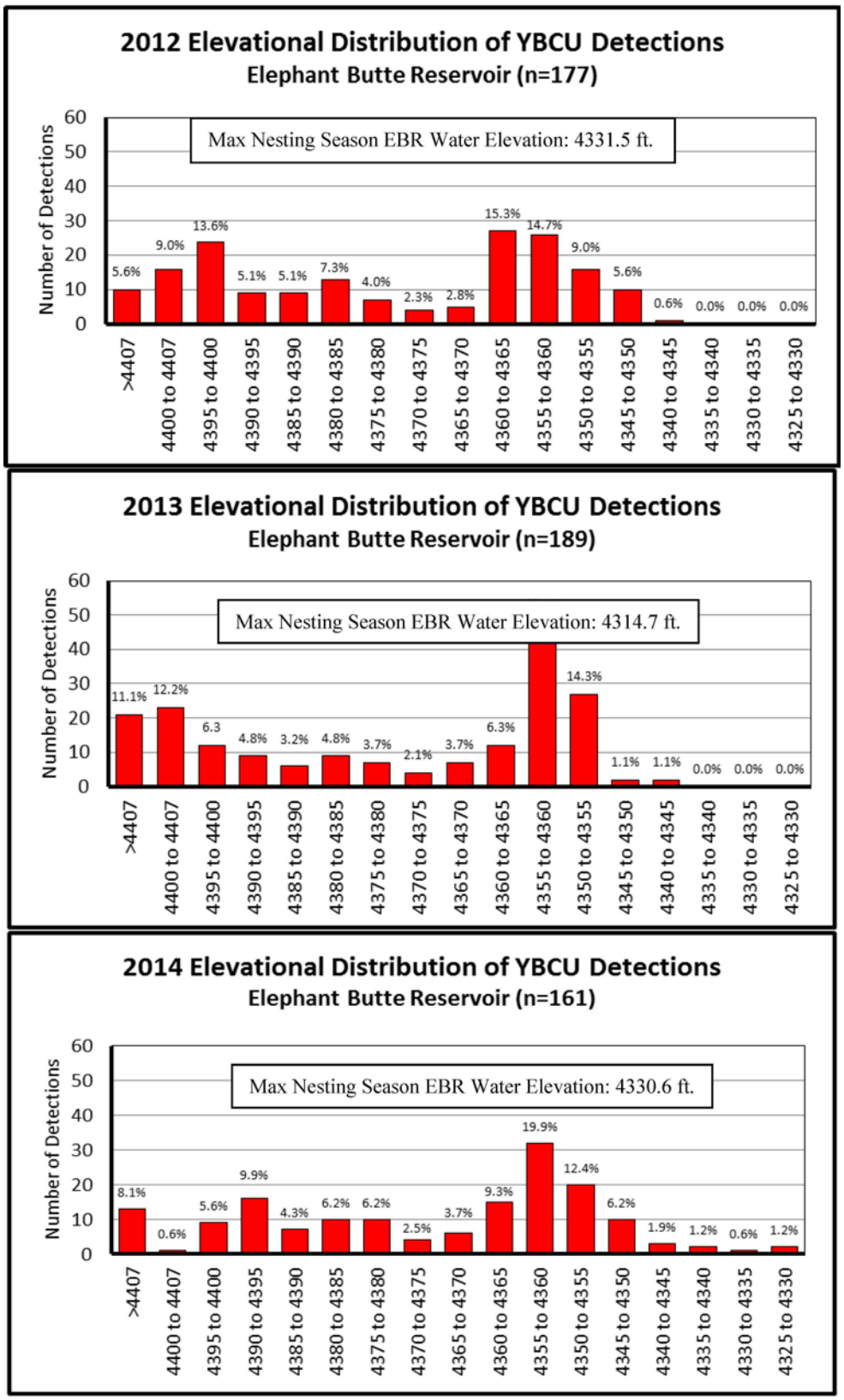

Figure 4-10. (Continued)

Table 4-9. Territory composition by major habitat type of 2013 cuckoo breeding territories (n=119).

Major Plant Habitat Type	Area of Habitat Type* (Ha)	Percentage of Territory
Native Canopy/Native Understory	57	9.3%
Native Canopy/Exotic Understory	106	17.4%
Native Canopy/Mixed Understory	118	19.3%
Exotic Canopy/Native Understory	0	0.0%
Exotic Canopy/Exotic Understory	31	5.1%
Exotic Canopy/Mixed Understory	1	0.2%
Mixed Canopy/Native Understory	2	0.3%
Mixed Canopy/Exotic Understory	35	5.7%
Mixed Canopy/Mixed Understory	54	8.9%
Native Canopy – No Understory	15	2.5%
Exotic Canopy – No Understory	22	3.6%
Mixed Canopy – No Understory	10	1.6%
Native Understory – No Canopy	53	8.7%
Exotic Understory – No Canopy	51	8.4%
Mixed Understory – No Canopy	55	9.0%
TOTAL	**610**	**100%**
*Area based on 150 m radius circle (7.1 ha) surrounding delineated territory center (non-habitat areas excluded).		

4.3.3 Reclamation's Actions to Minimize Effects on and Enhance Cuckoo Habitat

The terms and conditions in the Service's BOs for the delta channel included the planning and implementation of a restoration project to establish flycatcher habitat on the Rio Grande, outside of the San Marcial Reach. These efforts would also directly benefit cuckoos. Additionally, Reclamation also proposes to include the cuckoo in the flycatcher management plan and when conducting habitat restoration projects would create habitat for both birds. Reclamation continues to conduct surveys in the RGP for the cuckoo, and as previously mentioned monitors the river bed elevations up to BDA.

4.4 Current Status of New Mexico Meadow Jumping Mouse in Action Area

4.4.1 Critical Habitat

The mouse has exceptionally specialized habitat requirements to support unique life-history needs and maintain adequate population sizes, including tall (averaging at least 61 centimeters [cm] =24 inches [in]), dense riparian herbaceous vegetation (plants with no woody tissue) primarily composed of sedges (plants in the Cyperaceae Family) and forbs (broad-leafed herbaceous plants). This suitable habitat is found only when wetland vegetation achieves full growth potential associated with perennial flowing water. This vegetation is an important resource need for the mouse because it provides vital food sources (insects and seeds), as well as the structural material for building day nests that

are used for shelter from predators. In addition, individual jumping mice also need intact upland areas (areas up gradient and beyond the floodplain of rivers and streams) adjacent to riparian wetland areas because this is where they build nests or use burrows to give birth to young in the summer and to hibernate during the winter. Some uncertainty exists about the particular location of hibernation sites relative to riparian areas.

The mouse is only active three or four months during the summer. Within this short timeframe, it must breed, birth and raise young, and store up sufficient fat reserves to survive the next year's hibernation period. In addition, these mice only live three years or less and have one small litter annually with seven or fewer young, so the species has limited capacity for high population growth rates due to this low fecundity. As a result, if resources are not available in a single season, jumping mice populations could be greatly stressed.

Proposed critical habitat for the mouse does not exist within the RGOA action area. The Service (Service 2014b) proposed designating of 294 ha (727 ac) of critical habitat for mouse on the Rio Grande along streams, ditches, and canals within three subunits of streams on lands owned by Isleta Pueblo, Bernalillo County; Ohkay Owingeh, Rio Arriba County; and the Service's Bosque del Apache Natural Wildlife Refuge (NWR), Socorro County, NM. Areas proposed for mouse critical habitat do not include land within the RGOA action area, with closest critical habitat approximately 16 mile north of the delta reach of EBR on Bosque del Apache NWR.

The proposed critical habitat designation included four primary elements for the mouse (Service 2014a):

1. Riparian communities along rivers and streams, springs and wetlands, or canals and ditches characterized by one of two wetland vegetation community types: (a) Persistent emergent herbaceous wetlands dominated by beaked sedge (*Carex rostrata*) or reed canarygrass (*Phalaris arundinacea*) alliances; or (b) Scrub-shrub riparian areas that are dominated by willows (*Salix* spp.) or alders (*Alnus* spp.);
2. Flowing water that provides saturated soils throughout the mouse's active season that supports tall (average stubble height of herbaceous vegetation of at least 69 cm (27 in) and dense herbaceous riparian vegetation (cover averaging at least 61 vertical cm (24 in) composed primarily of sedges (*Carex* spp. or *Schoenoplectus pungens*) and forbs, including, but not limited to one or more of the following associated species: spikerush (*Eleocharis macrostachya*), beaked sedge (*Carex rostrata*), reed canarygrass (*Phalaris arundinacea*), rushes (*Juncus* spp. and *Scirpus* spp.), and numerous species of grasses such as bluegrass (*Poa* spp.), slender wheatgrass (*Elymus trachycaulus*), brome (*Bromus* spp.), foxtail barley (*Hordeum jubatum*), or Japanese brome (*Bromus japonicas*), and forbs such as water hemlock (*Circuta douglasii*), field mint (*Mentha arvense*), (*Rudbeckia laciniata*);

3. Sufficient areas of 9 km to 24 km (5.6 to 15 mi) along a stream, ditch, or canal that contain suitable or restorable habitat to support movements of individual mice; and
4. Adjacent floodplain and upland areas extending approximately 100 m (330 ft.) outward from the water's edge (as defined by the bankfull stage of streams).

4.4.2 Presence

Based on work conducted in support of delta channel maintenance (Reclamation 2013e), mice are not expected to occur within the RGOA action area for many reasons. First, the delta channel and associated access road and staging areas have been maintained approximately annually, since 1999. Annual scouring events from spring runoff and/or monsoon flows also contribute to the lack of vegetation and suitable habitat for the mouse. Next, the action area elevation is below 4,500 feet (above sea level), an elevation considered as a cutoff point for mice (Frey 2013). There is also a lack of moist soils supporting appropriate herbaceous species on berms (Frey 2013), and the berms are steep sided and composed of dry, sandy soils that would not be suitable for burrowing for maternal nesting or hibernation (V. Ryan 2014, pers. comm.). Finally, in similar habitat on Bosque del Apache NWR, approximately 16 miles north of the northern extent of the EBR delta, Frey and Wright (2012) did not find mice within the Rio Grande floodplain and also did not consider it a potentially suitable habitat.

Although trapping surveys for the mouse have not been completed throughout the RGOA action area, Frey and Kopp (2014) completed a preliminary assessment of mouse habitat down to RM 38 using GIS-based vegetation mapping and field evaluations of irrigation drains and the Low Flow Conveyance Channel. Mapping did identify potentially suitable habitat (herbaceous and regenerating willow) adjacent to the channel, outside of the berms up to the uplands, but because of the coarseness of the available data, this was a conservative effort and overestimated the amount of habitat. The assessment's field evaluation portion was conducted approximately every mile, depending on access, down to approximately RM 55.3. Four sites in the upper end of the Upper Reach of the delta maintenance area were assessed (between RM 55 and RM 58), and none of these sites were considered to be potentially suitable habitat (Frey and Kopp 2014). The nearest known, occupied mouse habitat is upstream of the project area along manmade canals in dense herbaceous habitats at Bosque del Apache NWR (Frey and Wright 2012), 16 river miles upstream. Based on an October 2014 survey of action area sites where there was potentially suitable habitat identified by Frey and Kopp (2014), only the Pete Well launching site was considered to possibly have suitable habitat. The Pete Well site was surveyed by Reclamation in June 2015 to make a final determination on whether the suitability of the site. During the site visit, no potentially suitable mouse habitat was found at the Pete Well Road staging area and equipment launching site. Vegetation was almost entirely dominated by cattails (*Typha* spp.), coyote willow (*Salix exigua*), and Goodding's willow (*Salix gooddingii*). Although, the cattails were tall and dense enough in some locations, they are not considered a food or shelter source for the mouse. Any plants that would be food or shelter for the mouse were either absent or rare (Reclamation 2015c).

4.4.3 Reclamation's Actions to Minimize Effects on and to Enhance Mouse Habitat

Because the mouse was just recently listed, efforts to minimize effects on the mouse have been limited to date. Reclamation did, however, fund Frey and Kopp's (2014) survey of mouse habitat along the delta channel, which has helped to define whether there is potentially suitable habitat. Though these data are coarse and need to be refined with on-the-ground habitat surveys, it is a good start in our understanding of where this species may occur - if it does - south of BDA NWR. Reclamation will continue efforts to define mouse habitat near the delta area and incorporate conservation measures, as appropriate. Reclamation will continue to conduct surveys for the mouse, manage EB and Caballo Reservoirs, manage the diversion dams, and work cooperatively with IBWC, EBID and all stakeholders.

4.5 Current Status of Minnow in Action Area

4.5.1 Critical Habitat

As mentioned above, the action area is outside designated minnow critical habitat, which ends where the active reservoir pool begins. No primary constituent elements of habitat exist in the inflow area to EBR. The Service's (2003) primary elements of habitat for the minnow (Service 2003) include:

1. A hydrologic regime that provides sufficient flowing water with low to moderate currents capable of forming and maintaining a diversity of aquatic habitats, including backwaters, shallow side channels, pools, eddies, and runs.
2. The presence of eddies created by debris piles, pools, or backwater, or other refuge habitat with unimpounded stretches of flowing water of sufficient length to provide a variation of habitats with a wide range of depth and velocities.
3. Substrate of predominately sand and silt.
4. Water of sufficient quality to maintain natural daily and seasonally variable water temperatures in the approximate range of greater than 1°C (35°F) and less than 30°C (85°F) and reduce degraded conditions (e.g., "decreased dissolved oxygen, increased pH").

The lotic portions of the Rio Grande through the RGOA action area south of the EBR Dam lack habitat meeting the first and, in many places, the last of these four elements.

4.5.2 Presence

Minnows currently occur within the action area, specifically within the low-flow conveyance channel and the river itself, starting near RM 62, extending south to the active pool (approximately RM 37 in 2015). Sampling by Reclamation within the low flow conveyance channel documented minnows in backwaters and point bars (see Section 4.5.2; Service 2008, 2014d; Reclamation 2014). This sampling also found young-

of-the-year, indicating that minnow spawning occurred upstream of the EBR pool. Minnows do not occur below EBR in the RGOA action area.

This delta channel has been surveyed by Reclamation at 4 sites in September 2010, 5 sites in September 2011, 4 sites in October 2012, 6 sites in October 2013, and 6 sites in 2014. Mean densities for minnows at each 2002 River Mile surveyed by year, are shown in **Table 4-10**. During the 2010, 2011, and 2013 surveys, minnows were found in suitable habitat (shorelines, backwaters, pools). Though there was not a statistically significant difference between the densities of minnow at individual sites, the upper two sites had higher mean density than the downstream sites (Reclamation 2013a). In February 2014, electrofishing sampling was conducted by Reclamation biologists near the confluence of the LFCC and downstream into the delta channel. The sampling yielded 10 minnow captures (Reclamation 2013a). Minnows are not expected to be found past the inflow to the active reservoir pool, that is, in the reservoir (approximately RM 37 in 2015). The decrease in minnow population density from 2010 to 2014 follows a similar pattern for the minnow throughout the MRG due to drought and decreased spring runoff (Reclamation 2013a).

4.5.3 Reclamation's Actions to Minimize Effects on and to Enhance Minnow Habitat

Along the channel though the full pool footprint, starting near RM 62, extending south to the active pool (approximately RM 37 in 2015), recent and ongoing construction and maintenance of the delta channel helps to maintain a riverine habitat suitable for minnows, including slackwater, backwaters, shoals, and pools, in an area that previously lacked any habitat (Reclamation 2014). Past the BDA, the final return location for all the water in the irrigation system, to the ongoing pool elevation is a section that remains wet all year.

Table 4-10. Minnow densities found during September/October surveys conducted by Reclamation, 2010-2014 (Reclamation 2013a).

River Mile#	2010	2011	2012	2013	2014
55	**	5.56	**	0.00	0.00
53	**	**	0.00	**	**
52	**	3.47	**	0.00	**
51	63.09	1.33	0.00	**	0.12
50	27.01	**	**	**	0.15
48	1.98	2.40	0.00	0.00	0.35
47	**	1.81	**	**	**
46	10.07	**	0.00	0.34	**
44	**	**	**	**	0.28
43	**	**	**	0.39	**
41	**	**	**	0.00	**
39	**	**	**	**	0.41
37	**	**	**	**	0.00
Overall CPUE§	**24.07**	**2.83**	**0.00**	**0.08**	**0.13**

**-- Surveys were not conducted.
#- Nearest whole 2002 River Mile to the actual coordinates of the seining location.
§- Calculated as all minnows captured divided by total area seined (divided by 100) for that year's survey.

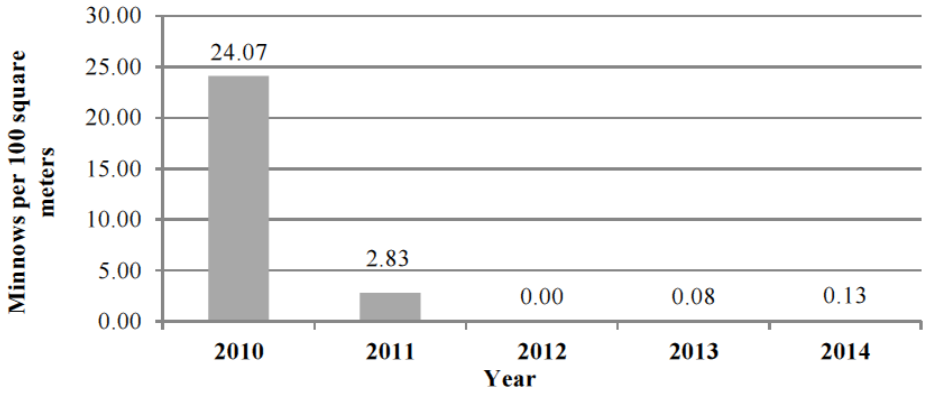

Figure 4-11. Rio Grande silvery minnow densities during September/October surveys conducted by Reclamation (2014).

