



LOWER COLORADO RIVER

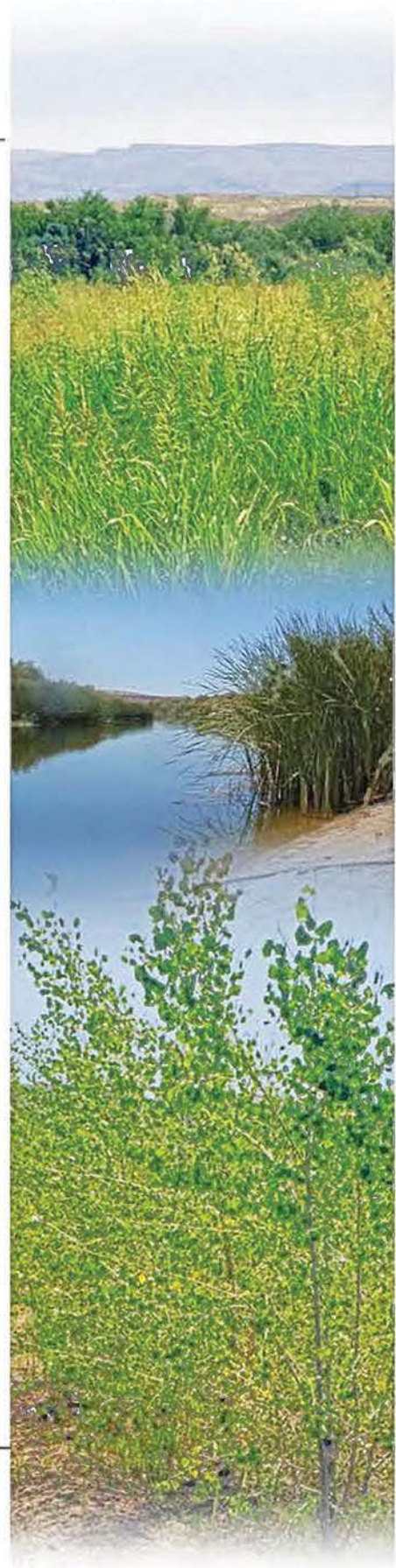
Multi-Species Conservation Program

Final
Appendices to Volumes I-III and V

Volume IV



January 2019



Appendix W

**Final Habitat Conservation Plan Amendment
(Addition of New Covered Species –
Northern Mexican Gartersnake)**

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Acronyms and Abbreviations

2	AGFD	Arizona Game and Fish Department
3	AMM	avoidance and minimization measure
4	CAMP	Arizona Game and Fish Department's conservation and
5		mitigation program
6	CLRA	Yuma clapper rail (<i>Rallus longirostris yumanensis</i>
7		[also known as Yuma Ridgway's rail =
8		<i>R. obsoletus yumanensis</i>]) conservation measure
9	CW	Fremont cottonwood-Goodding's willow
10		(<i>Populus fremontii-Salix gooddingii</i>)
11	ESA	Endangered Species Act
12	HCP	Habitat Conservation Plan
13	LCR	lower Colorado River
14	LCR MSCP	Lower Colorado River Multi-Species Conservation Program
15	MRM	monitoring and research measure
16	NMGS	northern Mexican gartersnake (<i>Thamnophis eques</i>
17		<i>megalops</i>) conservation measure
18	USFWS	U.S. Fish and Wildlife Service
19		

Final Habitat Conservation Plan Amendment (Addition of New Covered Species – Northern Mexican Gartersnake)

W.1 Background and Appendix Format

The northern Mexican gartersnake (*Thamnophis eques megalops*) was not considered for coverage during the 2005 development of the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) Habitat Conservation Plan (HCP) because it was believed to be extirpated within the planning area. However, based on a number of events, as described below, the LCR MSCP is now seeking to add the northern Mexican gartersnake to the list of covered species under the program.

- On July 10, 2013, the U.S. Fish and Wildlife Service (USFWS) published in the Federal Register a proposed rule to list the northern Mexican gartersnake as threatened under the Endangered Species Act (ESA) and a proposed rule for critical habitat designation (USFWS 2013a, 2013b). The final rule listing the northern Mexican gartersnake as threatened under the ESA was published on July 8, 2014 (USFWS 2014). Habitat identified for critical habitat was proposed on the Bill Williams River in Arizona (the proposed Bill Williams River Unit) within the LCR MSCP implementation area between Alamo Dam and the confluence of the Colorado River and the Bill Williams River.
- In 2012, personnel of the Arizona Game and Fish Department discovered northern Mexican gartersnakes on the Bill Williams River in Arizona between Planet Ranch and Alamo Dam while conducting amphibian surveys. This portion of the Bill Williams River is within the LCR MSCP implementation area (Reach 3). In December 2015, the Planet Ranch Conservation Area was included in the program. The

1 conservation area includes existing agricultural fields, the active flood
2 plain of the Bill Williams River where flows are normally subsurface,
3 and a portion of the Bill Williams River adjacent to the Bill Williams
4 River National Wildlife Refuge where perennial surface water occurs.
5 LCR MSCP habitat creation at Planet Ranch may result in creation
6 of habitat that could be colonized by lowland leopard frogs (*Rana*
7 *yavapaiensis*), Colorado River toads (*Bufo alvarius*), and now,
8 northern Mexican gartersnakes.
9

