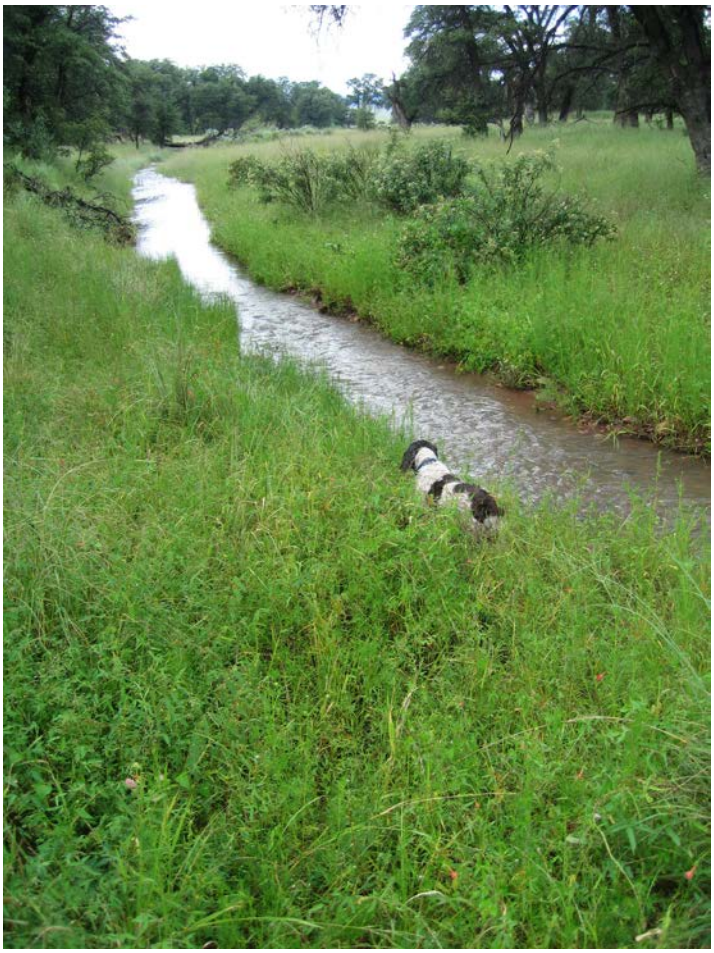
San Rafael Ranch
Low-Effect
Habitat Conservation Plan
Santa Cruz County, Arizona



Prepared for:
San Rafael Cattle Company
Ross Humphreys and Susan Lowell, general partners
1613 Patagonia-San Rafael Road
Patagonia, Arizona 85624

Prepared by:
David L. Harlow
Environmental Consulting
4033 Poppleton Way
Carmichael, CA 95608

December 2015

Contents

Executive Summary 1
Section 1: Introduction and Background 3
1.1 Overview and Background 3
1.2 Permit Holder/Permit Duration 3
1.3 Permit Boundary/Covered Lands 4
1.4 Species to be Covered by Permit 4
1.5 Regulatory Framework 5
1.5.1 Federal Endangered Species Act 5
1.5.2 The Section 10(a)(1)(B) Process - Habitat Conservation Plan Requirements and Guidelines 6
Section 2: Project Description/Activities Covered by Permit 8
2.1 Project Description 8
2.2 Activities to be Covered by Permit 8
2.2.1 Cattle grazing, herding, and watering. 9
2.2.2 Operation and maintenance of stock tanks, wells, waterlines, fences, roads, and utility lines supporting these facilities 9
2.2.3 Brush and invasive plant management 10
Section 3: Environmental Setting/Biological Resources 10
3.1 Environmental Setting 10
3.1.1 Climate 10
3.1.2 Topography/Geology 10
3.1.3 Hydrology: Streams, Rivers, Drainages 11
3.1.4 Vegetation 11
3.1.5 Existing Land Use 11
3.2 Covered Wildlife and Fish Species 12
3.2.1 Sonora Tiger Salamander (*Ambystoma mavortium stebbinsi*) 12
3.2.2 Northern Mexican Gartersnake (*Thamnophis eques megalops)* 13
3.2.3 Gila Chub (*Gila intermedia*) 15
3.2.4 Huachuca Springsnail (*Pyrgulopsis thompsoni*) 16
3.3 Covered Plant Species 17
3.3.1 Canelo Hills Ladies' Tresses (*Spiranthes delitescens*) 17
3.3.2 Huachuca Water Umbel (*Lileaopsis schaffneriana* ssp. *recurva*) 18
Section 4: Potential Biological Impacts/Take Assessment 20
4.1 Direct and Indirect Impacts 20
4.1.1 Livestock Watering and Grazing 20
4.1.2 Facilities Maintenance 23
4.1.3 Brush and Invasive Plant Management 24
4.1.4 Hay Production 24
4.1.5 Beneficial Actions 24
4.2 Anticipated Take of Covered Wildlife or Fish Species 25
4.2.1 Sonora Tiger Salamander 25
4.2.2 Northern Mexican Gartersnake 25
4.2.3 Gila Chub 26
4.2.4 Huachuca Springsnail 26
4.3 Anticipated Impacts on Covered Plant Species 27
4.3.1 Canelo Hills Ladies'-Tresses 27
4.3.2 Huachuca Water Umbel 27
4.4 Effects on Critical Habitat 28