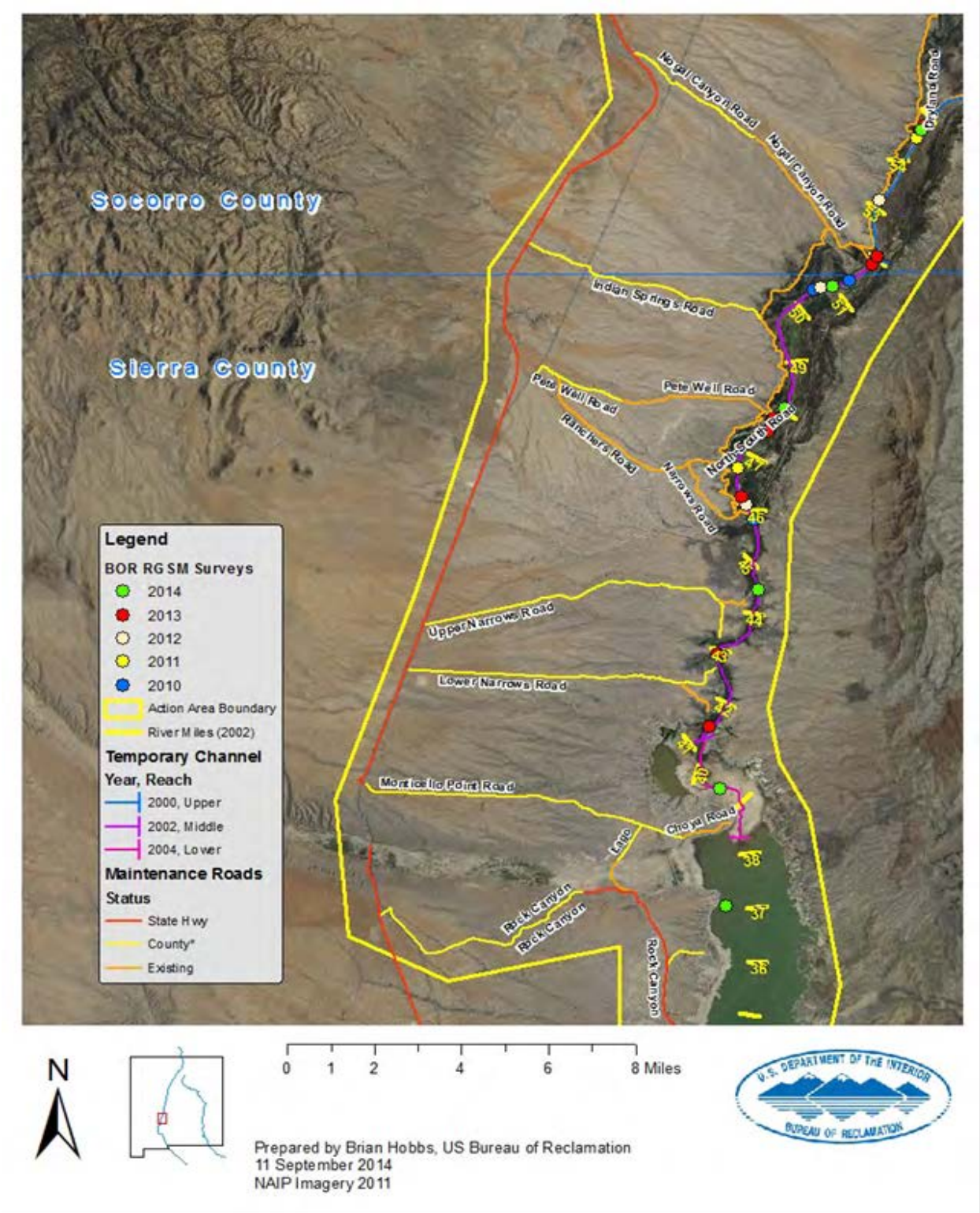

Figure 4-12. Reclamation survey sites for Rio Grande silvery minnow in the delta channel since 2010.

5. Effects of the Action

The reaches below Elephant Butte Dam would remain unchanged from the baseline and the effects to listed species that have been previously considered by Reclamation (2013a) or IBWC (2001, 2004). However, the RGOA, over its remaining duration, might produce environmental changes affecting ESA listed species and their habitat within EBR. Direct effects are based on modeled projections of future monthly EBR water surface elevations shown in **Figures 2-2 to 2-5**. Indirect effects would be any long-term changes in vegetation patches or territories of the birds in EBR, or the few patches of vegetation below Caballo Dam previously consulted upon by the IBWC (2001, 2004); however, given the cycles depicted in **Figures 2-3 and 2-4**, it is unlikely that such long-term changes in vegetation would occur. Instead, the fluctuations in water surface elevations would create dynamics in vegetation associations favorable to the birds.

5.1 Southwestern Willow Flycatcher and Yellow Billed Cuckoo

Both birds rely on dense patches of riparian vegetation for nesting, feeding, and other life cycle requirements. Both birds are presently restricted to the elevation in EBR above 4,325 feet (**Figures 4-4 and 4-10**). Flycatcher designated critical habitat extends to RM 54, at about the 4,380 foot elevation. The primary determinant of effect of the action to birds, would be months when the EBR water surface elevation rises (and remains) over 4,325 feet. Above this elevation, rising waters might inundate and potentially destroy flycatcher/cuckoo habitat, at least temporarily during the projected cycles through 2050.

Reclamation (2009) has previously reported that a partial (10-15 ft.) and temporary (< 6 months) flooding would likely cause a reduction in the overall structure of the vegetation. The shrub layer, if present, could be slow to recover. However, Goodding's willow, a primary component of occupied flycatcher territories within EBR, is a flood-tolerant species (Whitlow and Harris 1979). Goodding's willow dominates the vegetation and supports a large portion of the EBR flycatcher population. Saltcedar, coyote willow, and cottonwood are also components of flycatcher habitat within this reach, and these species can survive short-term inundations.

Based on hydrologic data collected since 2004, a large portion of the northern portion of the reservoir pool remains flooded throughout the year due to the outfall from the LFCC (Moore 2005, Moore and Ahlers 2005), not from the river channel into EBR. Water depth typically ranges from 0.5 feet to 2 feet, while some stands of Goodding's willow are showing signs of stress presumably due to prolonged flooding of several years, other stands are showing signs of maturing past a point of suitability for the flycatcher. Though habitat changes are occurring, suitable habitat in this portion of the reservoir pool remains relatively abundant.

Lowering Water Supply and Reservoir Pool Elevation

When the reservoir recedes cyclically, as the model projects, these reservoir bottom lands or nutrient-enriched exposed soils would quickly revegetate, to again provide habitat for the flycatcher/cuckoo. For example, willow growth on newly exposed reservoir bottomlands below RM 40 has been recently documented to reach and exceed 15 feet in height after two to three years of growth (H. Garcia, personal communication, 2015). If the reservoir remains at low water levels, suitable flycatcher/cuckoo habitat upstream and adjacent to the reservoir pool would ultimately mature through natural succession past a point of suitability. Without inundation, replenishment of nutrients and flushing of the salts would not occur, and the vegetation would be reduced in vigor, degrading its overall habitat suitability for flycatchers/cuckoos and other species.

Figure 4-4 shows the relationship for the distribution of flycatcher territories to water elevation in EBR from 2007 to 2014. Maximum reservoir elevations from April 1 to July 31 are added to those plots, originally presented in Moore and Ahlers (2014, 2015). This is the major portion of the flycatcher nesting season, from when males establish territories through most re-nesting and fledging of most young. (Young fledged after July 31 tend to have a relatively low potential of recruiting into the population, due to the limited time for them to grow and store energy necessary for the later summer and fall migrations to the wintering areas.)

Figure 4-3 presents the water depths that are included on **Figure 4-4**. From the **Figure 4-4** plots, flycatcher territories and nest sites appear to move rather quickly into areas following the drop of EBR water elevations, with occupation occurring within the same elevation histogram box as the EBR maximum water level for that year. While maximum water elevations for the nesting periods are included on the histograms, lower water elevations also occur during each year, as well as during periods outside of the nesting season when willow and other species can rapidly develop riparian habitat. It is also important to recognize that flycatchers nest over water. In fact, Moore and Ahlers (2015, page 77) report that greatest productivity of successful flycatcher nests occur for those over water.

The final (red) plot of **Figure 4-4** shows a pattern of increasing number of flycatcher territories occurring within the approximate EBR full-pool footprint (4,400 ft.) with increasing years of drought. Regression analysis of years of drought versus maximum nesting season EBR water elevation results in a highly significant relationship ($p=0.006$, **Figure 5-1**). In comparison, regressing percent of nest versus EBR water level produced a relatively poor relationship ($p=0.118$). The difference between these two could be expected, because water levels can fluctuate during periods of drought, with relatively minor alterations in water elevations, sometimes up, sometimes down, without producing marked effects on the distribution of territories. As such, this would indicate that duration of drought can have a greater influence on the distribution of flycatcher nests than changes in reservoir water elevations, at least during the range characterized by this dataset.

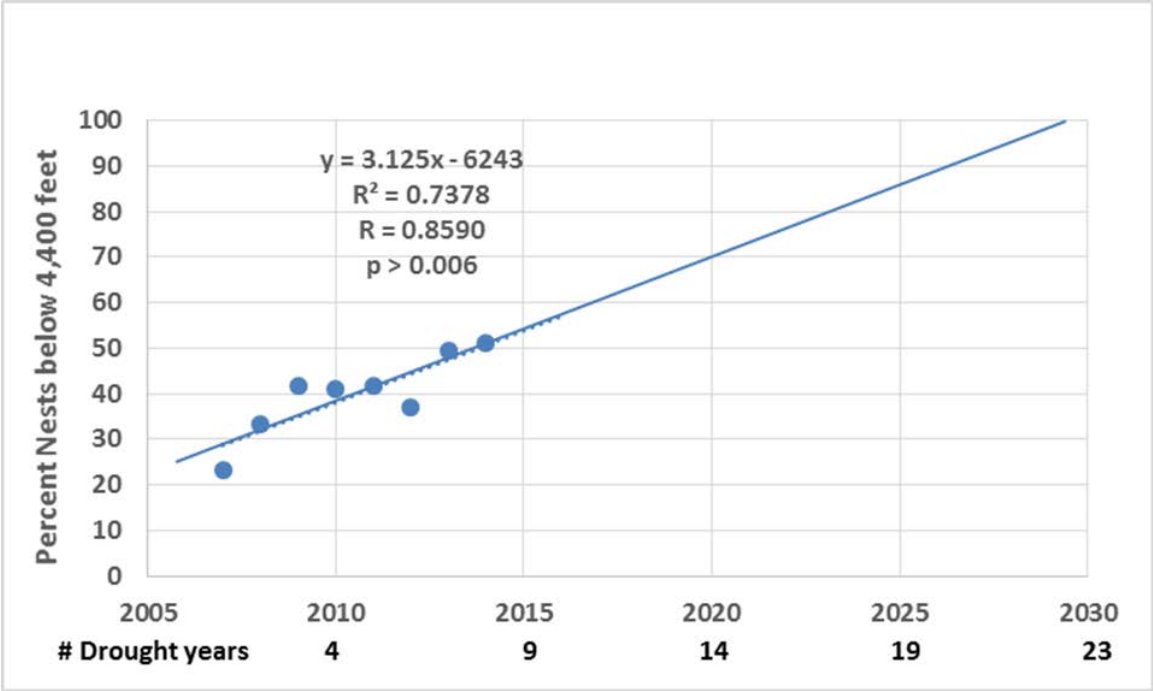

Figure 5-1. Regression results showing a projection of the number of flycatcher nests occurring within the footprint of the full reservoir pool (approximately 4400 ft.) during periods of prolonged drying.

Extrapolating the regression relationship derived for **Figure 5-1** and presented in that figure, indicates that during a period of drought lasting 22 to 23 years, all flycatcher territories would have potentially located to within the full-pool footprint of EBR. Yet, the drought pattern projected in lower graphic indicates maximum drought periods of nine to 15 years, after which the **Figure 5-1** regression indicates that perhaps a maximum of approximately 75 percent of the territories could be located within the full pool footprint.

In considering potential geomorphic changes in the river channel, with resulting effect on the adjacent habitat and effects on listed species and their habitat, it necessary to place potential for future pool lowering in a historical context. The historic minimum pool elevation for EBR, after its initial filling, occurred in August 1954 (4258.03 ft.). Other periods of minimum pool elevations include September 1971 (4271.19 ft.), October 1978 (4290.42 ft.) and July 2013 (4286.25 ft.). The 1954 minimum is about 28 feet lower than the 2013 minimum, so previous periods of marked channel adjustment upstream of EBR have occurred.

This suggests two things, first, very low water elevations are not uncommon in EBR (see **Figure 4-1**, above). Second, a further decline in pool elevation can be expected to occur if the current dry hydrology continues. This difference in slope should allow the river to form a competent channel downstream of about RM 38 if the pool elevation decreases.

In summary, periods of lower water inflows and lowering pool elevation in EBR, without other kinds of disturbance in the delta reach (e.g., fire or mechanical disturbance), would lead to development of mature vegetation communities, known to be unsuitable for flycatcher nesting habitat, as has already been observed within this reach (Moore and Ahlers 2014). Such environmental conditions, while fundamentally a result of natural climatic conditions, unrelated to the RGOA, could potentially produce multi-year periods of negative impact to flycatcher and their habitat.

Rising Water Supply and Reservoir Pool Elevation

The extent of short-term and long-term impacts to existing habitat in EBR from a rising reservoir pool would depend largely on the timing, level of water, and duration of inundation. Loss or degradation of habitat due to increasing reservoir water levels has been found to reduce some bird populations, species richness, and nest success, while other bird species such as shorebirds and waterfowl can benefit from the resulting improved feeding conditions for the species (Ellis et al. 2008, Reitan and Thingstad 1999, Warner and Hendrix 1984). Given the baseline distribution of the birds (**Figures 4-4 and 4-10**), and the critical habitat in the north end of the reservoir at elevation 4,380 feet, the primary concern would be water surface elevations that rose above 4,325 and 4,380 foot elevations during the months when the birds are present and the water remained at these levels for extended periods of time.

As shown in **Figure 4-4**, there is a separation in the density of flycatcher territories at the EBR water elevation of 4,380 feet since data were gathered in 2007; in 2014, 68.8% of territories were above 4,380 feet. In **Figure 4-10,** which depicts data since 2009, the cuckoo has been found in higher density below elevation 4,380 feet, but above 4,325. In 2014, 65.1% of cuckoo territories were below that elevation. As the reservoir rises, cuckoo habitat would be first in line to suffer impacts. The type of impacts to both flycatcher and cuckoo habitat can be considered the same, it is just that the cuckoo has been preferring habitat further south in EBR within the Narrows area. As the reservoir rises, cuckoo habitat would be first in line for impacts and as the reservoir recedes it would be later in regeneration if there are specific variables around the Narrows area of EBR that the cuckoo prefers.

Some habitat in proximity to the rising water levels can be enhanced by a rising water table. Habitat that is partially inundated could be enhanced by deposition of new sediments and nutrients; by flushing of accumulated salts, and by irrigating the respective site. However, prolonged and/or complete inundation can result in the total loss of some riparian habitat, which can depend on species composition and age class in determining survivability.

The greater the degree and duration of flooding, the greater the anticipated reduction in vegetation structure. At EBR (cf. Ellis et al. 2008 for Lake Roosevelt, Arizona), short-term impacts to flycatchers and their habitat would occur if the reservoir rose above 4,325 feet when the birds are present. At such times, flycatchers would be displaced to more suitable habitat. However, as Ellis et al. (2008) found for Roosevelt Reservoir, as

newly established vegetation develops with the inundation area and that vegetation reaches a stage of suitability, flycatcher populations return to the area.

While inundation could create short-term impacts to birds and shrubs, over the long term, a rising reservoir would benefit vegetation by increasing the water table in some areas, resulting in denser vegetation and taller trees favored by the birds. Inundation would also flush accumulated salts from the soils, replenish nutrients, and deposit new sediments. Based on the model, 4,380 feet elevation would be reached about 8% of the time under a wetter future climate. Under a drier climate, the reservoir is not expected to reach high levels.

Figures 2-2 to **2-4**, project cyclical fluctuations of water surface elevations. Given these cycles, it is expected that there will be dynamic succession of vegetation during the remainder of the RGOA. This will not differ from historical, baseline conditions that have resulted in the creation of critical habitat and occupied habitat for the birds.

Figure 2-5 shows that under the wetter climate scenario (P75), the reservoir should be below 4,325 feet 60% of the simulated months; under the central tendency scenario (P50), 55% of the months; and under the drier scenario (P25), 65% of the time. Under P75 and P50, the reservoir should be below 4,380 feet 95% of the months; and under P25, 100%.

5.2 New Mexico Meadow Jumping Mouse

The RGOA is not projected to have any impacts on the mouse because the mouse is not expected to occur within the action area due to the general lack of suitable habitat, especially downstream of EBR. Although trapping surveys for the mouse have not been conducted throughout the action area, Frey and Kopp (2014) completed a preliminary assessment of mouse habitat in the delta reach down to RM 38 using GIS-based vegetation mapping and field evaluations of state drains and the LFCC. This mapping did identify potentially suitable habitat (herbaceous and regenerating willow) adjacent to the channel, outside of the berms up to the uplands, but because of the coarseness of the available data, this was a conservative effort which overestimated the potential habitat.

5.3 Rio Grande Silvery Minnow

The RGOA has no effect on inflows to EBR. It is anticipated that any minnows in the delta reach of EBR would have the ability to move upstream along the lotic ecosystem of the temporary delta channel, continuing upstream of RM62 into the main river channel, during periods of reservoir filling, and thus avoid the lentic ecosystem of a rising reservoir.

Therefore, from the projected EBR water fluctuations modeling, no direct effects can be projected during the remaining term of the RGOA. If RGOA caused effects occur, it is not possible to project or would not be possible to measure RGOA caused effects due to

the strong dominating and confounding influence from the projected range of climate change driven weather patterns.

During the recent decade of drought, the Rio Grande channel upstream of RM 62 has become severely to moderately degraded as the reservoir surface water elevation has dropped to produce a high-energy, steep-gradient channel upstream. This procession has led to marked detachment of the channel from its adjacent floodplain extending upstream into Bosque del Apache NWR (Reclamation 2013e, 2013f). This condition has produced extreme degradation of habitat quality for minnow resting, spawning, rearing, and feeding (Tetra Tech 2015b). Filling of the reservoir would help to progressively slow the velocity of inflow water into the reservoir upstream. With time and the extent of filling progressing upstream, increasing deposition of sediment would occur upstream of RM 62. If this progression was of sufficiently long duration, upstream habitat quality for silvery minnow could markedly improve.

The delta channel provides habitat for minnow that did not exist prior to the reservoir drawdown and prior to the delta channel existence. Furthermore, the delta channel has remained wet during the recent years of severe drought, providing minnow habitat. Construction of the temporary delta channel included developing channel sinuosity (meandering), which produces variable depths and flow velocities in the channel, and promotes the formation of point bars and small backwater areas. Such features produce favorable habitat conditions for juvenile and adult minnows. It is anticipated that maintenance of a delta channel would be necessary to ensure river flow into EBR for efficient reservoir operations during the term of RGOA (Reclamation2013e).

The proposed action area does not include minnow critical habitat. Therefore, maintenance of the existing delta channel to aid MRG flows into EBR would not result in critical habitat loss for the minnow. Channel bed degradation is expected to occur within the delta channel and to continue upstream into the San Acacia reach of the MRG, as long as the reservoir pool continues to drain down. That degradation would occur due to natural geomorphic processes, with minimal and likely non-significant contributions due to channel maintenance activities along the temporary delta channel. In fact, the existing environment along the natural channel includes defined banks that already have formed within this channel. This condition extends for some distance upstream from the full pool contour at RM 62, reaching into the river channel adjacent to Bosque del Apache NWR. Therefore, water deliveries to meet the requirements of the RGOA and storage needs for SJ-C water in EBR would have no effect on upstream designated critical habitat. Effects due to prolonged weather patterns accompanying climate change would have a strong potential to alter minnow habitat

Prolonged periods of continued drought and a shrinking reservoir pool would result in needs to extend the temporary delta channel downstream, extending the reach of new lotic habitat for minnow downstream. Prolonged wet periods are project by Reclamation (2015b) to result in filling of the reservoir pool, constricting the length of the temporary delta channel. This response would reduce channel energies upstream, likely reversing rates of channel degradation and likely refilling some portions of the degrading channel

with deposited sediment. Depending on the extent and duration of reservoir pool filling, the quality of minnow habitat upstream of RM 62 and into its critical habitat reach could benefit from this increased sediment deposition. Such environmental conditions would likely cause minnows to move upstream, potentially into their critical habitat reach upstream of RM 62. If reservoir filling were of a sufficient magnitude and duration (e.g., decades in length), floodplains in some upstream reaches could reconnect to the channel. Therefore, a *Not Likely to Adversely Affect* determination is warranted for minnow and its critical habitat in relation to implementation of the RGOA through 2050.