- 10 • In 2015, a northern Mexican gartersnake was confirmed at the
11 LCR MSCP's Beal Lake Conservation Area in the riparian field
12 next to Willow Marsh on the Havasu National Wildlife Refuge near
13 Needles, California, in Reach 3. The Bureau of Reclamation initiated
14 a consultation with the USFWS for maintenance and infrastructure
15 improvements at the Beal Lake Conservation Area and received a
16 biological opinion in November 2015 (USFWS 2015).
17
- 18 • In addition to being listed as threatened under the ESA, the northern
19 Mexican gartersnake is also designated as an Arizona Species of
20 Greatest Conservation Need. There is no special regulatory
21 designation for the species in California or Nevada. It is considered
22 extirpated in California.
23

24 Information about the northern Mexican gartersnake contained in the
25 attachments to this appendix are formatted for the HCP. For example,
26 Attachment A provides additional text appended to the end of Table 3-9
27 from the HCP. The format for the new information presented herein is
28 an extension of the original HCP text.
29
30

31 **W.2 Species Habitat Model**

32

33 Covered species habitats had not been directly field delineated in the
34 LCR MSCP planning area; rather, species habitats were defined in the
35 HCP by application of species habitat models based on the likelihood for
36 each land cover type to support species habitat. For these species, the
37 analysis of the extent of their habitat began with a definition of the
38 land cover types used for the species models. The land cover type
39 classification system used in the LCR MSCP was derived from previous
40 classifications developed by Anderson and Ohmart (1976, 1984) and
41 Younker and Anderson (1986). For riparian species, land cover types
42

1 were classified by plant community and structural type. For marsh
2 species, land cover types were classified by plant community and
3 characteristics.

4
5 Attachment A provides a summary of the habitat used by the northern
6 Mexican gartersnake. The land cover types that this species can use
7 as habitat are marsh (marsh types 1–7) and adjacent riparian habitat.
8 Riparian habitat associated with marsh that was assessed to be impacted
9 in the 2005 HCP is Fremont cottonwood-Goodding’s willow (*Populus*
10 *fremontii-Salix gooddingii*) (CW) CW I–IV.

11
12 The buffer distance to define the riparian habitat for the northern
13 Mexican gartersnake is proposed at 600 feet from the edge of the marsh.
14 This is based on the main area of activity observed in radio tracking
15 studies and trapping studies, which range from 50 to 528 feet from the
16 water’s edge (Emmons 2014, personal communication, as cited in the
17 Federal Register; Emmons and Nowak 2016a; Nowak et al. 2011; Rosen
18 and Schwalbe 1988; USFWS 2013b). Activities included foraging,
19 seeking mates, gestation, and terrestrial movements of various distances.
20 Additionally, the current draft proposed critical habitat (USFWS 2013b)
21 uses a 600-foot buffer.

22
23 It is recognized that the northern Mexican gartersnake may be found,
24 though less frequently, in additional upland areas up to 1 mile from
25 known water sources (Cogan 2014). In these situations it is hypothesized
26 that they are opportunistically moving between foraging habitat patches
27 and using upland cover sites such as burrows, rock structures, etc. (Gloyd
28 1937; Rosen and Schwalbe 1988). However, the majority of activities
29 that may result in incidental take, and the areas where most of the
30 northern Mexican gartersnake activity will be, is within marshes and
31 within 600 feet of open water aquatic habitat.

32 33 34 **W.3 Analysis of Impacts and Level of Take**

35
36 Since the covered activities are not changing with the addition of the
37 northern Mexican gartersnake, the conservation plan as outlined in the
38 HCP will not change. A portion of the habitat already planned to be
39 created will be managed for the gartersnake. Attachment B shows the
40 amount of northern Mexican gartersnake habitat that will be impacted
41 by the covered activities for reaches of the Colorado River. Since the
42 covered actions have not changed, the impacts to marsh types 1–7 are the
43 same as those already described in the HCP.

1 To calculate the impacts for the riparian buffer and to be sure that the
2 impact analysis was consistent, the lower Colorado River (LCR)
3 vegetation layer (from 1997 vegetation mapping from the original impact
4 analysis) was used. A 600-foot buffer was generated around each marsh
5 expected to be affected by covered activities in Reaches 3, 4, and 5.
6 These buffers were then intersected with all cottonwood-willow
7 vegetation polygons in the vegetation layers. Whole cottonwood-willow
8 polygons were not included, just the resultant intersecting area between
9 the 600-foot marsh buffers and the cottonwood-willow polygons.