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6. Determination of Effects

While there is considerable uncertainty in any projection of future hydrology, the Rincon and Mesilla Basins Hydrologic Model indicates that EBR is projected to be at 4,318 feet elevation most future months (50th percentile, central tendency P50). The model shows that over the next 43 years, the reservoir is likely to drop to very low levels and rise to high levels under either the central tendency or wet climate models. However, under the dry climate change model under the driest quintile, the reservoir is likely to reach extremely low levels and it would be unlikely to reach full pool again.

6.1 Southwestern Willow Flycatcher

Based on 2014 flycatcher surveys, about 31% of the flycatcher territories (n=260) exist between 4,325 and 4,380 feet elevation (**Figure 4-4**). Under the most probable future condition (P50, 50th percentile), the reservoir would be below the location of the birds (i.e., it would be between 4,306 and 4,318 feet). Under a wetter future climate, the reservoir would be expected to be within the levels where the birds are present about 20% of the time. Under a drier future climate, the birds would be well above the projected level of the reservoir pool.

An effect form the projected cycles of water surface elevations is due to changes in vegetation and potentially in territories used by the birds. If the reservoir remained full or at high levels, that could adversely affect habitat by killing the vegetation and not allowing for a revegetation process, which is what the modeled projection is from 2047 to 2050. At this time the model was not run after 2015 so we have no indication of how long the full pool would last. But with a rising and receding reservoir with long stretches of low reservoir pool elevations, existing vegetation would survive, or be able to survive short wet periods, or be able to regrow in a short time period, or new areas could vegetate. **Figure 2-4** showed that there are expected to be cycles of higher and lower reservoir levels through 2047. These fluctuating reservoir levels would promote the growth of vegetation which becomes the habitat for the territories used by the birds. It is likely that vegetation would quickly recolonize newly exposed reservoir bottomland and be able to grow fast under the EBR conditions, as has previously occurred. For example, under similar conditions of a shrinking EBR pool over the past two years, a high rate of vegetation growth has occurred between RM 40 and 37 and has already been colonized by flycatchers.

Considerations of such effects from the long-term hydrological modeled projections, however, may be most appropriately considered in the future, when specific conditions producing such effects can be better defined, and are based on monitored responses to actual climatic conditions documented up to that time and updated modeling is available to project potentially new events. In fact, such EBR filling as currently modeled may not actually occur. Therefore, Reclamation, requests that the Service consider whether the

need for Incidental Take for the proposed implementation of the RGOA is required now or later based on modeled versus real future conditions. Again, the model indicates that approximately 20% of future months under a wetter climate could result in higher reservoir levels (although, most of these months would occur in the winter to early spring when the birds are not present and then followed by a reduction in the reservoir due to irrigation deliveries). But the finding of effect is that the continued implementation of the RGOA and SJC storage with future climatic events as projected by the model **"may adversely affect"** flycatchers that could be present in the EBR and designated critical habitat above RM 54 after full reservoir filling in 2047. Based on baseline conditions, as some individual flycatchers may be displaced and some territories/nests may be inundated by a rising reservoir, these impacts might turn out to be only a minor adverse effect since there is more suitable habitat available that is not being used and regrowth of vegetation can occur really fast under the right conditions.

Thus, based on the projected cycles there could be a period of no effect to existing vegetation aside from natural succession from projected low reservoir elevation levels and there could even be habitat gains, then followed by a period of maybe adverse effects from a rising reservoir, but countered by a fast receding reservoir that could allow for the vegetation to regrow, which at the final tally there were some adverse impacts to existing habitat and there was creation of new habitat with no net loss.

The riparian and aquatic habitat in the river downstream from EBR to El Paso is not expected to change under the continued implementation of the RGOA. Caballo Reservoir water levels are highly managed and rarely are these sites flooded by more than a foot or two of reservoir water. The river below Caballo Reservoir is projected to have releases within the range of historical operations under the Proposed Action. These releases would support existing and proposed habitat restoration projects, such as the 30 riparian habitat sites IBWC agreed to enhance with the signing of the 2009 Record of Decision. Below Caballo, the entire river channel to El Paso is more directly influenced by the lack of releases during the non-irrigation season and by monsoon rains. During the non-irrigation season, groundwater or secondary arroyos may provide enough water into the river to keep short sections of the river wet. Based on projected operations of the RGOA in the reach below EBR, there would be **"no effect"** to the flycatcher. No critical habitat for this species occurs in this reach and therefore there would be **"no effect"** to designated critical habitat.

Various ongoing conservation measures exist for other actions that overlap the RGOA action area, and related to other commitments to achieve recovery goals for the flycatcher within the action area. These include, for example, among other measures, Reclamation's (2012) *Southwestern Willow Flycatcher Management Plan for the Rio Grande Project, which* establishes that Reclamation would:

1. Monitor flycatcher habitat and population dynamics within the Middle Rio Grande, with an emphasis upstream from the active pool of EBR.
2. Conduct annual flycatcher presence/absence surveys within the Lower Rio Grande, in cooperation with IBWC.

3. Conduct mapping or vegetation inventories every 2-3 years until the vegetation is stabilized and mature with the goal of informing managers of areas having higher suitability as flycatcher habitat.
4. Maintain the recovery plan goals for the target number of flycatcher territories in both the MRG and Lower Rio Grande Management Units through implementing restoration projects, as appropriate.
5. Assess opportunities to add additional sites to expand restoration efforts to benefit flycatcher habitat (and for other ESA listed species as the cuckoo).

As part of the Delta Channel Maintenance BA, Reclamation (2013a) proposed an array of conservation measures to minimize or avoid adverse effects to listed species. Over the duration of the RGOA, similar needs would continue for periodic delta channel maintenance to ensure efficient delivery of water to EBR by Reclamation needed to meet downstream user demands under the RGOA, as well to meet downstream storage needs of SJ-C water and Rio Grande Compact requirements. A section of those conservation measures that would likely continue, as adaptive management deems appropriate and necessary, along the delta reach up stream of the EBR active pool include:

1. Any maintenance activities having the potential for adverse impacts would be monitored to ensure compliance.
2. Avoidance of impacts to birds protected by the Migratory Bird Treaty Act (16 U.S.C. 703) by conducting channel maintenance activities outside of the normal breeding and nesting season (April 15 to August 15), as possible.
3. Conduct vegetation controls consisting of mechanical removal, mowing, and/or herbicide treatment.
4. Water quality would be monitored during maintenance and after equipment operates in the river channel. Monitoring would include visual observations and may include direct sampling, as appropriate.
5. Channel bed elevation along both the delta reach and upstream reaches (to RM 69) would continue to be closely monitored at least annually.

And, as final example, the Biological Opinion for IBWC's *Integrated Land Management Alternative for Long-Term Management of the lower Rio Grande Canalization Project in southern New Mexico into Texas* (Service 2012) includes several Conservation Measure that also would accompany future in-channel maintenance activities occurring downstream of EBR:

1. Encourage adaptive management of flows and conservation of water to benefit flycatcher and yellow-billed cuckoo habitat in the Lower Rio Grande.
2. Work to secure long-term water sources to support habitat restoration activities in the Lower Rio Grande.
3. Monitor, maintain, and expand riparian habitat restoration areas.

4. Coordinate with the Service and other agencies the monitoring of survey data for federally listed species, including their management, collection, entry, and reporting.
5. Monitor ground water levels near Restoration Sites, as needed.

6.2 Yellow-Billed Cuckoo

The San Marcial Reach and the exposed portion of the EBR conservation pool supports one of the largest remaining cuckoo populations in the Southwestern United States. Survey results indicate that the number of cuckoos detected and the number of territories occupied was also the highest and most consistent during a period of time in this reach. In 2013, the exposed pool of EBR constituted 86 percent of all cuckoo detections and 86 percent of all territories found within the San Marcial Reach. The San Marcial subset also contained 48 percent of all cuckoo detections, and 50 percent of all territories found in the entire MRG Study Area. A total of 189 cuckoo detections, comprising an estimated 60 territories, were discovered within EBR delta reach during the 2013 survey season. The San Marcial reach is the only reach that has maintained a fairly large and consistent population of cuckoos during the past 5 years, ranging from 57 to 70 territories, annually. In contrast, nearly all other reaches have experienced substantial annual variability over the same period. These results suggest the distribution of breeding territories along the Rio Grande can vary annually among reaches. This is likely influenced by the availability of preferred habitat, vegetation, and hydrological characteristics. Population variability may possibly be linked to availability of an abundant prey base (Moore and Ahlers 2013).

Following the recession in EBR water levels from 1995 to 2004, several vast stands of native Goodding's willow-dominated habitat were established. In the upstream portion of EBR, this habitat is maintained on the west side by flows from the LFCC and is typically flooded during normal years. Habitat, particularly within the southern portion of the exposed reservoir, continues to improve and is likely to support an increasing number of cuckoos in the near future. Conversely, habitat in the upper portion of the exposed reservoir associated with both the Rio Grande and the LFCC outfall, has begun to decline in quality due to either a reduced groundwater table or extended flooding. These areas become less attractive to both cuckoos and flycatchers as they are converted to either cattail marsh or dry, sparse saltcedar (Ahlers and Moore 2014).

This effects determination takes into account the current cuckoo population within EBR, their proposed critical habitat that extends to RM 54, and their suitable (occupied or unoccupied) habitat. In some parts of EBR suitable vegetation has aged; and large areas of more mature vegetation are considered a benefit to cuckoo habitat. Vegetation in other parts have died due to earlier periods of inundation or due to more recent period of drought. Both factors can and, undoubtedly, have reduced habitat quality for cuckoo within EBR. Habitat drying or rising pool -induced floodplain inundation could result in a temporarily or permanent loss of habitat with a number of cuckoos displaced from their immediate territories, dependent on the reservoir level scenario. However, it is important

to note that cuckoos can move to newly developed habitat or currently unoccupied habitat along the RGP.

The hydrologic model developed to analyze the RGOA can be used to extrapolate potential effects into the future, relative to the elevation of 4,380 feet at RM 54 where the proposed critical cuckoo habitat extends into EBR. The model results show three cycles of reservoir drying and filling, as shown on Figure 2-4. The first cycle starts with a dry period extending followed by a two-year wet period when EBR fills to a maximum elevation of 4,380 feet before showing a 3-year decline (drying). This increase in the EBR water levels would only just reach the lower extent of the proposed cuckoo critical habitat, thus not affect that habitat. However, based on baseline 2014 cuckoo surveys, 65.1 percent (n=161) of territories would be affected by the reservoir rising to 4,380 feet (**Figure 4-4**). In these considerations, we know that no cuckoo territories currently exist below the 4,325-foot elevation (**Figure 4-4**), and the model shows the reservoir elevation staying around 4,310 for the first two dry cycles.

During the second dry cycle extending nine years (2016 to 2035), regrowth of vegetation could occur, as the reservoir pool recedes. This period is then projected to be followed by a three to five-year wet period (2036 to 2040). The vegetation further south, nearer to the active pool, would be covered by the rising reservoir and die, as the EBR water elevation again reaches its peak at a 4,380 feet, some of the vegetation in the upstream extent of this reach may survive because the reservoir would fluctuate and not flood completely during this cycle. It is likely that vegetation would quickly recolonize the newly exposed reservoir bottomland and be able to grow fast under the EB reservoir conditions, as has previously occurred over the past 20 years.

The third modeled cycle shows EBR filling to 4,407-feet elevation or full pool at about year 2047 and continuing to the end of the modeled period. The extended period of inundation is certain to inundate and kill most if not all vegetation within the proposed critical cuckoo habitat above RM 54. In considering potential effects to cuckoos with territories previously within the inundated reach, it is important to recognize that an abundance of suitable habitat exists adjacent to the reservoir pool and along upstream reaches of the MRG. All such habitat would be available to accommodate any cuckoos displaced during this period of full-pool EBR inundation.

Under the wet climate scenario, a number of cuckoo territories and nests, if present in the riparian areas, would be inundated, depending on the number of the nesting cuckoos continuing to nest at that time within the EBR footprint, the placement of these nests, and the timing of the reservoir rise. An abundance of suitable habitat at higher elevations within the pool and upstream of EBR would be available to accommodate any displaced cuckoos. It is difficult to predict adverse effects with any reasonable degree of certainty or to determine whether the continued implementation of the RGOA would increase the likelihood or frequency of such an occurrence, due the strong influence of climate-change driven weather patterns rather than implementation of the RGOA, as the prime cause of future reservoir water elevation changes. The confounded effects from climate change and the RGOA does produce the possibility that some cuckoos could be displaced and/or

cuckoo nests, if present, could be inundated. Therefore, Reclamation has determined that the proposed action **"may affect, and is likely to adversely affect"** cuckoos in EBR, and to its proposed critical habitat to RM 54 in EBR after the projected model reservoir fill in 2047.

Considerations of such effects from the long-term hydrological modeling, however, may be most appropriately considered in the future. After Reclamation continues hydrological modeling and compares these results to monitored future responses to actual water elevations in EBR. In fact, the projected EBR cycles with a filling in 2047, as currently modeled, may not actually occur. Therefore, Reclamation, requests that the Service consider whether the need for Incidental Take for the proposed implementation of the RGOA is now required. Because some individual cuckoos may be displaced and some territories and nests may be inundated by a rising reservoir based on a model, the need for an incidental take at this time needs to be assessed, Reclamation would re-consult in the future as the model and real events merit such.

Breeding cuckoos have been known to inhabit suitable flycatcher breeding habitat in the MRG. Therefore, during Reclamation's surveys for flycatchers in suitable habitat from Caballo Reservoir, NM to El Paso, TX, surveyors periodically played cuckoo vocalizations in an effort to elicit responses. These casual detections cannot be considered formal survey results but were recorded as detection waypoints in the comments section of the flycatcher survey form for the particular survey site (Reclamation 2013c). While conducting these 2012 flycatcher surveys, a total of 12 casual cuckoo detections were recorded. All detections occurred between June 23 and July 19 and, as such, were assumed to be resident birds. Due to habitat characteristics, all but three detections occurred in the delta of Caballo Reservoir – five were documented in the Caballo Delta North site, three were heard in the Caballo Delta South site, and one was located in the Las Palomas site. The other three birds were located in the Selden Canyon (two detections) and HA-02 (one detection) sites (Reclamation 2013c).

The riparian and aquatic habitat in the river downstream from EBR to El Paso is not expected to change under the continued implementation of the RGOA. The river below Caballo Reservoir is projected to have releases within the range of historical operations under the Proposed Action. These releases would support existing and proposed habitat restoration projects, such as the 30 riparian habitat sites IBWC agreed to enhance with the signing of the 2009 Record of Decision. Below Caballo, the entire river channel to El Paso is more directly influenced by the lack of releases during the non-irrigation season and by monsoon rains. During the non-irrigation season, groundwater or secondary arroyos may provide enough water into the river to keep short sections of the river wet.

Based on projected operations of the RGOA below EBR, there would be **"no effect"** to the cuckoo and there is no critical habitat or proposed critical habitat below RM 54.

Various ongoing conservation measures, as described in Section 6.1, exist for other actions that overlap the RGOA action area, and related to other commitments to achieve recovery goals for the flycatcher within the action area. The conservation measures intended to achieve recovery goals for the flycatcher would also benefit the cuckoo.

6.3 New Mexico Meadow Jumping Mouse

Mice are not expected to occur within the action area due to the general lack of suitable habitat, especially downstream of EBR. This effects determination takes into account the potentially suitable (occupied or unoccupied) mouse habitat that may occur within the reservoir pool. In support of proposed delta channel maintenance, it was determined that proposed work sites in the reservoir did not have the required elements for mouse habitat. While the Pete Well equipment launching site at the south end of the delta channel in EBR was considered to possibly be suitable habitat, Reclamation's survey of the site in June 2015 resulted in a final determination that no potentially suitable mouse habitat occurred at this site. Vegetation was almost entirely dominated by cattails (*Typha* spp.), coyote willow (*Salix exigua*), and Goodding's willow (*Salix gooddingii*). Any plants that could provide suitable food or shelter for the mouse were either absent or rare (Reclamation 2015c). In consideration of the above, our determination is that the proposed action would have **"no effect"** on the mouse and there is no critical habitat for the mouse in the RGOA action area.

6.4 Rio Grande Silvery Minnow

Critical habitat for the minnow extends downstream along the Rio Grande to RM 62, which is at the upstream extent of EBR at full pool. Downstream of RM 62 EBR inflow water travels through two channels in the delta reach; these include the continuation of both the Rio Grande (also known as the Rio Grande Floodway) and the LFCC. They become a single channel shortly upstream from RM 60 that then continues as a single, maintained channel to the active reservoir pool. Thus, there are two available channel habitat reaches for the minnow for approximately 2 miles downstream from RM 62. This entire reach, including both upstream channels, is consider here to be the delta reach and its length can vary depending on the elevation of the EBR pool. During 2014, the upper extent of the EBR active pool was at about RM 37/38. Thus, the 2014 baseline extent of the delta reach was approximately 25 miles from RM 37 upstream to RM 62.

When EBR stored volumes of water increase, as indicated by the modeling projections to occur over the duration of the RGOA, its surface elevation also increases and the extent of the delta reach shortens. Filling of EBR would tend to displace individual minnows and their population within the delta channel closest to the filling pool into more upstream reaches of the channel(s) until EBR reaches its peak storage volume. This upstream movement of minnows could potentially extend into their critical habitat reach of the Rio Grande upstream of full pool extent of EBR (i.e., RM 62). As the reservoir pool subsequently contracts, the minnow could and likely would again move into and repopulate the newly available lotic habitat, repopulating the delta channels. The quality of the habitat would not change or be diminished by fluctuations in reservoir elevation. Minnows are well known to swim freely within the available channel habitat of the Rio Grande. Such movement is commonly necessary for all riverine fish species as they seek new habitats holding fresh food resources to exploit. Reclamation would continue to maintain the delta channel for efficient delivery of water to the reservoir; even without a

maintained channel, a naturally formed river channel would develop as long as upstream river flows were sufficient to enter the EBR pool.

No potential adverse effects to minnow are projected in relation to the model projected range of water storage volumes in EBR in relation to its baseline pool elevation. The basis for this effects determination includes considerations of the minnow's population status and the occurrence of minnows downstream through the delta channel of EBR, from approximately RM 62 to RM 37/38.

As a bottom feeding lotic fish species, appropriate food supplies do not exist for minnows in lentic reservoirs, precluding the potential for developing minnow populations in these habitats. Minnows also do not occur in other downstream Rio Grande reaches of the RGOA action area because suitable habitat does not exist due to annual drying of the river outside of the irrigation season. Due to the absence of minnows in these segments of the action area, continued implementation of the RGOA would produce no adverse effects to this species in these assessment segments.

For the minnow, a **"may affect, but not likely to adversely affect"** determination is warranted due to the ability of the minnow to move upstream, potentially into their critical habitat reach upstream of RM 62, whenever reservoir filling is of a sufficient magnitude and duration to produce such movement. With sufficient magnitude and duration of reservoir filling, critical habitat upstream of RM 62 may receive beneficial effects due to increase deposition of sediment in that reach. The minnow is considered to be extinct in all segments of the action area south of EBR.

7. Conservation Measures

As part of the proposed action of continuing to implement the RGOA and manage the RGP, Reclamation proposes the following conservation measures:

1. Continue modeling updates of hydrology and climatic conditions for the RGOA.
2. Conduct fish community surveys, and flycatcher, cuckoo, and mouse habitat surveys following established protocols.
3. Continue to monitor the channel morphology through the reservoir and upstream of the full pool of EBR (approx. RM 62) to improve understanding of the river as the reservoir fluctuates in elevation.
4. Refine Frey and Kopp's potentially suitable habitat maps.

Reclamation also proposed to update the Reclamation (2012) *Southwestern Willow Flycatcher Management Plan for the Rio Grande Project*, to include the cuckoo. Activities identified in the 2012 plan which would be continued include:

1. Conduct annual flycatcher and cuckoo presence/absence surveys in cooperation with IBWC.
2. Conduct mapping or vegetation inventories every two to three years until the vegetation is stabilized and mature to determine areas having higher suitability as flycatcher and cuckoo habitat.
3. Maintain the recovery plan goals for the target number of flycatcher territories in both the MRG and Lower Rio Grande Management Units.
4. Assess opportunities to expand restoration efforts to benefit flycatcher and cuckoo habitat (and for other ESA listed species).
5. Explore opportunities to reestablish younger age classes of native vegetation, focusing on Goodding's willow.

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Appendix A. Technical Information for Listed Species

Operating Agreement Action Area

For analysis purposes, there are four reaches including in this assessment that vary in degree and type of effects. These geographical segments include:

- EBR, including its upstream delta, New Mexico
- Rio Grande downstream from Elephant Butte Dam to the inflow to Caballo Reservoir, New Mexico
- Caballo Reservoir, New Mexico
- Rio Grande from Caballo Dam to the El Paso-Hudspeth County line in Texas.

Listed Species

Based on literature reviews and field surveys, six threatened or endangered species occur or have been observed within the RGOA action area (**Table A-1**). The following pages provide information that characterize the relationship for two of these species (Interior Least Tern and Piping Plover) to the action area: both are found as rare migrated through the area and both lack suitable habitat in the area. Therefore, no additional assessment is required for these two species. The main text of this BA provides additional discussion on the remaining four species.

Table A-1. Six threatened or endangered species considered for assessment in the action area including listing status.

Scientific Name	Common Name	ESA Status
Hybognathus amarus	Rio Grande silvery minnow	Endangered
Empidonax traillii extimus	Southwestern Willow Flycatcher	Endangered
Zapus hudsonius luteus	New Mexico Meadow Jumping Mouse	Endangered
Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo	Threatened
Sterna antillarum	Interior Least Tern	Endangered
Charadruis melodus	Piping Plover	Threatened

The only current or proposed critical habitat contained within the action area is for the flycatcher and cuckoo. The southern boundary of critical habitat along the Rio Grande in

New Mexico for each was extended to about river mile (RM) 54, or about eight miles into the upper end of the EBR delta, as discussed in the text of this BA. No critical habitat has been designated south of this point for any of the six species.

Interior Least Tern (*Sterna antillarum*)

Status and Distribution

The Service stated in the 2003 Biological Opinion (consultation #2-22-03-F-0129) that "the interior least tern occurs as a vagrant along the Middle Rio Grande, and no nesting has been recently documented. Therefore, effects from the proposed action are likely to be insignificant or discountable."

The Interior Least Tern (*Sternula antillarum athalassos*, tern) was listed as endangered by the Service in 1985 (50 CFR 21784). This subspecies historically bred along the Colorado (in Texas), Red, Rio Grande (in Texas), Arkansas, Missouri, Ohio, and Mississippi River systems and has been found on braided rivers of southwestern Kansas, northwestern Oklahoma, and southeastern New Mexico (Reclamation 2013c). In New Mexico, the tern was first recorded (including nesting) at Bitter Lake National Wildlife Refuge (NWR) in 1949; and since then, it remained present essentially annually (Reclamation 2013a). The species also occurs as an occasional breeder in Eddy County, New Mexico (Reclamation 2013a). The tern has been observed as a 'vagrant' or 'highly unusual' species among the 377 avian species detected on the Bosque del Apache NWR since 1940 (Service 1995). In 2005, a range-wide survey of terns was completed, and the Rio Grande/Pecos River systems collectively made up 0.8 percent of the population (Reclamation 2013a). Historically, tern nesting has been confirmed on six reservoirs along the Rio Grande/Pecos reach at Bitter Lake NWR, Brantley Lake, and Imperial Reservoir on the Pecos; and Lake Casa Blanca, Amistad Reservoir, and Falcon Reservoir on the Rio Grande in Texas (Reclamation 2013a).

Life History and Ecology

Terns nest colonially on bare or sparsely vegetated sand along rivers, lakes, or reservoirs and along mudflats along coasts and rivers. Nesting occurs from late April to August. Sand is the dominant nesting substrate (Reclamation 2013a). Chicks leave the nest a few days after hatching, but parental attention continues until migration in early September. Terns' diet consists of small fish and invertebrates. At the Bitter Lake NWR, the terms are reported to fly at least 3 km from nesting colonies to foraging areas (Reclamation 2013a).

Breeding habitat requirements for this species include the presence of bare or nearly bare ground on alluvial islands, shorelines, or sandbars for nesting, the availability of food (primarily small fish), and the existence of favorable water levels during the nesting season so nests remain above water (Ducey 1981 in Reclamation 2013a). Breeding colonies contain from five to 75 nests. Although most nesting occurs along river banks and reservoirs, the tern also nests on barren flats of saline lakes and ponds. Nests are constructed by scraping a depression within the sand.

Habitat Description

From late April to August, terns use sparsely vegetated beaches and sandbars along rivers or lake or reservoir shorelines. Wide river channels with scattered sand bars are the preferred habitat, but terns use sand and gravel pits. Their nest is a shallow depression in an open area, above high water levels and safe from ground predators; thus islands are favored habitats (Reclamation 2013a).

Threats

The primary threat to the tern is loss and degradation of habitat. Dams and other alterations to river systems have reduced their preferred sandbar nesting habitat. Fluctuating water levels in streams may cause scouring of sandbars or high flows that wash away chicks and nests. Recreational use of beaches and sandbars results in reduced use of such areas by the tern.

Presence-Absence within the Action Area

Altered flows and channelization of the Rio Grande have eliminated suitable nesting habitat; however, terns may use the river corridor for feeding or resting during migration and as mentioned above, they have been documented as present south of the action area. At least one tern was observed in the southern portion of the action area by IBWC during fall surveys in September 2000, presumably in the process of migrating south. The U.S. Geological Survey (USGS) reports no tern at Fort Bliss in El Paso County (Reclamation 2013a) (**Table A-2**). In short, it would be extremely unlikely for this species to be found in the action area. No tern have been incidentally recorded during flycatcher surveys within the action area since the mid-1990s, however, it should be noted that these surveys are not generally conducted in habitat suitable for terns and surveyors are not asked to record other bird observations specifically (Reclamation 2013a).

Table A-2. Bird occurrence at Fort Bliss, Texas by month.

	Month											
Common Name	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Interior Least Tern												
Piping Plover								--6				
Willow Flycatcher				-4	444		--4	333	445			
Yellow-Billed Cuckoo					--4	444	444	444	44-			
Source: USGS 2013. Legend: 1=abundant; 2=common; 3=fairly common; 4=uncommon; 5=rare/irruptive; 6=very rare.												

As previously mentioned in the Status and Distribution section of this analysis, the tern can be considered a vagrant on the MRG and no tern nesting has been recently documented (Reclamation 2013a). According to the recovery plan from the Service in 1990, the only documented breeding along the Rio Grande takes place in Texas, and the only documented breeding within the state of New Mexico can be found on the Pecos River (Reclamation 2013a), similar conclusions are drawn in the complete range-wide survey collected in 2005 (Reclamation 2013a).

Piping Plover (*Charadruis melodus*)

Status and Distribution

In 1986, the Great Lakes population of Piping Plover (*Charadruis melodus)* was listed as endangered and the species is threatened in the northern Great Plains and Atlantic coast. A recovery plan was published by the Service in 2003. In the spring and summer they breed in the U.S. and Canada. Piping Plovers are migratory birds. In the spring and summer they breed in the northern United States and Canada. In the fall, they migrate south to winter along the Gulf of Mexico and more southerly locations. The Piping Plover has been documented in the Bosque del Apache NWR in New Mexico north of the action area and at Fort Bliss, Texas (Reclamation 2013a).

Life History and Ecology

The Piping Plover arrives on northern or coastal breeding grounds from early to mid-March. They often nest with a colony of terns. The young leave the nest shortly after hatching and by early September most have departed for their wintering areas. The Piping Plover diet consists of marine worms, fly larvae, beetles, crustaceans, mollusks, and other small animals and their eggs. Food is obtained by foraging on beaches, dunes and in tidal wrack.

Site Specific Habitat or Critical Habitat

Piping Plovers use wide, flat, open, sandy beaches with little vegetation. Nesting territories include beaches and sand flats along creeks and wetlands. Most adults return to their previous nesting sites. They also nest in riverine sand or gravel bars.

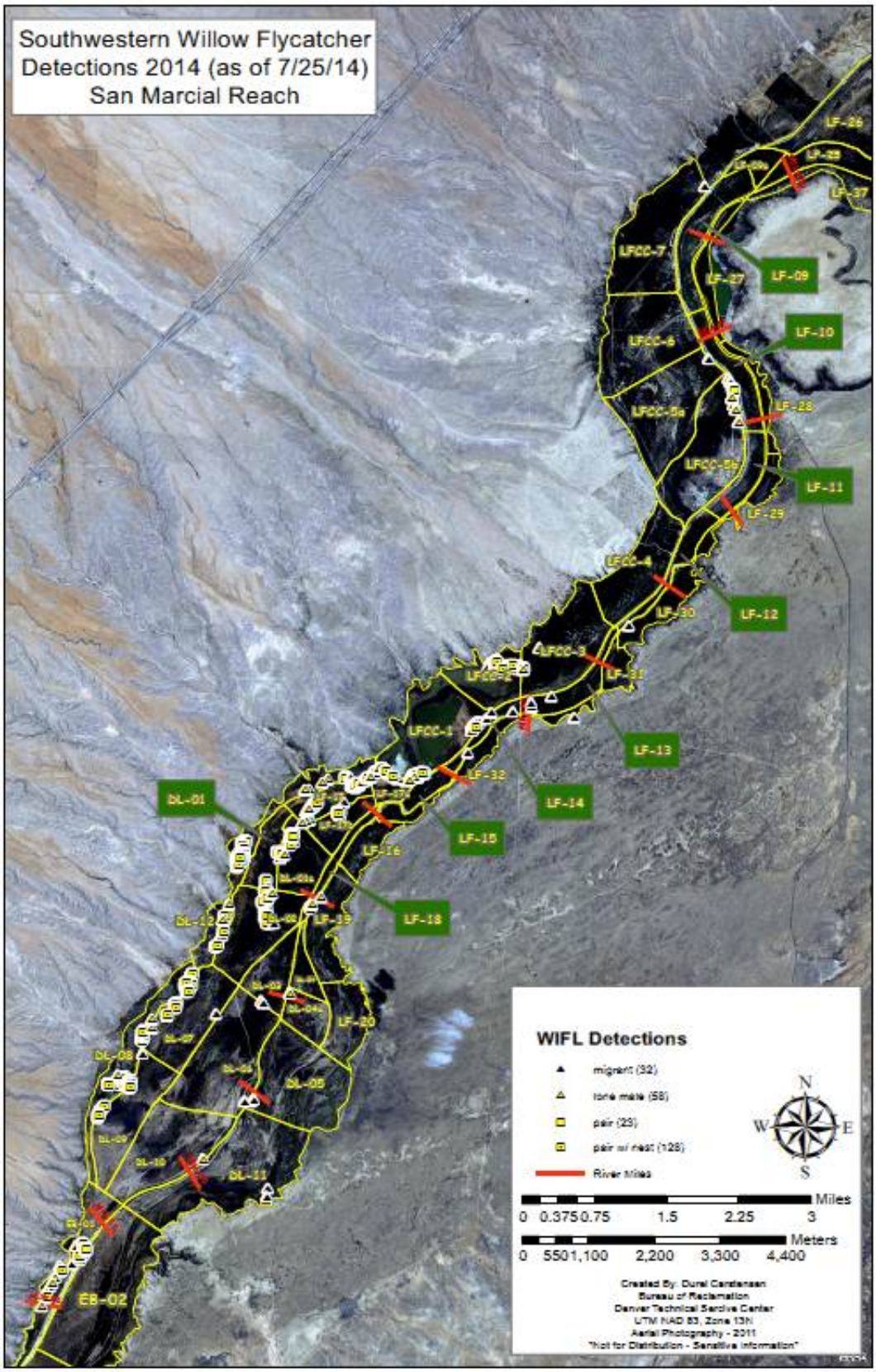
Threats

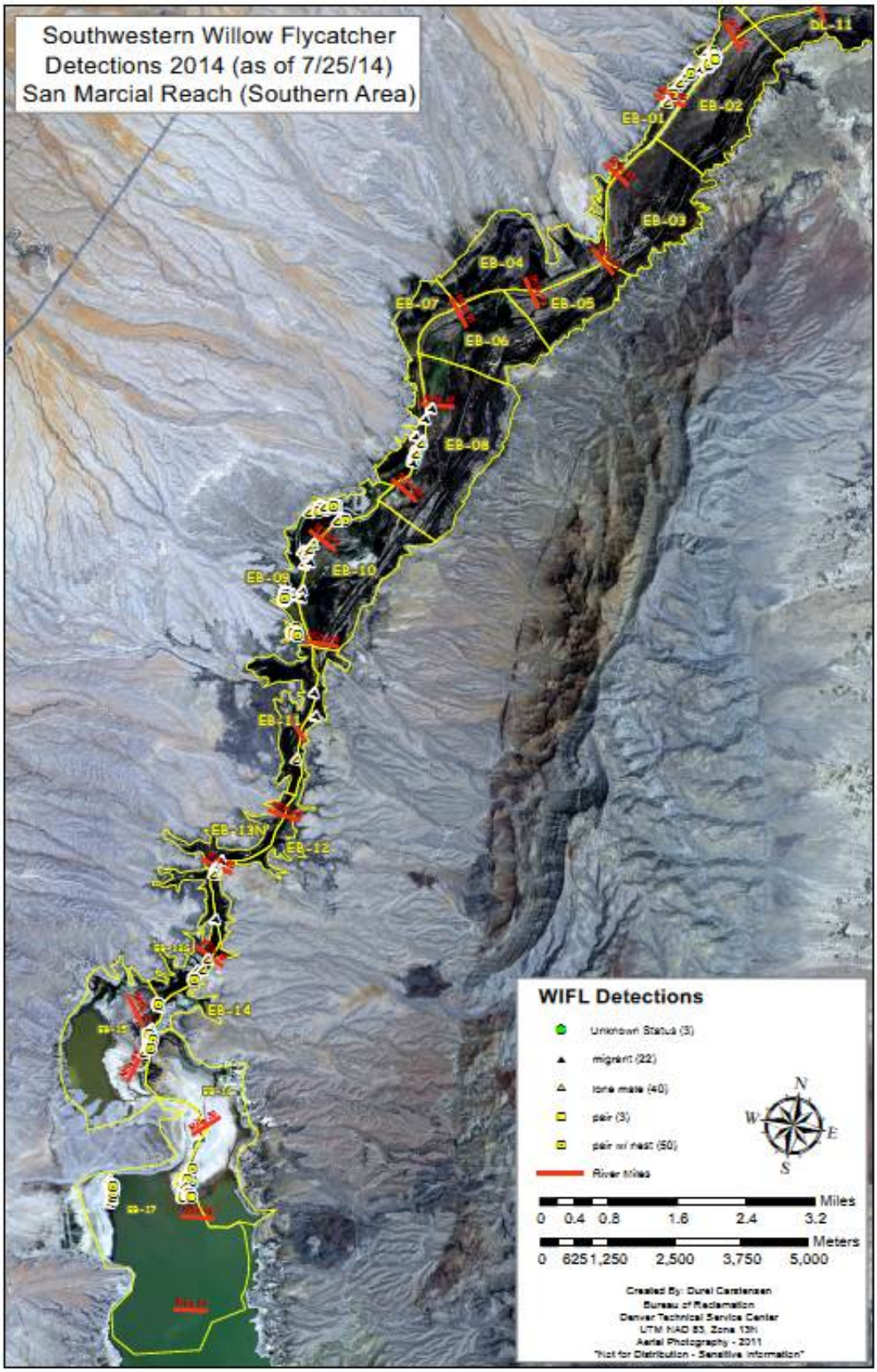
Habitat loss or degradation and poor breeding success are major reasons for the population decline. Construction of reservoirs on the rivers and channelization has resulted in a loss of sandbar habitat. Too much water in the spring floods nests and vegetation growth on nesting beaches makes sites unsuitable for nesting. Piping Plovers are sensitive to nest disturbance and the presence of people.