10
11 Attachment C describes the effects of the flow-related covered activities,
12 the non-flow-related covered activities, and the effects of LCR MSCP
13 implementation on northern Mexican gartersnake habitat. For
14 Reaches 1–7, 243 acres of marsh and 984 acres of adjacent cottonwood-
15 willow habitat could be impacted by implementation of covered activities.
16 As noted in Attachment C, “Section 4.5.28.1 Effects of Flow-Related
17 Covered Activities,” periodic loss of ephemeral marshes and adjacent
18 cottonwood-willow habitat in Lake Mead (Reach 1) could result in a low
19 level of take.
20
21

22 **W.4 Conservation Measures**

23
24 Attachment D outlines the conservation measures. To mitigate the
25 effects of the covered activities, Conservation Measure NMGS1 states
26 that 512 acres of marsh will be created to provide northern Mexican
27 gartersnake habitat. This created habitat will also be habitat for the
28 Yuma clapper rail (*Rallus longirostris yumanensis* [also known as
29 Yuma Ridgway’s rail = *R. obsoletus yumanensis*]) (HCP Conservation
30 Measure CLRA1). Of the 5,940 acres of LCR MSCP-created CW I–IV,
31 984 acres will be created and managed near marshes to provide northern
32 Mexican gartersnake habitat. Marsh associated with backwaters that
33 are disconnected from the LCR channel are of higher value to the
34 gartersnakes than connected backwaters on the LCR and are the
35 preferred type to achieve LCR MSCP conservation goals for this species.
36 Marsh associated with disconnected backwaters are managed to limit
37 nonnative predatory species, to the extent practicable. Conservation
38 Measure NMGS2 provides for implementation of measures to avoid
39 or minimize take of the northern Mexican gartersnake as provided
40 through LCR MSCP best management practices. These practices
41 will be developed in coordination with the USFWS and may include
42 measures addressing worker education programs, speed limits, seasonal
43 restrictions, backfilling or covering trenches overnight, and effects of

1 nonnative species. The following avoidance and minimization measures
2 (AMMs) outlined in the HCP would also apply to the gartersnake:
3 AMM1, AMM2, AMM4, AMM5, and AMM6. These measures are
4 ongoing and will be implemented to benefit the northern Mexican
5 gartersnake, except where implementation would negatively affect other
6 covered species. Since the measures are beneficial to all of the covered
7 species, there may be temporary negative impacts that rise to the level
8 of take but overall will benefit the northern Mexican gartersnake. In
9 addition, Monitoring and Research Measure (MRM) MRM2 would also
10 apply.

11
12 Including the northern Mexican gartersnake for coverage would not
13 increase program costs because the amount of habitat being created
14 for the HCP would not be increasing, and under Section 10.3 of the
15 Implementing Agreement, the USFWS must consider and give full
16 credit for conservation measures under the HCP already being
17 implemented that would benefit the northern Mexican gartersnake.
18 Implementation of some of the AMMs may result in nominal, additional
19 costs at conservation areas, but these costs would be included under
20 existing program costs and reflected accordingly in the LCR MSCP
21 annual Implementation Report, Work Plan and Budget. Additional
22 information on the northern Mexican gartersnake’s status is included in
23 Attachment E.

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Attachment A

**Additional Text Added to Table 3-9
(Beginning on Page 3-22 of the HCP)**

Attachment A

Additional Text Added to Table 3-9 (Beginning on Page 3-22 of the HCP)

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Table 3-9.—LCR MSCP Habitat Models for Selected Species

Covered Species	Assumed Distribution by River Reach							Summary Habitat Description	LCR MSCP Land Cover Types Assumed to Support Species Habitat
	1	2	3	4	5	6	7		
Selected Threatened and Endangered Species									
Northern Mexican gartersnake	X		X	X	X	X	X	Associated with: 1. Aquatic or riparian habitat that includes: <ul style="list-style-type: none"> • Perennial or spatially intermittent streams of low to moderate gradient that possess appropriate amounts of in-channel pools, off-channel pools, or backwater habitat, and that possess a preferred natural, unregulated flow regime; • Lentic wetlands such as livestock tanks, springs, and cienegas; and • Shoreline habitat with adequate organic and inorganic structural complexity to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities (e.g., boulders, rocks, organic debris such as downed trees or logs, debris jams, small mammal burrows, or leaf litter); and 2. Adequate terrestrial space, 600-foot lateral extent to either side of bankfull stage, adjacent to designated stream systems with sufficient structural characteristics to support life history functions such as gestation, immigration, emigration, and brumation.	Marsh types 1–7 and adjacent Fremont cottonwood-Goodding's willow (<i>Populus fremontii</i> - <i>Salix gooddingii</i>) (CW) CW I-IV

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Attachment B

**Additional Text Added to Table 4-5
(Beginning on Page 4-32 of the HCP)**

**Additional Text Added to Table 4-5
(Beginning on Page 4-32 of the HCP)**

Table 4-5.—Summary of Estimated Extent of Covered Species Habitat Affected with Implementation of the Covered Activities, Including Reduction in Annual Flow of 0.860 Million Acre-Feet in Reach 3 and 1.574 Million Acre-Feet in Reaches 4 and 5 (acres)

Covered Species	Impacts of Non-Federal Covered Activities on Species Habitat			Impacts of Federal Non-Flow-Related Covered Activities	Total Impacts on Species Habitat
	Removed (Non-Flow-Related)	Degraded (Flow-Related)	Total Impacts of Implementation on Species Habitat		
Northern Mexican gartersnake	50	1,081	1,131	96	1,227

Attachment C
**Additional Text Added on
Page 4-81 of the HCP**

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Attachment C
**Additional Text Added on
Page 4-81 of the HCP**

4 **4.5.28 Northern Mexican Gartersnake**

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The potential effects of implementing covered activities and Lower Colorado River Multi-Species Conservation Program (LCR MSCP) conservation measures on the rangewide distribution and status of the northern Mexican gartersnake are expected to be minor, affecting a relatively small number of individuals and a proportion of its habitat throughout its range over the term of the LCR MSCP. The LCR MSCP Habitat Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the northern Mexican gartersnake, and the potential effects of habitat loss expected to be minimized with the creation of replacement habitat.