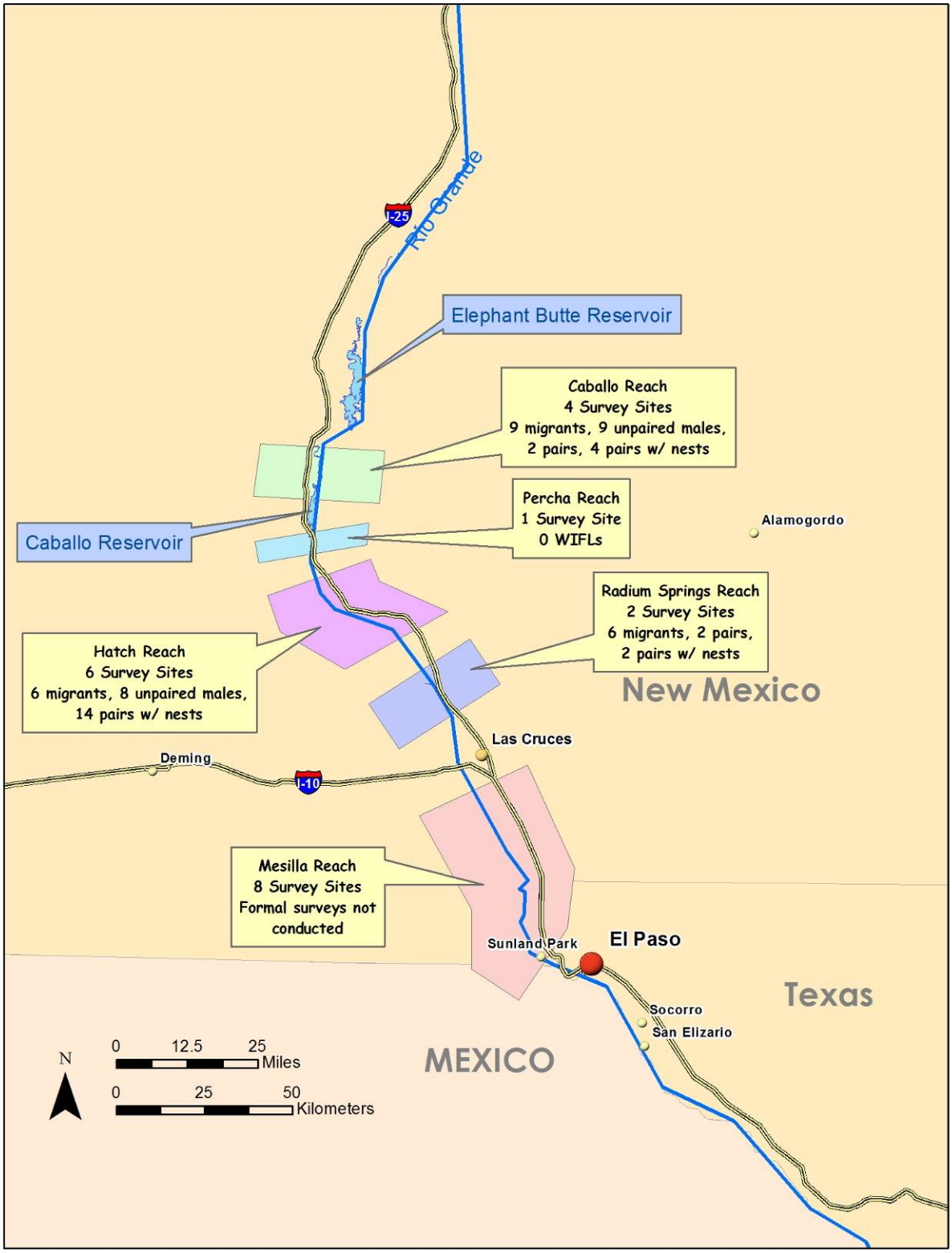
Presence-Absence within the Action Area

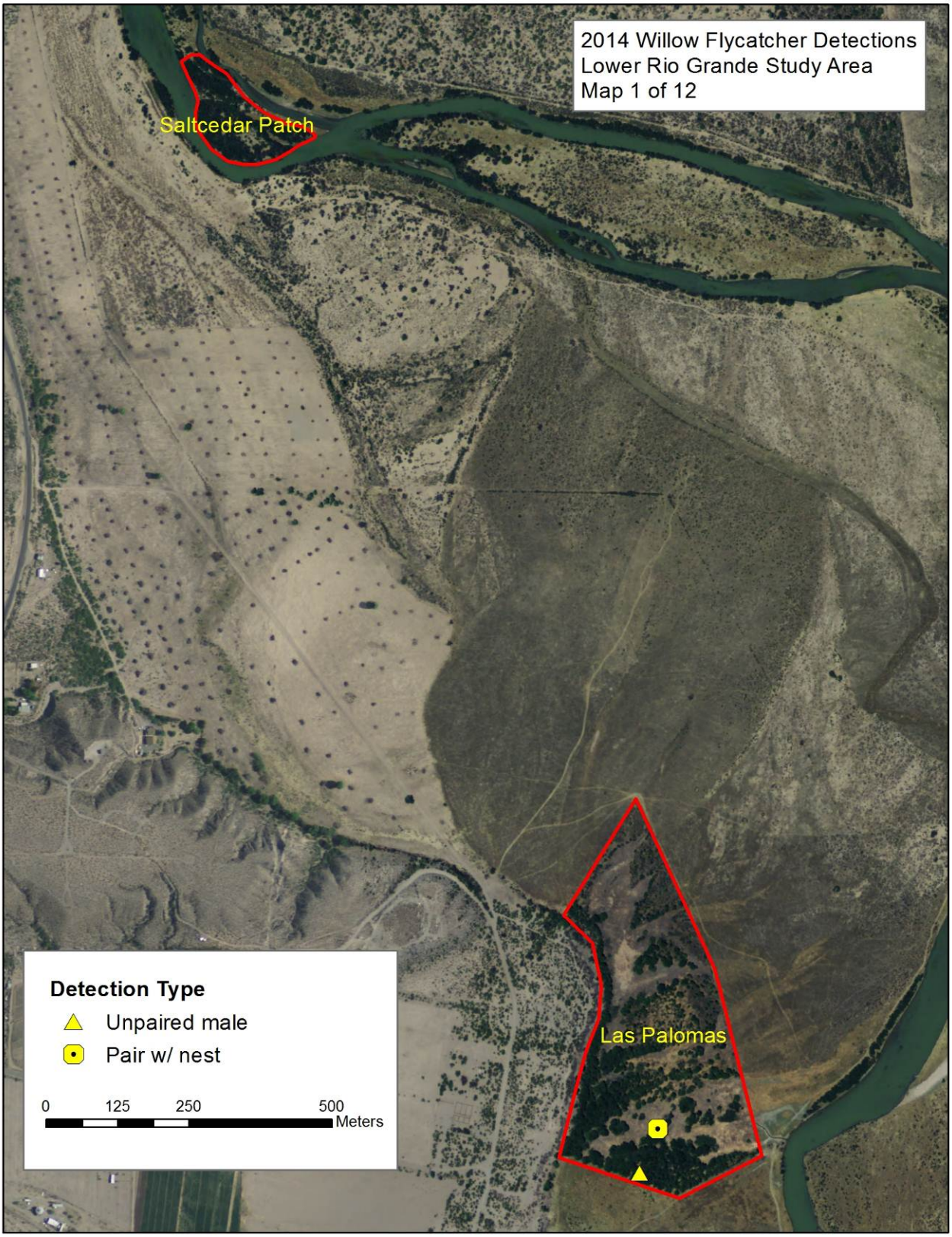
The Piping Plover is a rare migrant to New Mexico and Texas and it has never been documented in the action area. It was sighted at Fort Bliss once in August (Reclamation 2013a), and it is possible, although unlikely, that it could be present in the action area as it migrates south. No Piping Plovers have been incidentally recorded during flycatcher surveys within the action area since the mid-1990s, however, it should be noted that these surveys are not generally conducted in habitat suitable for plovers and surveyors are not asked to record other bird observations specifically (Reclamation 2013a).

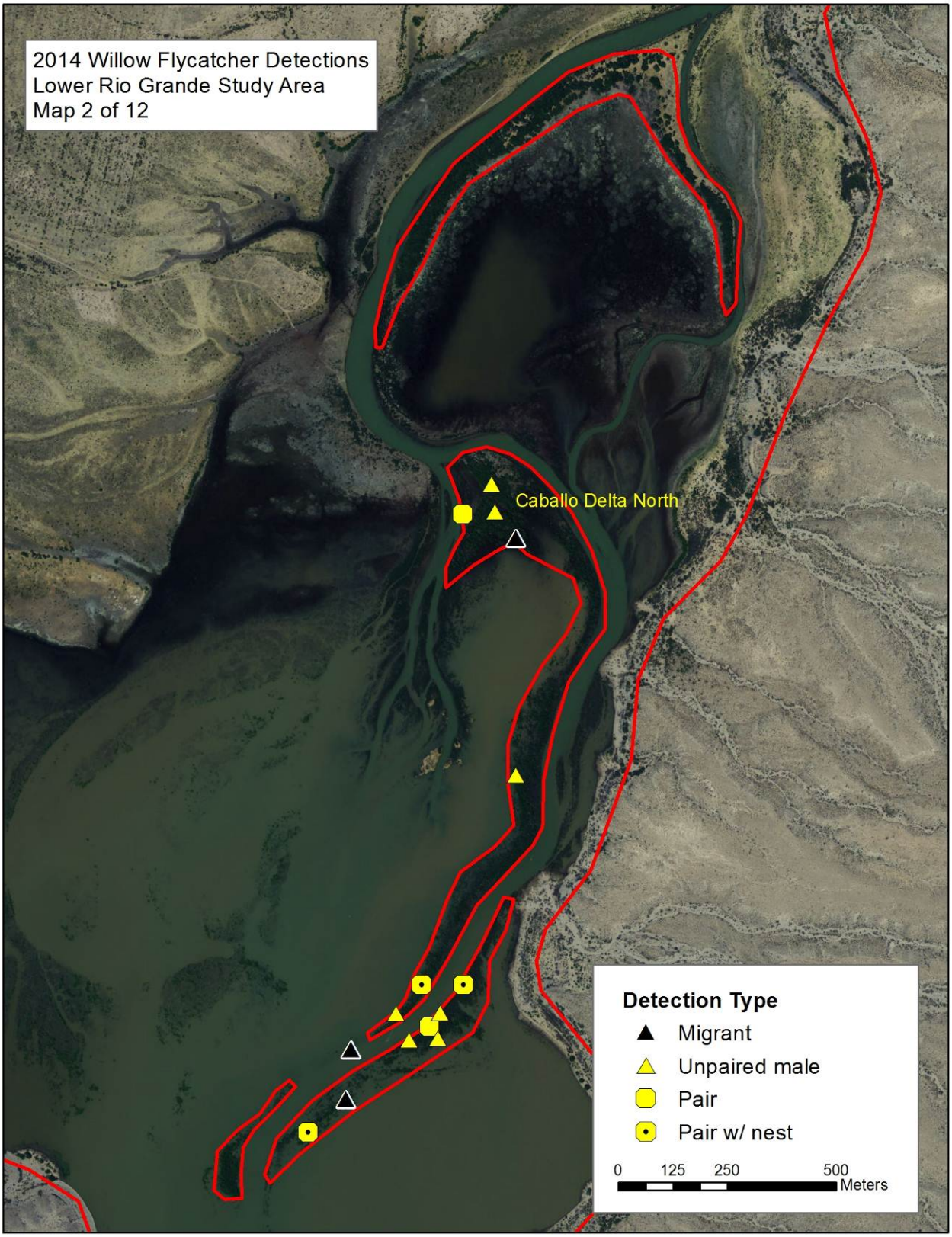
Appendix B. Distribution Maps showing Locations of Observed Flycatchers and Cuckoos in the RGOA Action Area

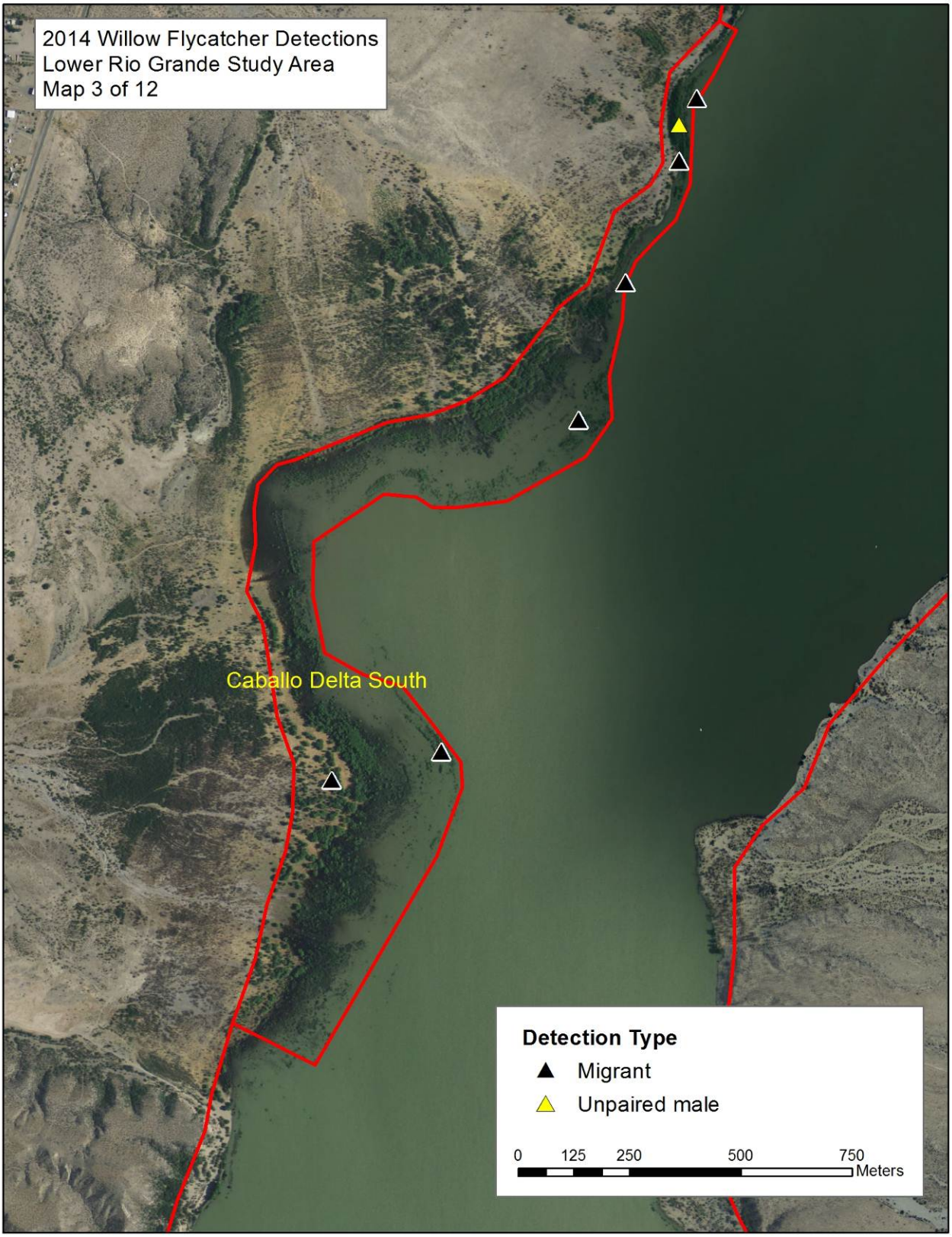

Southwestern Willow Flycatcher
Detections 2014 (as of 7/25/14)
San Marcial Reach
LF-26
LF-25
LF-37
LFCC-7
LF-27
LF-09
LF-10
LFCC-6
LFCC-5a
LF-28
LFCC-5b
LF-11
LF-29
LFCC-4
LF-30
LF-12
LFCC-3
LF-31
LFCC-2
LFCC-1
LF-13
LF-32
LF-14
DL-01
LF-15
LF-16
LF-18
LF-19
LF-20
DL-08
DL-05
DL-11
EB-02
WIFL Detections
migrant (32)
lone male (58)
pair (23)
pair w/ nest (128)
River Miles
N
W
E
S
Miles
0 0.375 0.75 1.5 2.25 3
Meters
0 550 1,100 2,200 3,300 4,400
Created By: Dural Cardenas
Bureau of Reclamation
Denver Technical Service Center
UTM NAD 83, Zone 13N
Aerial Photography - 2011
"Not for Distribution - Sensitive Information"

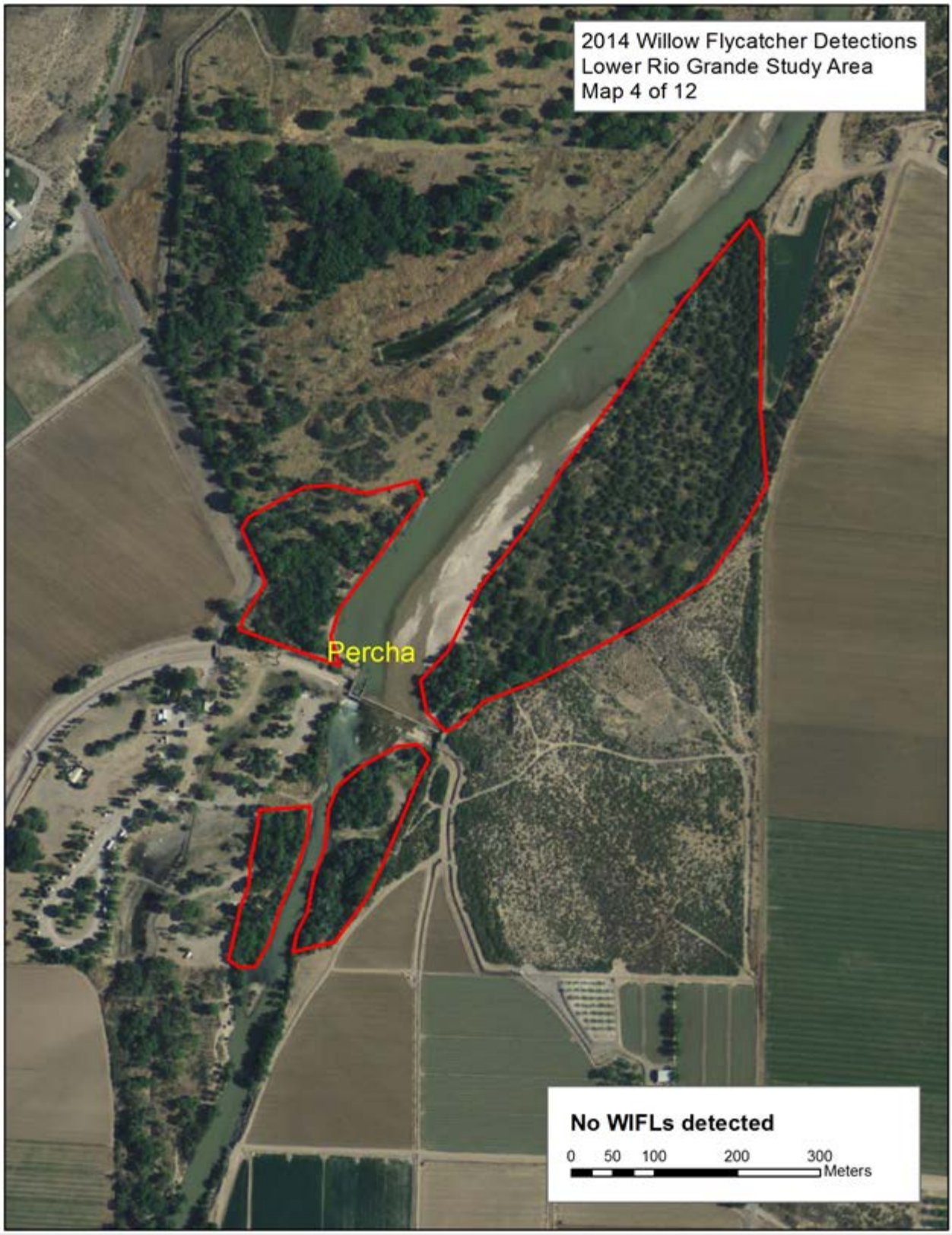

Southwestern Willow Flycatcher
Detections 2014 (as of 7/25/14)
San Marcial Reach (Southern Area)
DL-11
EB-01
EB-02
EB-03
EB-04
EB-05
EB-06
EB-07
EB-08
EB-09
EB-10
EB-11
EB-12
EB-13N
EB-14
EB-15
EB-17
WIFL Detections
Unknown Status (3)
migrant (22)
lone male (40)
pair (3)
pair w/ nest (50)
River Miles
N
W
E
S
Miles
0 0.4 0.8 1.6 2.4 3.2
Meters
0 625 1,250 2,500 3,750 5,000
Created By: Durel Carstensen
Bureau of Reclamation
Denver Technical Service Center
UTM NAD 83, Zone 13N
Aerial Photography - 2011
"Not for Distribution - Sensitive Information"