19 **4.5.28.1 Effects of Flow-Related Covered Activities**

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Flow-related activities may result in take of the northern Mexican gartersnake. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent of 1,081 acres of habitat (see Table 4-5) provided by marshes associated with backwaters and adjacent Fremont cottonwood-Goodding’s willow (*Populus fremontii-Salix gooddingii*) (hereafter cottonwood-willow). Reservoir elevations in Reaches 3–5 would not be affected by lower river stage elevations. Consequently, flow-related activities are not expected to affect habitat associated with marshes maintained by reservoirs (e.g., Bill Williams Delta – Reach 3) or that are managed to support marsh vegetation (e.g., Imperial National Wildlife Refuge – Reach 5). Through implementation of Avoidance and Minimization Measure (AMM) AMM2, the

1 LCR MSCP will avoid potential effects of lowering groundwater
2 elevations on an additional 149 (16 acres of marsh and a maximum of
3 133 acres of cottonwood-willow) acres of habitat at Topock Marsh by
4 maintaining water deliveries to Topock Marsh for maintenance of
5 water levels and existing habitat conditions (see Table 4-3). Lowering
6 groundwater elevations could cause direct loss of these habitats
7 through desiccation, fragmentation, or reduction in the extent of
8 habitat patches.

9
10 As described in Section 4.2.3.3 and Section 4.2.3.2, implementation
11 of flow-related covered activities may affect marsh vegetation
12 and adjacent cottonwood-willow that provide northern Mexican
13 gartersnake habitat that periodically establish at inflow points of
14 Lake Mead (e.g., Colorado River Delta, Virgin River Delta, and
15 Muddy River Delta) when Lake Mead water surface elevations are
16 below full pool. Marsh habitat below the full pool elevation will
17 be created and lost based on water surface elevations. For example,
18 marsh vegetation established at a certain elevation may be lost if the
19 water surface elevation declines so that groundwater elevations drop
20 below the rooting depths of emergent vegetation. Alternatively,
21 established marsh vegetation would be inundated and lost during
22 wetter periods, when Lake Mead reservoir elevations rise. The
23 frequency, extent, and value of habitat and attendant species benefits
24 that could be periodically created and subsequently lost as a result of
25 changes in reservoir elevations over the term of the LCR MSCP
26 cannot be predicted based on the available information. The periodic
27 loss of these ephemeral marshes, however, could result in a low level
28 of take of the northern Mexican gartersnake over the term of the
29 LCR MSCP.

30
31 As described in Section 4.2.2.3, effects of ongoing flow-related
32 covered activities could contribute to a minimal and unquantifiable
33 level of degradation of marshes that provide habitat over the term of
34 the LCR MSCP.

35 36 37 **4.5.28.2 Effects of Non-Flow-Related Covered Activities**

38
39 Proposed activities related to habitat restoration and maintenance
40 projects, facilities, and infrastructure maintenance may result in take of
41 the northern Mexican gartersnake. The likelihood for take is expected
42 to increase over the term of the LCR MSCP if the abundance of the
43 northern Mexican gartersnake increases in the LCR MSCP planning

1 area as a result of implementing LCR MSCP conservation measures
2 for this species. Restoration-related activities that affect surface
3 habitat, such as operation of equipment to remove vegetation, could
4 result in temporary or permanent loss of habitat and harassment or
5 mortality of individuals. These activities, however, would be
6 conducted, to the extent practicable, when individuals are least likely
7 to be active on the ground surface. Restoration-related activities that
8 effect subsurface habitat or potential cover sites (ground-disturbing
9 projects with heavy equipment) would be conducted during the times
10 of year when individuals are most likely to be surface active and can
11 move out of harm's way. Effects on habitat would be temporary for
12 restoration projects that restore or improve existing northern Mexican
13 gartersnake habitat. The probability for permanent loss of habitat is
14 considered minimal because restoration projects undertaken in existing
15 northern Mexican gartersnake habitat will be designed to maintain or
16 improve its habitat, and it is unlikely that State fish and wildlife
17 agencies would remove northern Mexican gartersnake habitat to
18 restore habitat for other species. However, because habitat restoration
19 sites have not yet been identified, it is assumed that up to 10 acres of
20 degraded or former marsh and up to 10 acres of degraded cottonwood-
21 willow land cover that provides low-value habitat could be removed
22 over the term of the LCR MSCP to restore habitat for other species
23 (see Table 4-5).

24
25 Activities associated with maintaining facilities and infrastructure may
26 result in the periodic removal of emergent vegetation growing in
27 canals and drains that may provide northern Mexican gartersnake
28 habitat. Up to 557 miles of canals and drains that could support
29 some patches of emergent vegetation could be subject to periodic
30 maintenance activities that would remove emergent vegetation over
31 the term of the LCR MSCP. As described in Section 4.2.3.1, it is
32 unlikely that maintenance of canals would measurably affect the extent
33 of species habitat. Periodic maintenance of the 244 miles of drains in
34 the LCR MSCP planning area, however, could result in the removal
35 of up to 30 acres of emergent vegetation that could provide habitat.
36 Implementation of Federal non-flow-related covered activities
37 addressed in the LCR MSCP biological assessment could result in the
38 loss of an additional 96 acres of species habitat (see Table 4-5).