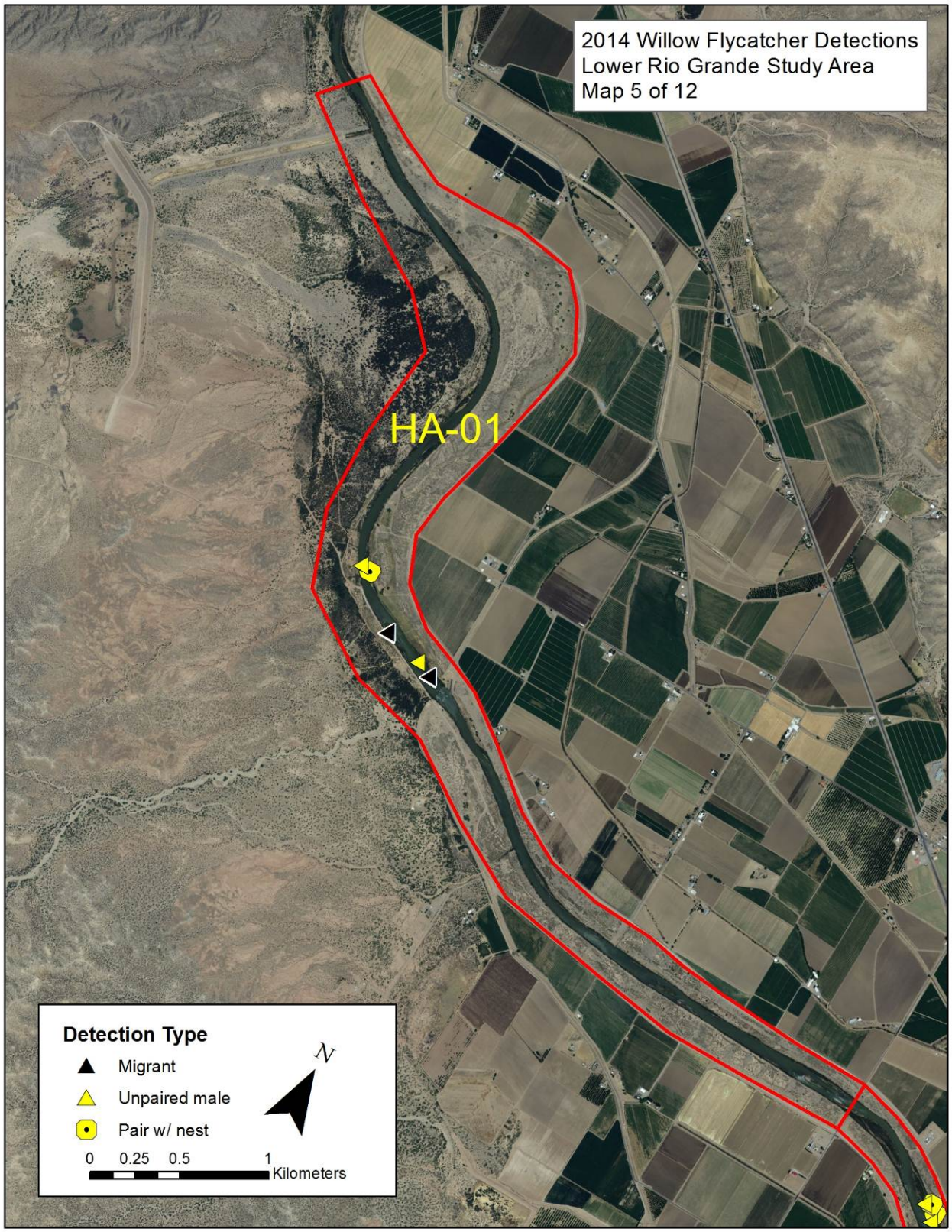

Rio Grande
I-25
Elephant Butte Reservoir
Caballo Reach
4 Survey Sites
9 migrants, 9 unpaired males,
2 pairs, 4 pairs w/ nests
Percha Reach
1 Survey Site
0 WIFLs
Caballo Reservoir
Alamogordo
Radium Springs Reach
2 Survey Sites
6 migrants, 2 pairs,
2 pairs w/ nests
Hatch Reach
6 Survey Sites
6 migrants, 8 unpaired males,
14 pairs w/ nests
New Mexico
Las Cruces
Deming
I-10
Mesilla Reach
8 Survey Sites
Formal surveys not
conducted
Sunland Park
El Paso
Texas
Socorro
San Elizario
MEXICO
N
0 12.5 25 Miles
0 25 50 Kilometers

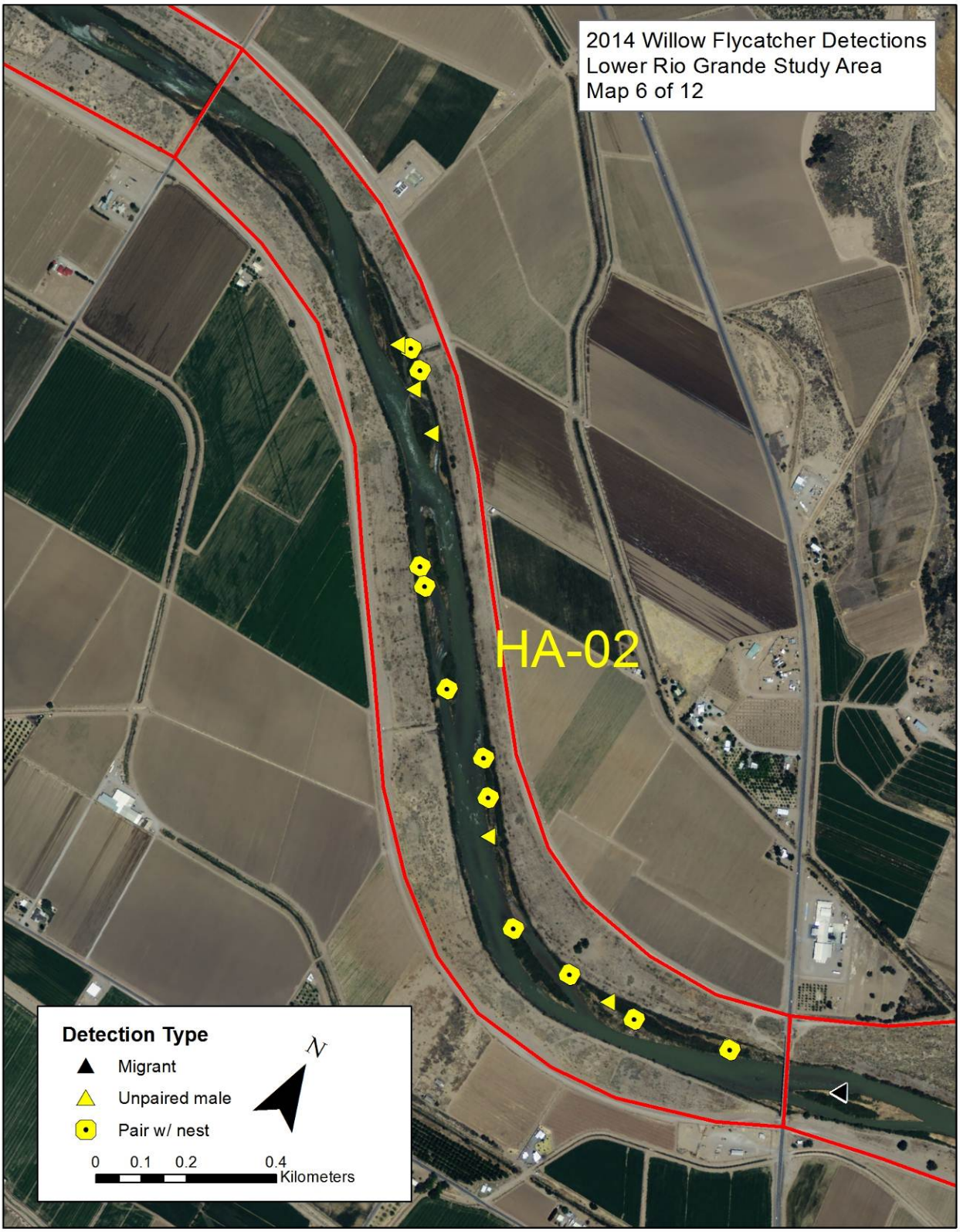

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 1 of 12
Saltcedar Patch
Las Palomas
Detection Type
Unpaired male
Pair w/ nest
0
125
250
500
Meters

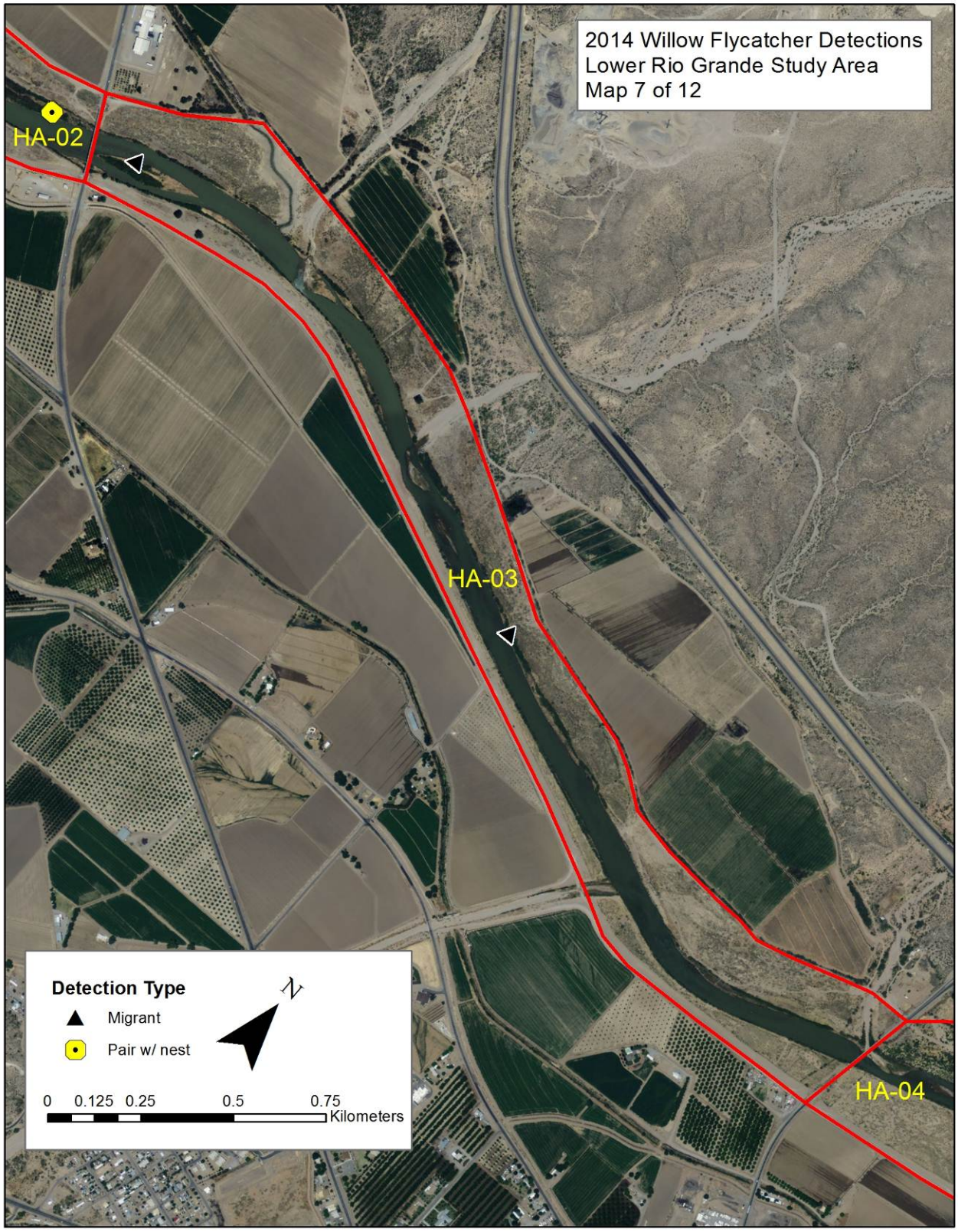

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 2 of 12
Caballo Delta North
Detection Type
Migrant
Unpaired male
Pair
Pair w/ nest
0
125
250
500
Meters

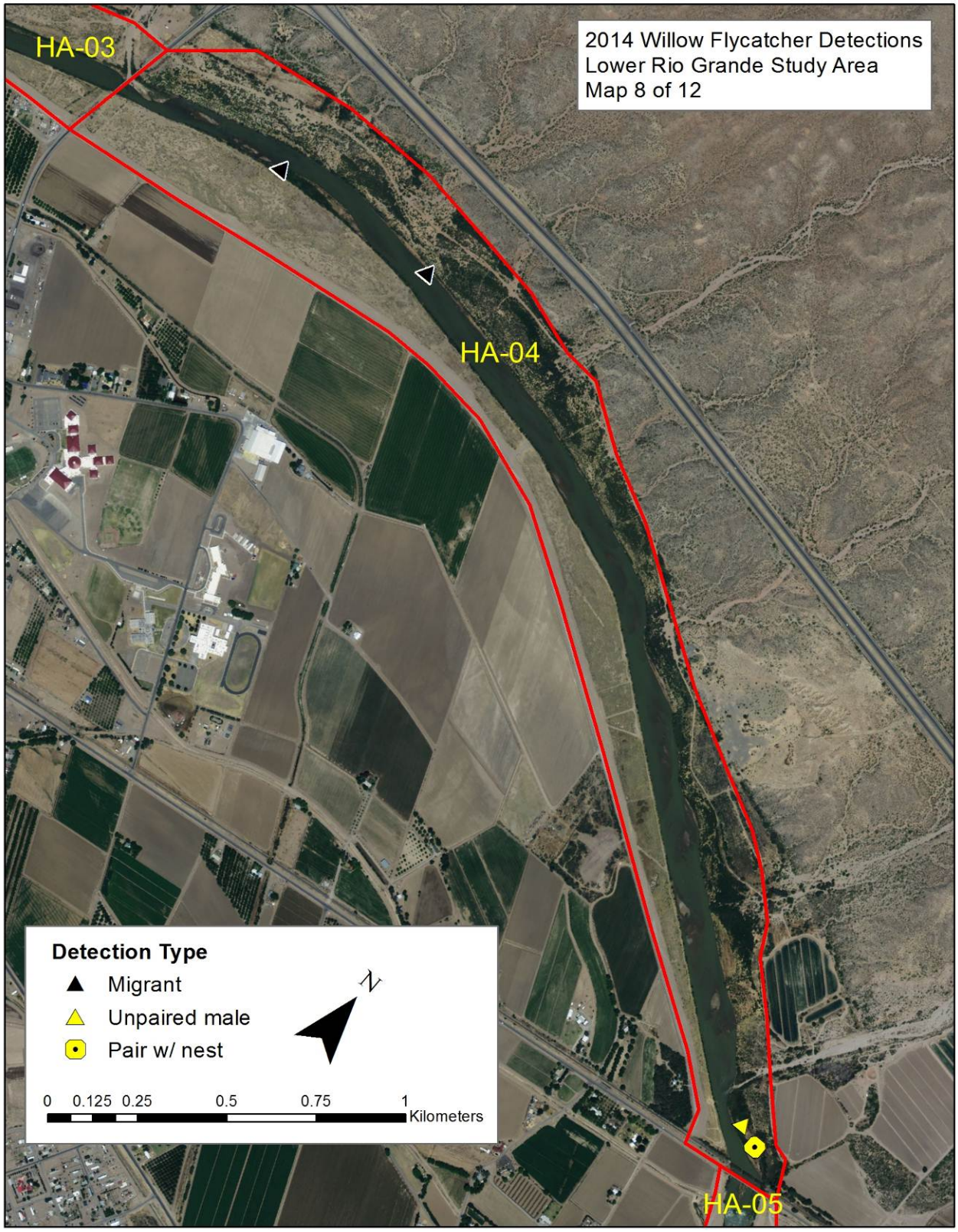

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 3 of 12
Caballo Delta South
Detection Type
Migrant
Unpaired male
0
125
250
500
750
Meters

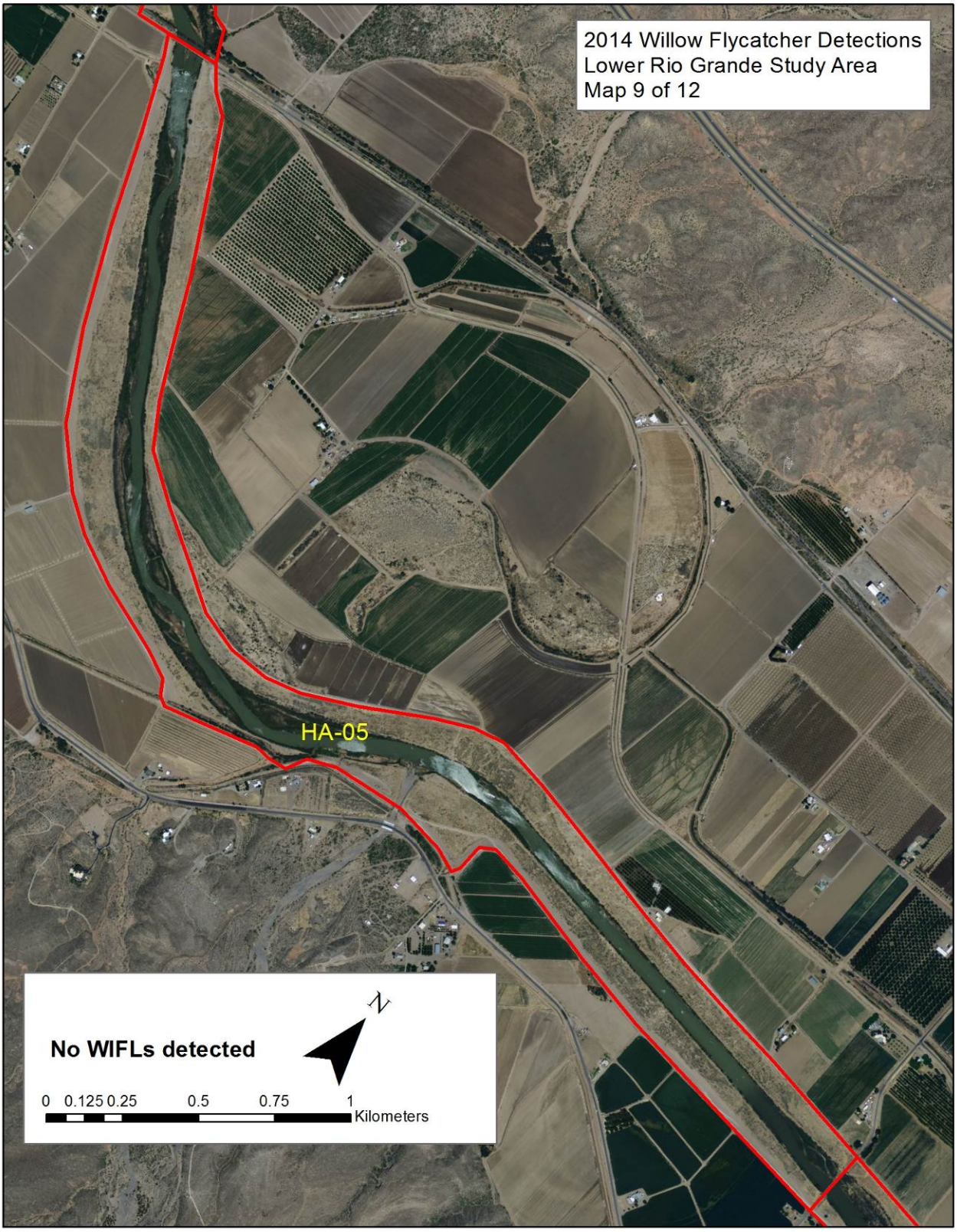

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 4 of 12
Percha
No WIFLs detected
0 50 100 200 300
Meters