39
40 As described in Section 4.2.2.3, implementation of ongoing non-flow-
41 related covered activities are not expected to result in indirect effects
42 on the northern Mexican gartersnake.
43
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4.5.28.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining habitat for covered species may result in take of the northern Mexican gartersnake. LCR MSCP habitat creation-related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to fully functioning marsh that provides high-value northern Mexican gartersnake habitat. Some additional limited and low-value (e.g., dry patches of herbaceous vegetation near marsh edges) could be converted to habitat to benefit other covered species; however, with implementation of the AMMs described in Section 5.6.1, "Avoidance and Minimization Measures," removal of these low-quality habitats is not expected to result in harm (i.e., injury or mortality of individuals) and, therefore, is not expected to result in take of the northern Mexican gartersnake.

Habitat management-related activities, such as operation of equipment to remove vegetation and maintain open water in backwaters, burning decadent marsh vegetation to stimulate vegetation growth, periodic removal of trees in patches of created habitat to encourage stand regeneration, and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment, injury, or mortality of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 1,496 acres (i.e., the extent of marsh and cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of the northern Mexican gartersnake increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in the species' habitat.

Attachment D

**Additional Text Added on
Page 5-73 of the HCP**

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Attachment D
**Additional Text Added on
Page 5-73 of the HCP**

4 **5.7.28 Northern Mexican Gartersnake**

5

6 **5.7.28.1 Summary of Effects**

7

8 Implementation of covered activities and Lower Colorado River Multi-
9 Species Conservation Program (LCR MSCP) conservation measures
10 could result in the loss of up to 1,131 acres of northern Mexican
11 gartersnake habitat and take of individuals. Implementation of Federal
12 non-flow-related covered activities addressed in the amendment to
13 the LCR MSCP biological assessment could result in the loss of an
14 additional 96 acres of habitat. Some additional limited and low-value
15 habitat (e.g., dry patches of herbaceous vegetation near marsh edges)
16 could be affected by habitat creation and maintenance activities;
17 however, the level of take is assumed to be low because of the limited
18 value of the potentially affected habitat.

19

20

21 **5.7.28.2 Conservation Measures**

22

23 **NMGS1—Create 1,496 acres of northern Mexican gartersnake**
24 **habitat.** Create and manage 512 acres of marsh to provide northern
25 Mexican gartersnake habitat. This created habitat will also be habitat
26 for the Yuma clapper rail (*Rallus longirostris yumanensis* [also known
27 as Yuma Ridgway’s rail = *R. obsoletus yumanensis*]) (Conservation
28 Measure CLRA1). Of the 5,940 acres of LCR MSCP created Fremont
29 cottonwood-Goodding’s willow (*Populus fremontii-Salix gooddingii*)
30 (CW) I–IV, 984 acres will be created and managed near marshes to
31 provide northern Mexican gartersnake habitat. Additional northern
32 Mexican gartersnake habitat may be provided by marsh vegetation that

1 becomes established along margins of the 360 acres of backwaters that
 2 will be created. These small patches of habitat may provide linkages
 3 between existing habitat and may facilitate the colonization of created
 4 habitats. Marsh associated with backwaters that are disconnected
 5 from the lower Colorado River channel are of higher value to the
 6 northern Mexican gartersnake than connected backwaters on the lower
 7 Colorado River and are the preferred type to achieve LCR MSCP
 8 conservation goals for this species. Marsh associated with
 9 disconnected backwaters are managed to limit nonnative predatory
 10 species, to the extent practicable. The design and management
 11 criteria described in the conservation measures for the Yuma clapper
 12 rail (HCP Section 5.7.1), California black rail (*Laterallus jamaicensis*
 13 *coturniculus*) (HCP Section 5.7.13), southwestern willow flycatcher
 14 (*Empidonax traillii extimus*) (HCP Section 5.7.2) and the yellow-billed
 15 cuckoo (*Coccyzus americanus occidentalis*) (HCP Section 5.7.14) will
 16 ensure that created cottonwood-willow and marsh areas will also
 17 provide other habitat requirements for this species.

18
 19 **NMGS2—Implement conservation measures to avoid or minimize**
 20 **take of northern Mexican gartersnakes.** Implement measures to
 21 avoid or minimize take of northern Mexican gartersnakes. These
 22 measures could include worker education programs and other practices
 23 in accordance with LCR MSCP best management practices.
 24
 25

26 **5.7.28.3 Expected Outcomes with Implementation of** 27 **Conservation Measures**

28
 29 Implementation of the LCR MSCP conservation measures, including
 30 creation of 1,496 acres of habitat, achieves the LCR MSCP goal to
 31 avoid, minimize, and fully mitigate adverse effects of covered
 32 activities and LCR MSCP implementation on the northern Mexican
 33 gartersnake, and to contribute to its recovery. Implementation of
 34 these measures will help ensure that the existing abundance of the
 35 species in the LCR MSCP planning area is maintained as a result
 36 of fully replacing affected habitat and maintaining existing
 37 habitat that otherwise could decline in function or be lost without
 38 management intervention. In addition, implementation of the
 39 conservation measures will benefit the northern Mexican gartersnake
 40 by increasing the amount of new habitat in the LCR MSCP planning
 41 area by 269 acres and by replacing the extent of affected habitat.

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Attachment E

2

**Additional Text Added on Page I-29 of
Appendix I of the HCP**

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**Additional Text Added on Page I-29 of
Appendix I of the HCP**

I.1.1.7 Northern Mexican Gartersnake (Thamnophis eques megalops)

Legal Status

The northern Mexican gartersnake is a subspecies of the Mexican gartersnake (*Thamnophis eques*), the only subspecies that occurs in the United States, and is listed as a threatened species under the Endangered Species Act. The U.S. Fish and Wildlife Service (USFWS) also proposed designation of critical habitat for this species in July 2013 (USFWS 2013b). The USFWS has not yet published a final rule on critical habitat.

Other Status

- G4T3 (global rank) in NatureServe and 1A (State rank) in the Arizona Heritage Data Management System.
- A wildlife species of special concern in Arizona.
- Not listed in the California Natural Diversity Database (there are apparently no records of this species from the California counties along the Colorado River).
- Not listed in the Nevada Natural Heritage Program. It is noted as a historic species.

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Species Distribution

At the time the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) was established in 2005, the northern Mexican gartersnake was considered extirpated from the area surrounding the main stem of the lower Colorado River (LCR) and had not been considered as a potential covered species. The species was re-documented in 2012 below Alamo Dam on the Bill Williams River and later in its largest tributaries. More recently, it was documented on the Havasu National Wildlife Refuge within the Beal Lake Conservation Area in Mohave County, Arizona.

The Arizona Game and Fish Department (AGFD) conducted surveys for the lowland leopard frog (*Rana yavapaiensis*) and Colorado River toad (*Bufo alvarius*) in potential habitat within the LCR MSCP planning area from south of Davis Dam to the Southerly International Boundary and the Bill Williams River from east of Planet Ranch west to the confluence with Lake Havasu from 2011 to 2013 (Cotten 2011; Cotten and Grandmaison 2013). Lentic (of, relating of, or living in still waters such as lakes, ponds, or swamps) and lotic (of, relating to, or living in actively moving water) backwaters and desert washes that appeared to provide suitable habitat for the toad and frog were surveyed using funnel trap arrays, visual encounter surveys, and nocturnal audio surveys (Cotten 2011; Cotten and Grandmaison 2013). During these surveys, 10 northern Mexican gartersnakes were captured in funnel traps along the Bill Williams River upstream of Planet Ranch in 2012 (Cotten 2011; Cotten and Grandmaison 2013).

The northern Mexican gartersnake can be secretive and difficult to detect, especially if present in low densities (Emmons and Nowak 2013; Cotten 2015, personal communication). The surveys from 2011 to 2013 were targeted for the lowland leopard frog and Colorado River toad, not the northern Mexican gartersnake; methods, trap placement, location, and timing would be different depending upon the targeted species (Cotten 2015, personal communication).

Habitat Requirements and Species Considerations

Habitat

In Arizona, Rosen and Schwalbe (1988) found that the most important habitat characteristics for the northern Mexican gartersnake were permanent water, dense bankline vegetation, and an abundance of prey species. Surveys and observations of northern Mexican gartersnakes in Mexico suggested that dense vegetation is most important as protective cover where the gartersnake occurs with harmful nonnative species, but in largely or wholly native communities, vegetation density is much less important to survival (Burger 2007). Individuals often remain concealed under surface cover or subsurface in burrows and are found in areas with protected backwaters, braided side channels, beaver ponds, isolated pools near the main stem of the river, edges of dense emergent vegetation, dried up channels, ample downed and vegetative cover, and flooded areas (Emmons and Nowak 2013). Surveys in Mexico for the northern Mexican gartersnake found the species to be abundant in areas where habitat was severely degraded, with no or low vegetation cover, but had few or no harmful nonnative species present and maintained a suitable native prey base, suggesting that in the absence of harmful nonnative species, dense vegetation is less important in maintaining healthy gartersnake populations (Burger 2007; Servoss 2015, personal communication). While actively foraging, studies have shown that northern Mexican gartersnakes usually stay within 15 meters of a water source (a direct function of preferred prey) but will move farther away on occasion for gestation, periods of dormancy, ecdysis (shedding) cycles, etc. (Rosen and Schwalbe 1988). They have been observed from over 500 feet (Emmons 2014, personal communication, as cited in the Federal Register) to over 1 mile away (Cogan 2014) from the water for sheltering purposes, foraging on land, and moving to other water sources or hibernation sites (Nowak et al. 2011; Rosen and Schwalbe 1988; USFWS 2013b).

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Sheltering Habitat

Northern Mexican gartersnakes take shelter or cover in dense herbaceous vegetation, dense emergent vegetation, holes, root crevices, submergent vegetation, debris dams, downed logs or trees, rocky areas or rock piles, animal burrows, and man-made cover such as riprap or debris piles (Conant 2003; Emmons and Nowak 2013; Nowak et al. 2011; Rosen and Schwalbe 1988; Cotten 2015, personal communication). The presence of small-diameter trees provides additional habitat complexity, thermoregulatory opportunities, and cover for the northern Mexican gartersnake (USFWS 2014).