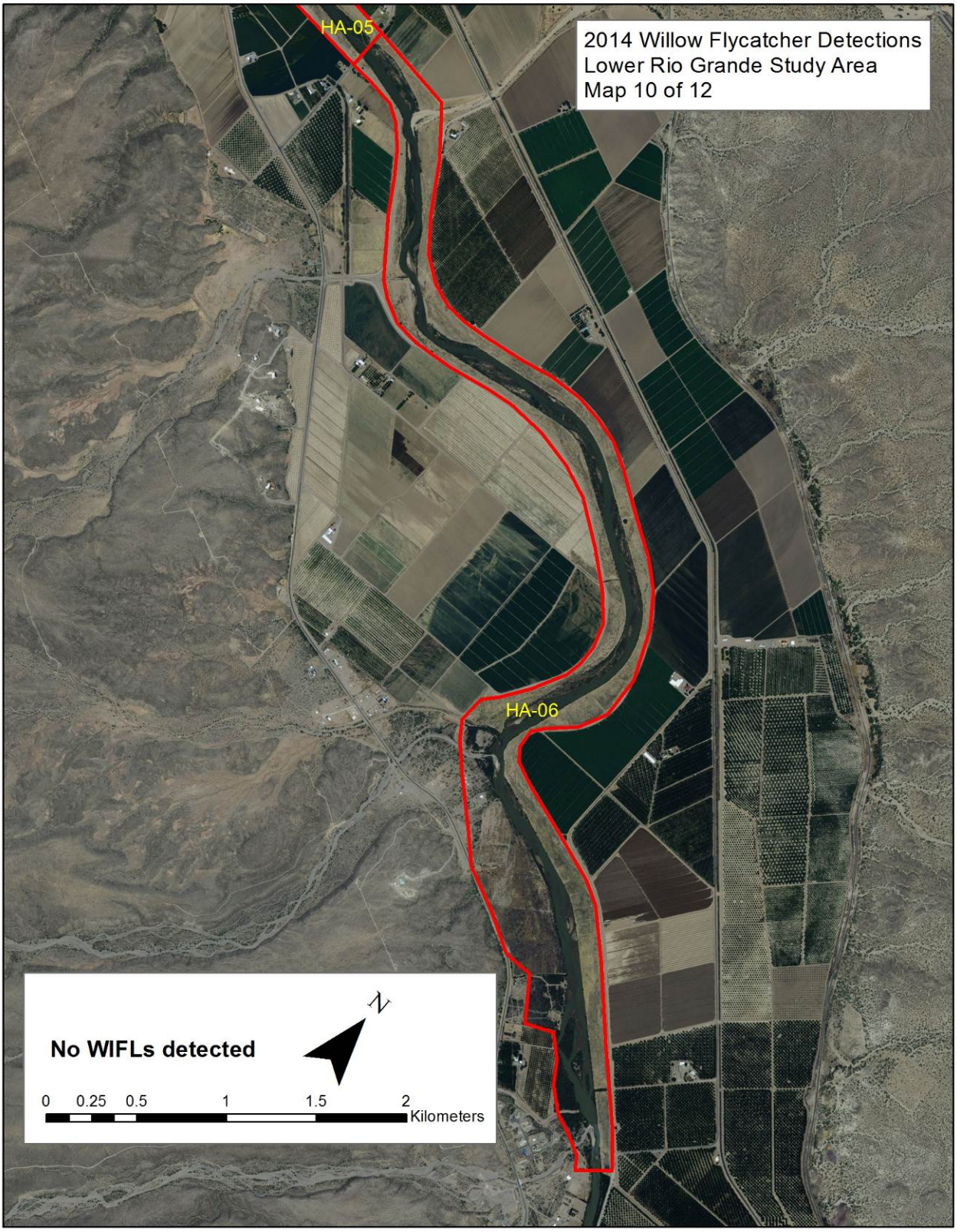

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 5 of 12
HA-01
Detection Type
Migrant
Unpaired male
Pair w/ nest
N
0 0.25 0.5 1
Kilometers

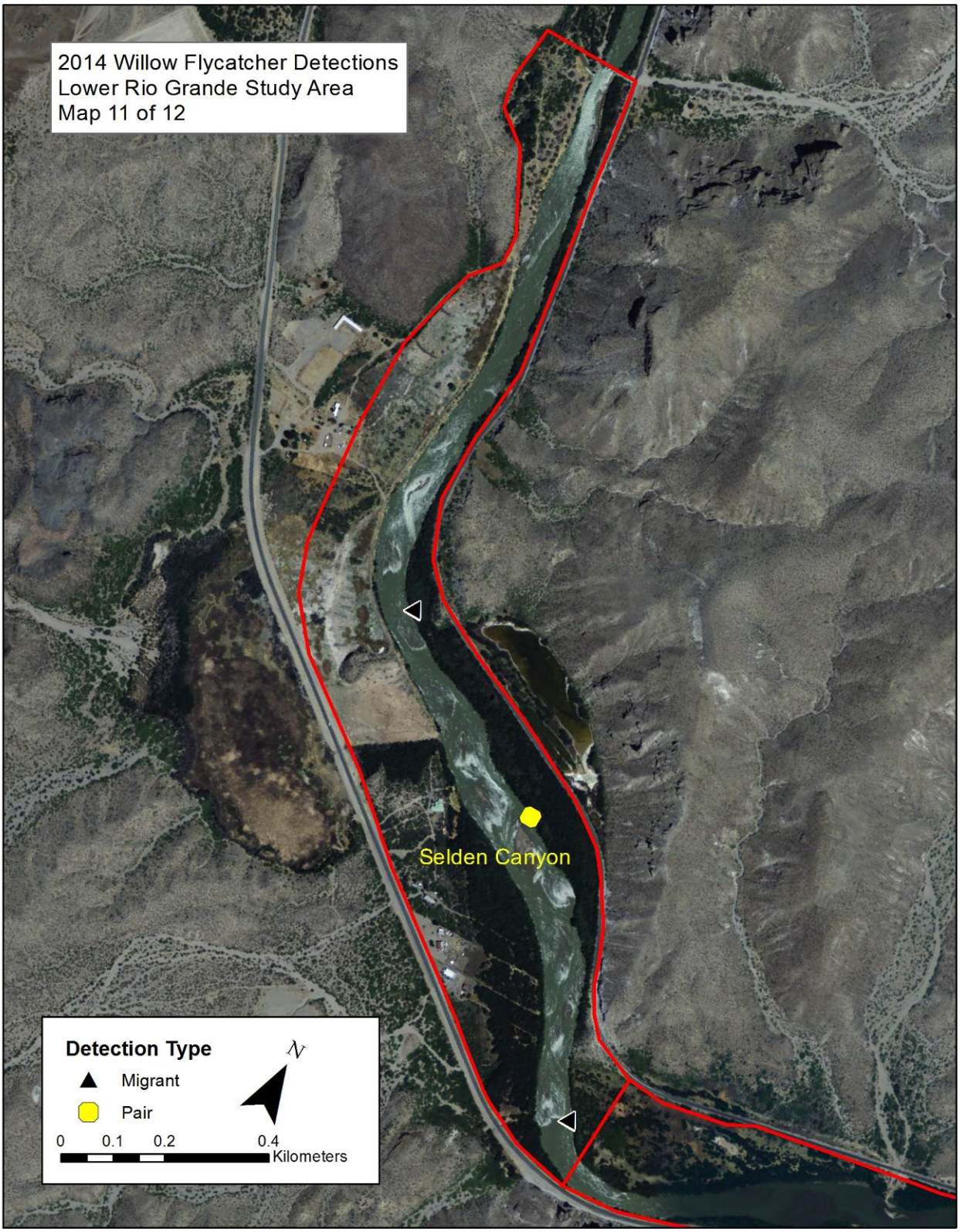

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 6 of 12
HA-02
Detection Type
Migrant
Unpaired male
Pair w/ nest
N
0 0.1 0.2 0.4
Kilometers

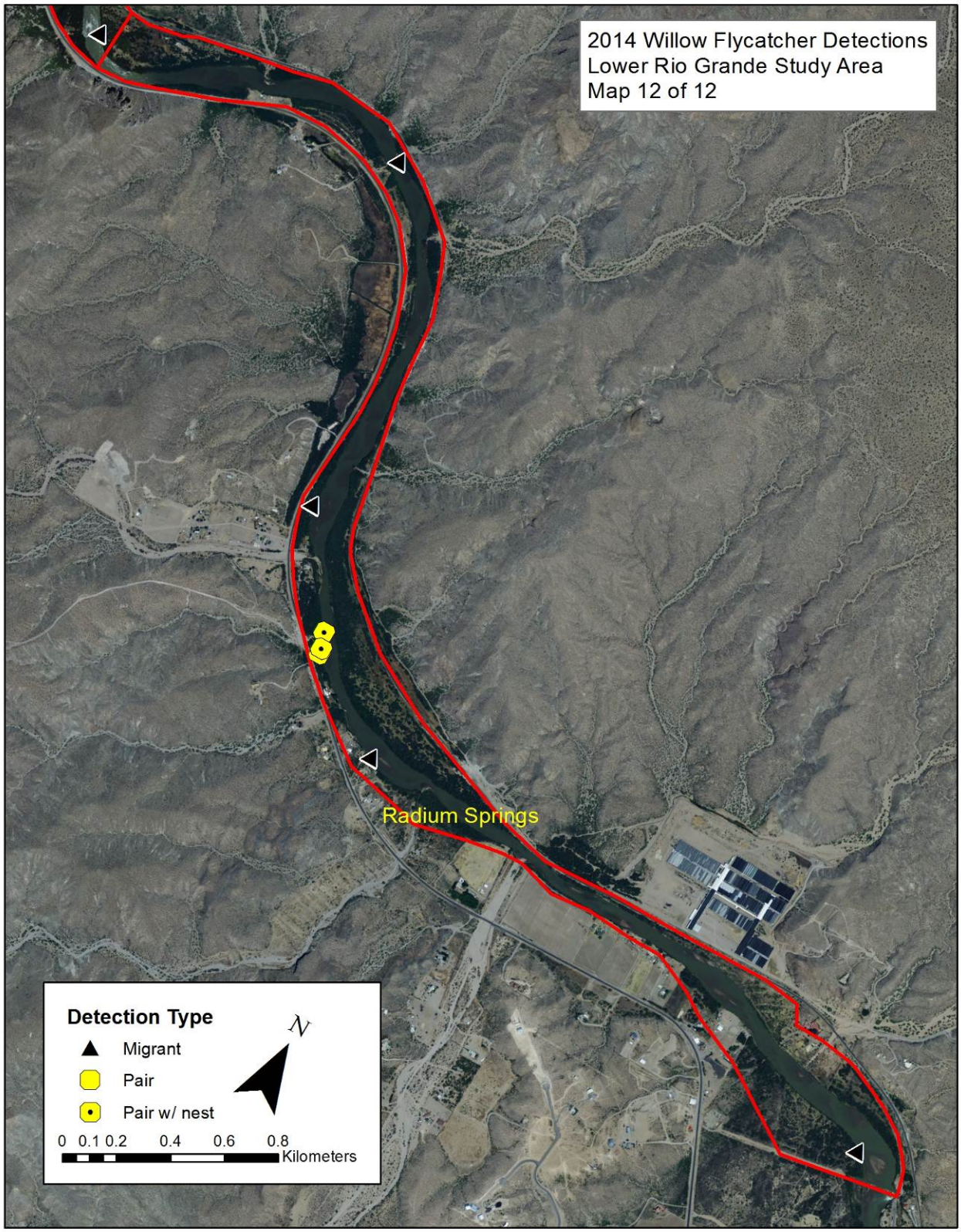

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 7 of 12
HA-02
HA-03
HA-04
Detection Type
Migrant
Pair w/ nest
N
0 0.125 0.25 0.5 0.75
Kilometers

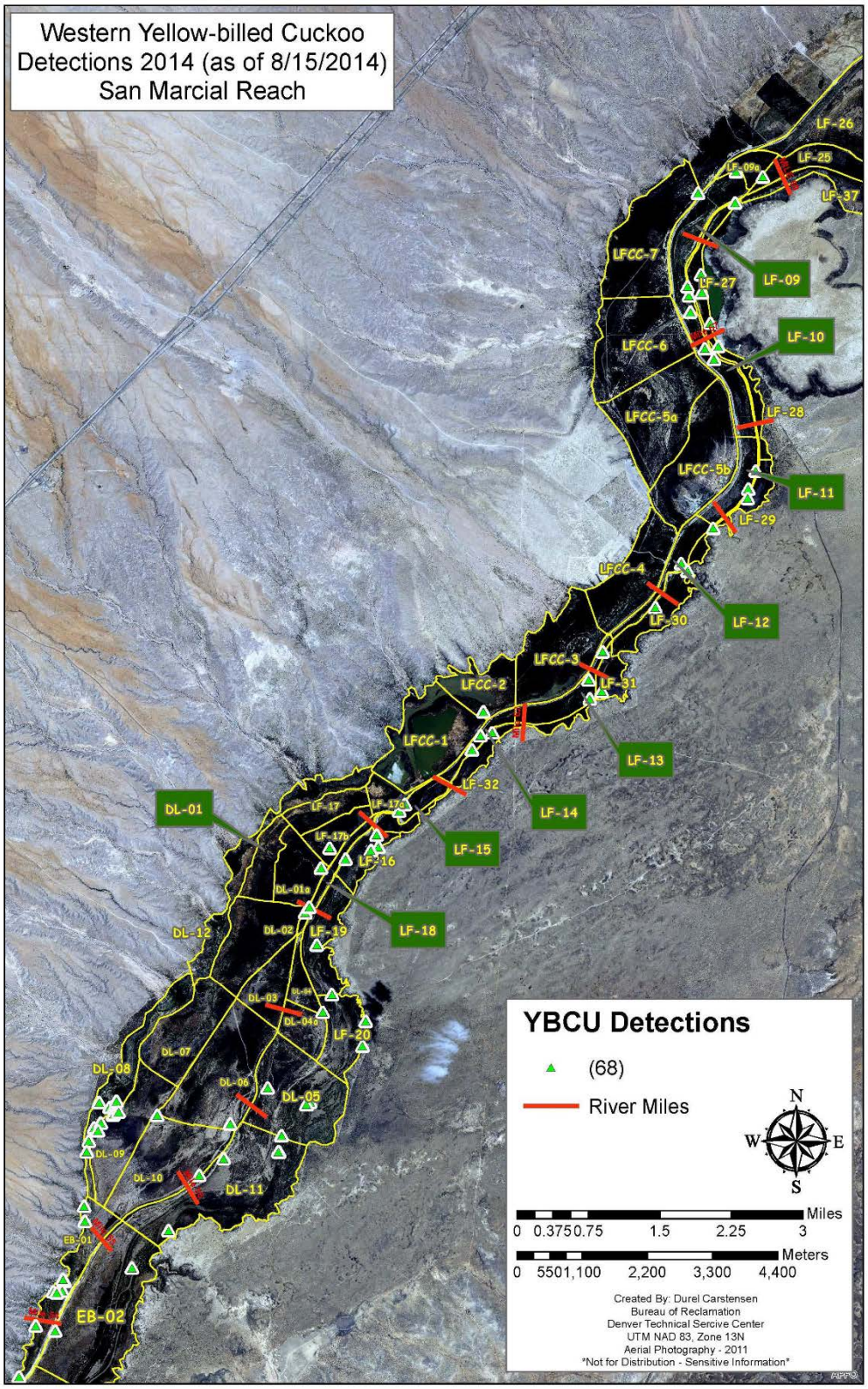

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 8 of 12
HA-03
HA-04
HA-05
Detection Type
Migrant
Unpaired male
Pair w/ nest
N
0 0.125 0.25 0.5 0.75 1
Kilometers

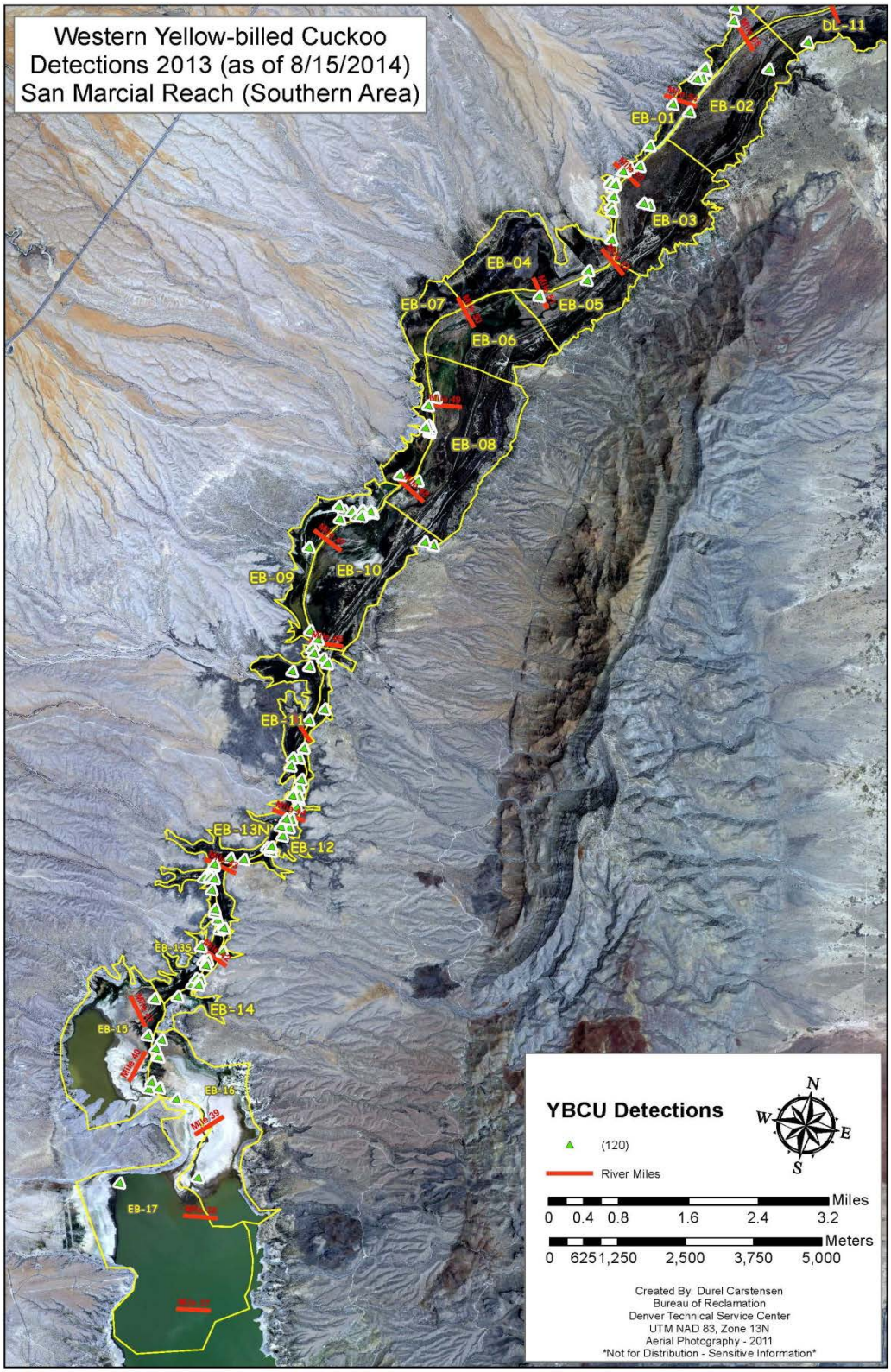

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 9 of 12
HA-05
No WIFLs detected
N
0 0.125 0.25 0.5 0.75 1
Kilometers