Habitat Used During Prolonged Inactivity

The northern Mexican gartersnake will use areas of cover with optimal thermal requirements for cover during periods of prolonged inactivity (Cotten 2015, personal communication). Steep hills, riverbanks, upland burrows, and cliffs adjacent to riparian areas near permanent water sources can provide such areas for the species (Nowak et al. 2011). Individuals will also use small mammal burrows, packrat middens, debris piles, flood debris drifts, rock piles, and retaining wall riprap (Cotten 2015, personal communication).

Diet

Potential prey along the main stem of the LCR include the Woodhouse’s toad (*Anaxyrus woodhousii*), Pacific tree frog (*Hyla regilla*), invertebrates, lizards, and small mammals (Cotten 2011; Cotten and Grandmaison 2013; Rorabaugh et al. 2004). Potential prey species found along the Bill Williams River are the Arizona toad (*Anaxyrus microschaphus*), red-spotted toad (*Anaxyrus punctatus*), longfin dace (*Agosia chrysogaster*), invertebrates, lizards, and small mammals (Cotten 2011; Cotten and Grandmaison 2013). Small size classes of harmful nonnative fish may also be used as prey,

1 including largemouth bass (*Micropterus* sp.), black
2 bullheads (*Ameiurus melas*), and American bullfrogs
3 (*Lithobates catesbeianus*) (Emmons and Nowak 2016b).
4

5
6 ***Breeding***

7
8 The exact timing of breeding events varies with elevation
9 (Rosen and Schwalbe 1988). Mating occurs in fall and
10 spring, and females store the sperm until ovulation in late
11 March or early April (Rosen and Schwalbe 1988).
12 Northern Mexican gartersnake females give birth to live
13 young from late May through early July (Brennan and
14 Holycross 2006; Rosen and Schwalbe 1988; Wallace
15 2002). Manjarrez (1998) noticed that births were
16 positively correlated with temperature. Females can
17 have up to 38 young during one breeding season (Nowak
18 and Boyarski 2012), and the size of the litter is positively
19 correlated with the length of the female (Manjarrez 1998;
20 Rosen and Schwalbe 1988). Female northern Mexican
21 gartersnakes have been found to bear young in warm
22 microenvironments 5 to 15 meters from the water, using
23 rock walls, the ground, and sun-warmed sacaton tussocks
24 (Rosen and Schwalbe 1988) but may give birth in a
25 variety of microhabitats and distances from water. The
26 breeding season in this area is estimated to occur
27 between March and July (March – May mating; May –
28 August live birth).
29

30
31 ***Behavior***

32
33 The northern Mexican gartersnake is considered a
34 terrestrial and aquatic generalist (USFWS 2013b). It is
35 active during the warmer months of the year and most
36 active from May to September (Degenhardt et al. 1996;
37 Emmons and Nowak 2013; Manjarrez 1998), but surface
38 activity patterns may depend heavily on elevation and
39 climate, with longer windows of activity at lower
40 elevations. The northern Mexican gartersnake will bask
41 on any substrate, natural or artificial, including on reeds,
42 stones, the ground, and rocks (Rosen 1991; Conant
43 2003).
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The northern Mexican gartersnake forages along watercourses and seeks shelter in thick streamside vegetation (Degenhardt et al. 1996), burrows, under debris and rocks, etc. A northern Mexican gartersnake was observed demonstrating a wide variety of foraging methods, including ambushing prey in water and on land; active foraging in riffles, vegetation mats, grass, and open water; and feeding in areas where there are temporary concentrations of prey (Rosen and Schwalbe 1988). The Mexican gartersnake, including the northern subspecies, primarily forages along the shoreline of the water source but occasionally dives in water, forages away from the shoreline, and forages on the pond's surface (Drummond and Macias-Garcia 1989). Mexican gartersnakes have been observed hanging from holes between the rocks with their head in the water and catching fish as they swam by, and by floating in the water, wiggling their tails to catch fish (Conant 2003).

The northern Mexican gartersnake can be difficult to detect due to its secretive nature, its ability to quickly escape underwater, and its ability to persist in low population densities (USFWS 2013b). Additionally, the northern Mexican gartersnake coexists with other species of gartersnakes across their distribution (Rosen and Schwalbe 1988; Tanner 1959).

Regionally Significant Populations in the LCR MSCP Planning Area

In spring 2015, the LCR MSCP was notified by the Great Basin Bird Observatory that they may have sighted a northern Mexican gartersnake at the Beal Lake Conservation Area on the Havasu National Wildlife Refuge in Arizona during riparian bird monitoring. The AGFD, USFWS, and the U.S. Geological Survey were notified, and five photographs were provided for identification. A gartersnake was observed on May 4, 2015, in the same area, and two additional photographs were taken for identification. The USFWS notified the LCR MSCP on June 1, 2015, that the species was

1 confirmed as a northern Mexican gartersnake by
2 Taylor Cotten and Tom Jones of the AGFD and
3 Jeff Servoss of the USFWS.
4