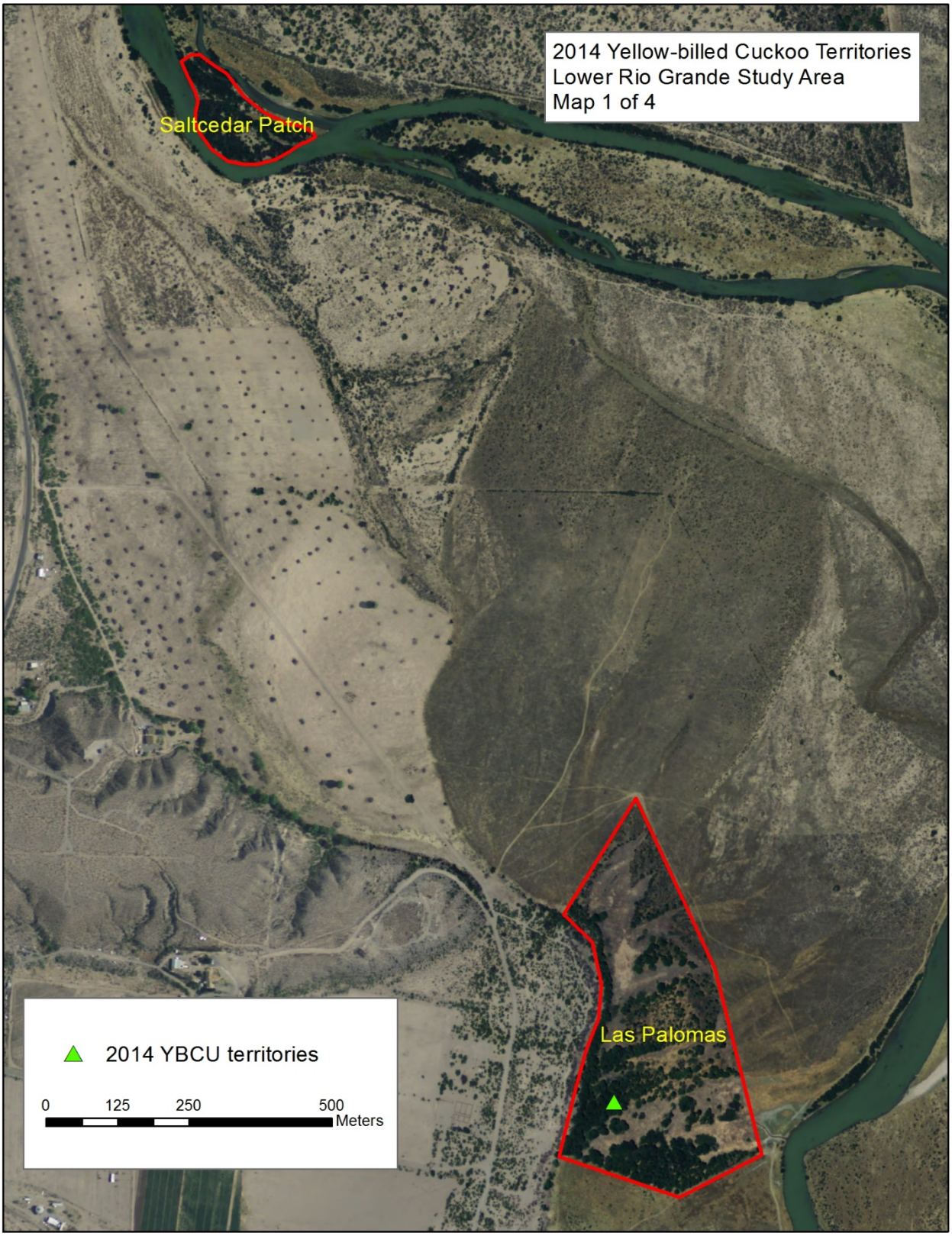

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 10 of 12
HA-05
HA-06
No WIFLs detected
N
0 0.25 0.5 1 1.5 2
Kilometers

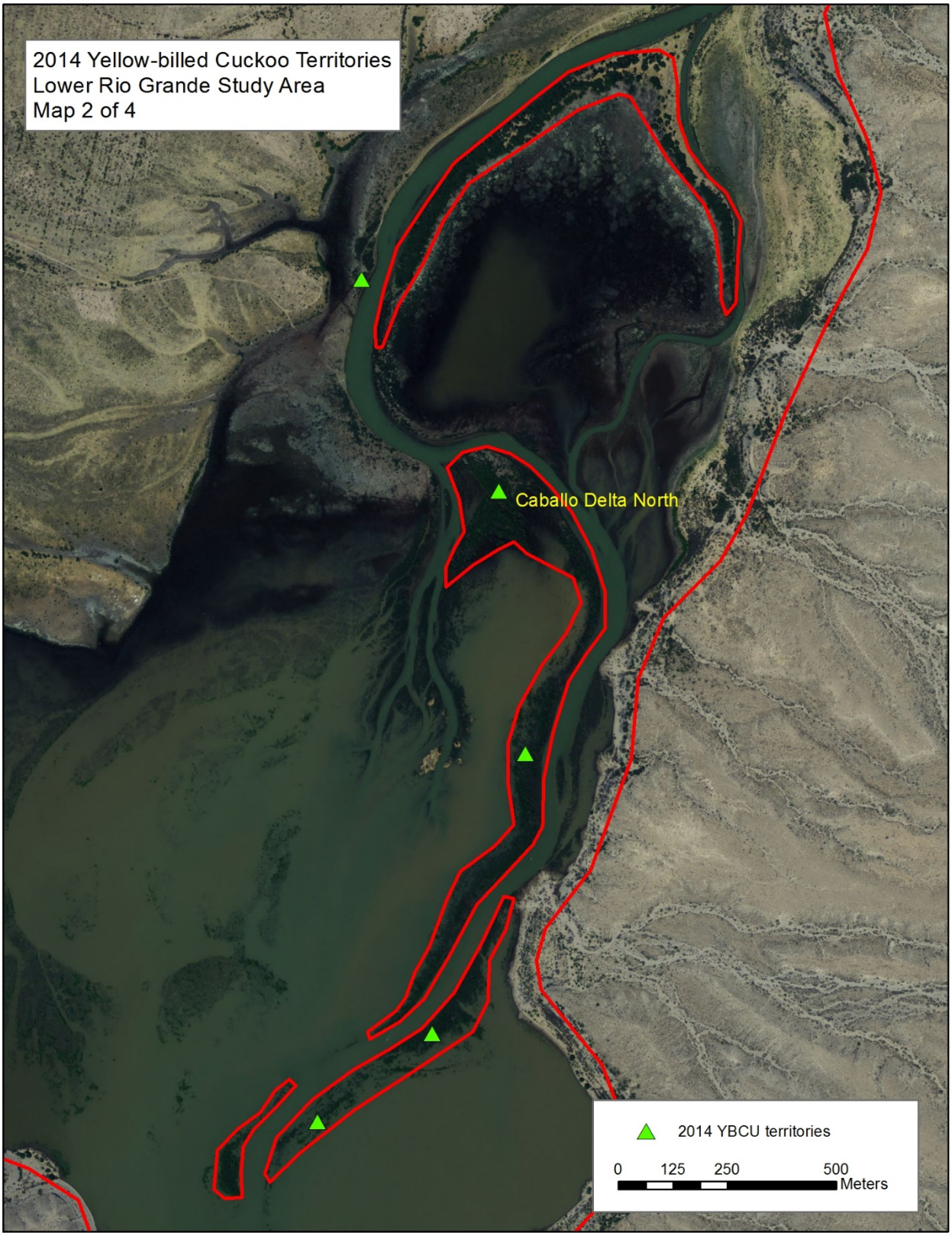

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 11 of 12
Selden Canyon
Detection Type
Migrant
Pair
N
0
0.1
0.2
0.4
Kilometers

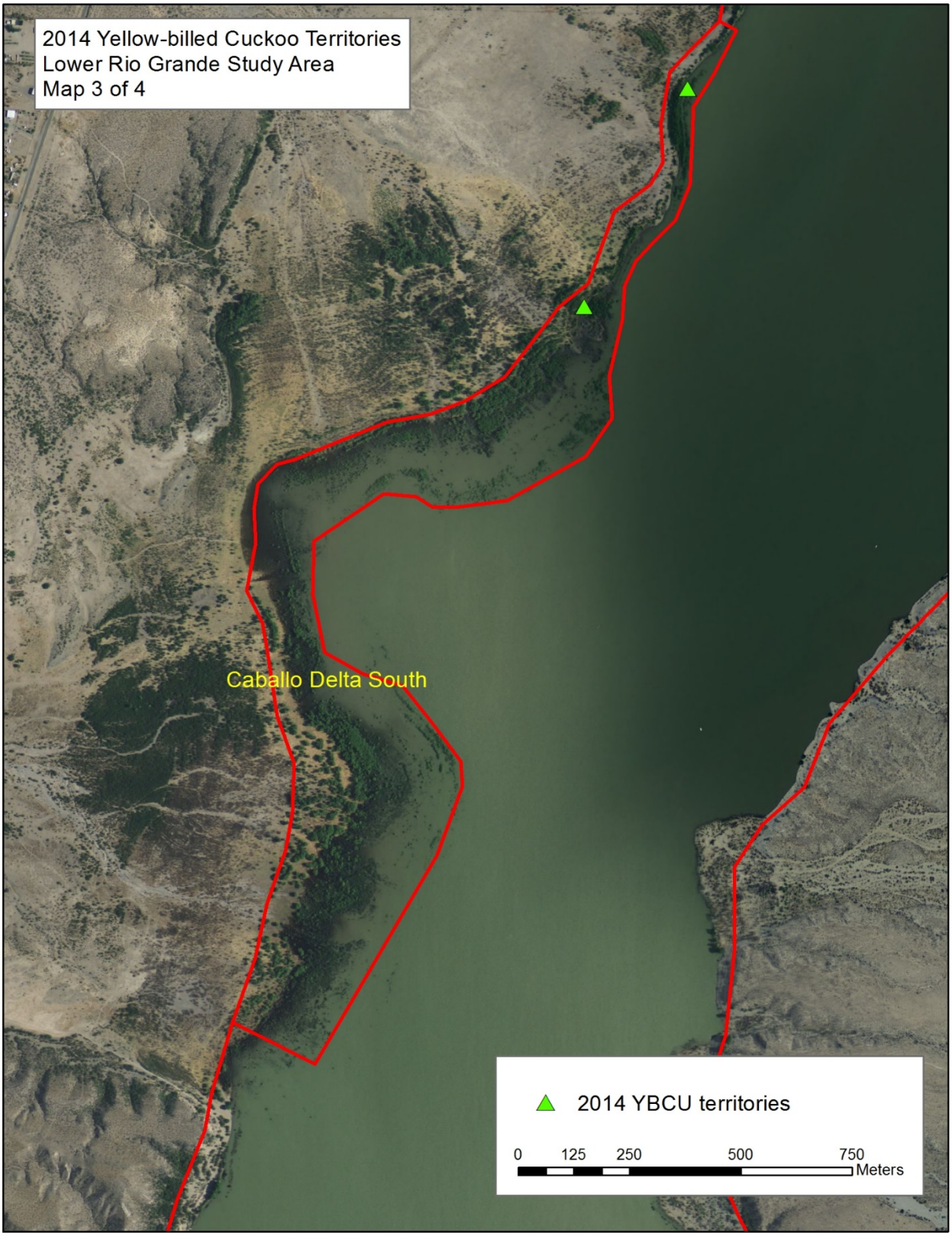

2014 Willow Flycatcher Detections
Lower Rio Grande Study Area
Map 12 of 12
Radium Springs
Detection Type
Migrant
Pair
Pair w/ nest
N
0 0.1 0.2 0.4 0.6 0.8
Kilometers

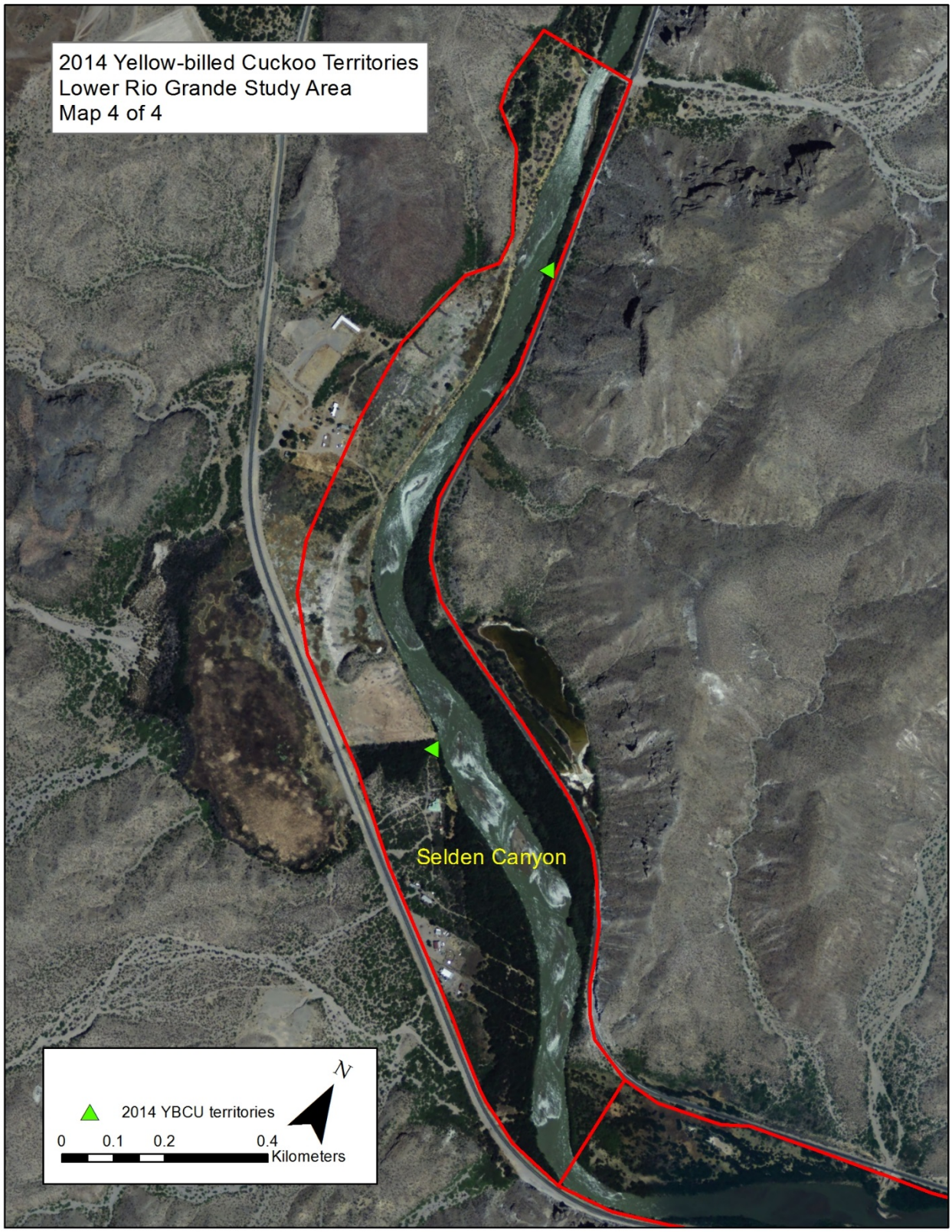

Western Yellow-billed Cuckoo
Detections 2014 (as of 8/15/2014)
San Marcial Reach
LF-26
LF-25
LF-37
LF-09a
LFCC-7
LF-27
LF-09
LF-10
LFCC-6
LFCC-5a
LF-28
LFCC-5b
LF-11
LF-29
LFCC-4
LF-30
LF-12
LFCC-3
LF-31
LFCC-2
LFCC-1
LF-13
LF-32
LF-14
DL-01
LF-17
LF-17a
LF-17b
LF-16
LF-15
DL-01a
DL-12
DL-02
LF-19
LF-18
DL-03
DL-04a
LF-20
DL-07
DL-08
DL-06
DL-05
DL-09
DL-10
DL-11
EB-01
EB-02
YBCU Detections
(68)
River Miles
N
W
E
S
Miles
0 0.375 0.75 1.5 2.25 3
Meters
0 550 1,100 2,200 3,300 4,400
Created By: Durel Carstensen
Bureau of Reclamation
Denver Technical Sercive Center
UTM NAD 83, Zone 13N
Aerial Photography - 2011
Not for Distribution - Sensitive Information


Western Yellow-billed Cuckoo
Detections 2013 (as of 8/15/2014)
San Marcial Reach (Southern Area)
DL-11
EB-01
EB-02
EB-03
EB-04
EB-05
EB-06
EB-07
EB-08
EB-09
EB-10
EB-11
EB-12
EB-13N
EB-13S
EB-14
EB-15
EB-16
EB-17
YBCU Detections
(120)
River Miles
N
W
E
S
Miles
0 0.4 0.8 1.6 2.4 3.2
Meters
0 625 1,250 2,500 3,750 5,000
Created By: Durel Carstensen
Bureau of Reclamation
Denver Technical Service Center
UTM NAD 83, Zone 13N
Aerial Photography - 2011
Not for Distribution - Sensitive Information


2014 Yellow-billed Cuckoo Territories
Lower Rio Grande Study Area
Map 1 of 4
Saltcedar Patch
Las Palomas
2014 YBCU territories
0
125
250
500
Meters


2014 Yellow-billed Cuckoo Territories
Lower Rio Grande Study Area
Map 2 of 4
Caballo Delta North
2014 YBCU territories
0
125
250
500
Meters


2014 Yellow-billed Cuckoo Territories
Lower Rio Grande Study Area
Map 3 of 4
Caballo Delta South
2014 YBCU territories
0
125
250
500
750
Meters


2014 Yellow-billed Cuckoo Territories
Lower Rio Grande Study Area
Map 4 of 4
Selden Canyon
2014 YBCU territories
N
0
0.1
0.2
0.4
Kilometers

Appendix C. Technical Memorandum

(See Appendix C of the EIS)

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