5 Northern Mexican gartersnake distribution and abundance
6 within the Beal Lake Conservation Area is not well known
7 at this time. From the photographs, it is likely that the
8 sightings described above were of the same individual. The
9 snake may have come from Topock Marsh, as it was found
10 on a road about 275 meters from the marsh to the north and
11 well over 800 meters from open water of the backwater to
12 the south. However, due to the cryptic nature of the species
13 and ineffectiveness of species-specific surveys, species
14 presence and absence determinations can be unreliable.
15 The LCR MSCP has reviewed the existing literature and
16 coordinated with biologists knowledgeable of the species to
17 predict the potential for encountering gartersnakes based
18 on the habitat type and species' preferences. It is also
19 important to note that, due to the mild winter temperatures
20 in the area (rarely below freezing for long periods of time)
21 and preliminary findings from telemetry research along the
22 Verde River, the snakes may exhibit more surface activity
23 than previously suspected and may be more active in the
24 winter months compared to other locations.
25
26

27 **Population Status and Reasons for Decline**

28
29 The population is listed under the ESA as threatened.
30 Reductions in range and population densities have affected
31 the status of the northern Mexican gartersnake significantly
32 in the last 30 years. The subspecies occurs at low to very
33 low population densities or may even be extirpated in as
34 much as 90 percent of the northern Mexican gartersnake's
35 historical distribution in the United States. As of 2016,
36 there were only five northern Mexican gartersnake
37 populations in the United States where the subspecies
38 remains reliably detected and is considered viable, and all
39 are located in Arizona. The five known populations are:
40 (1) the Page Springs and Bubbling Ponds State Fish
41 Hatcheries along Oak Creek, (2) lower Tonto Creek, (3) the
42 upper Santa Cruz River in the San Rafael Valley, (4) the
43 Bill Williams River, and (5) the upper and middle Verde
44 River. As many as 23 of 33 known northern Mexican

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gartersnake localities in the United States (70 percent) are likely not viable and may exist at low population densities that could be threatened with extirpation or may already be extirpated (Servoss 2015, personal communication).

Northern Mexican gartersnake populations have declined primarily from interactions with harmful nonnative species such as bullfrogs, crayfish, and predatory fishes. These nonnative species prey upon, or compete with, the gartersnakes and the native prey species that are vital to their existence. Human activities that diminish surface water or degrade streamside (riparian) vegetation are also significant threats, but they are particularly threatening where they co-occur in the presence of nonnative species (USFWS 2014).

Current Threats to Species Survival

The presence of harmful nonnative species constitutes the most significant threat to the gartersnake. Harmful nonnative species directly prey upon the gartersnake and compete with them for prey. Landscape-level effects from the continued expansion of harmful nonnative species have changed the spatial orientation of the gartersnakes' distribution, creating greater isolation between populations. The prey base of these gartersnakes includes native amphibians and fish populations. Declines in their prey base have led to subsequent declines in the distribution and density of gartersnake populations. In most areas across their range, prey base declines are largely attributed to the introduction and expansion of harmful nonnative species (USFWS 2014).

Human activities that diminish surface water or degrade streamside (riparian) vegetation, urbanization, and road construction are also significant threats, but they are particularly threatening where they co-occur in the presence of nonnative species (USFWS 2014).

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Management Needs

The creation or restoration of marshes for the Yuma clapper rail (*Rallus longirostris yumanensis* [also known as Yuma Ridgway's rail = *R. obsoletus yumanensis*]) and creation of Fremont cottonwood-Goodding's willow (*Populus fremontii-Salix gooddingii*) habitat for the southwestern willow flycatcher (*Empidonax traillii extimus*) will benefit the northern Mexican gartersnake. Marshes associated with backwaters that are disconnected from the LCR channel are of higher value to the northern Mexican gartersnake than connected backwaters on the LCR and are the preferred type to achieve LCR MSCP conservation goals for this species. Marshes associated with disconnected backwaters are managed to limit nonnative predatory species, to the extent practicable.

Existing Management Actions

No existing management actions have been identified for the northern Mexican gartersnake. The AGFD's conservation and mitigation program (CAMP; implemented under an existing section 7 incidental take permit) has committed to either stocking (with captive-bred stock) or securing two populations each of northern Mexican and narrow-headed gartersnakes (*Thamnophis rufipunctatus rufipunctatus*) to help minimize adverse effects to these species from their sport fish stocking program through 2021 (USFWS 2011, Appendix C). Other CAMP commitments include: (1) developing a gartersnake monitoring, research, and restocking plan to guide CAMP activities to establish or secure populations, (2) developing outreach material to reduce the deliberate killing or injuring of gartersnakes (placed in high angler access areas), (3) ensuring that chemically renovated streams are quickly restocked with native fish as gartersnake prey, (4) conducting a live bait assessment team to develop recommendations to amend live bait management, (5) reviewing and updating outreach programs on the risks to native aquatic species from the transport of nonnative aquatic species, (6) developing and implementing a public education program on gartersnakes, and (7) working with the New Mexico Department of Game and Fish to examine

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the role of escaped rainbow trout (*Oncorhynchus mykiss*) from Luna Lake into tributaries to the San Francisco River in supporting narrow-headed gartersnakes.

Recovery Goals

The recovery plan for the northern Mexican gartersnake has not yet been prepared; there are no agency-mandated recovery goals for the species at this time.