4.4 Anticipated Impacts to Non-covered Listed Species 29
4.4.1 Chiricahua Leopard Frog 29
4.4.2 Gila Topminnow 30
4.4.3 Northern Aplomado Falcon 30
4.4.4 Yellow-billed Cuckoo 30
4.4.5 Jaguar 31
4.4.6 Ocelot 31
4.4.7 Lesser Long-nosed Bat 31
4.5 Cumulative Impacts 32
4.5.1 Conservation Projects 32
4.5.2 Illegal Immigration, Smuggling, and Other Trespass 32
4.6 Anticipated Effects of the Taking 33
4.6.1 Sonora Tiger Salamander 33
4.6.2 Northern Mexican Gartersnake 34
4.6.3 Gila Chub 34
4.6.4 Huachuca Springsnail 34
Section 5: Conservation Program/Measures to Minimize and Mitigate for Impacts 35
5.1 San Rafael Ranch Habitat Conservation Plan Goals and Objectives 35
5.2 Avoidance, Minimization, and Mitigation Measures 36
5.2.1 Measures to Avoid Impacts 36
5.2.2 Measures to Minimize Impacts 36
5.2.3 Measures to Mitigate Unavoidable Impacts 38
5.3 Monitoring 38
5.3.1 Compliance and Effects Monitoring 39
5.3.2 Effectiveness Monitoring 39
5.4 Performance and Success Criteria 41
5.5 Adaptive Management Strategy 41
5.6 Plan Implementation 42
5.7 Reporting 42
Section 6: Funding 43
6.1 Costs of HCP Implementation 43
6.2 Funding Source(s) 44
6.3 Funding Mechanism and Management 44
6.4 Additional Funding for Conservation Actions 44
Section 7: Alternatives 45
7.1 Summary 45
7.2 No Action Alternative 45
Section 8: Changed and Unforeseen Circumstances 46
8.1 Changed Circumstances 46
8.1.1 Summary of Circumstances 46
8.1.2 Newly Listed Species 46
8.1.3 New Critical Habitat Designation 47
8.1.4 Drought/Climate Change 47
8.1.5 Large or Catastrophic Wildfires 47
8.1.6 Flood Event 47
8.1.7 Invasive non-native plants or animals 48
8.2 Unforeseen Circumstances 48
Section 9: Permit Administration 49
9.1 Amendments 49
9.1.1 Minor Amendments 49
9.1.2 Major Amendments 49

9.2 Suspension/Revocation 49
9.3 Permit Renewal.....50
9.4 Permit Transfer 50
9.5 Other Measures as Required by Director 50
Section 10: Literature Cited 50
Acknowledgements 55
Appendices 56

Executive Summary

The San Rafael Ranch Low-Effect Habitat Conservation Plan (henceforth referred to as SRRHCP) has been prepared as part of a Section 10(a)(1)(B) permit application, pursuant to the Endangered Species Act of 1973, as amended (Act). The San Rafael Cattle Company, Ross Humphreys and Susan Lowell, general partners (collectively "the applicant"), proposes to continue cattle ranching operations on the San Rafael Ranch while providing habitat conditions favorable to the management and restoration of several listed and unlisted species. The San Rafael Ranch is located in San Rafael Valley, Santa Cruz County, Arizona, which encompasses the headwaters of the Santa Cruz River (Figure 1). The SRRHCP covers a total of 22,060 acres, including 18,375 acres of rangeland and 125 acres of irrigated pasture owned by the San Rafael Cattle Company. In addition, the SRRHCP also covers 3,560 acres of grazing preference on the Arizona State Parks, San Rafael State Natural Area, consistent with lease terms. The SRRHCP addresses ranching activities that may adversely affect and/or incidentally take covered species in the covered area.

The headwaters of the Santa Cruz River, which lie in the San Rafael Valley, historically supported a unique assemblage of native species of fish, wildlife, and plants. Many fish species native to the Santa Cruz River once were resident on the San Rafael Ranch. However, past alterations to habitat, non-native invasive species introductions, and water withdrawals likely led to the extirpation of many of these species. Today the San Rafael Ranch supports the federally endangered **Gila chub**, the endangered **Sonora tiger salamander**, the candidate **Huachuca springsnail**, endangered **Gila topminnow**, and the threatened **northern Mexican gartersnake**. These species may be adversely affected by some normal ranching activities. Therefore, the applicant is seeking a permit to incidentally take these animal species as a result of normal ranching activities. The SRRHCP also addresses two federally listed plants, the endangered **Canelo Hills ladies'-tresses** and the endangered **Huachuca water umbel**, as some ranching activities may adversely affect these plants.

In addition, the SRRHCP discusses the **jaguar, ocelot, lesser long-nosed bat**, **western yellow-billed cuckoo**, and **northern aplomado falcon**, as these species either have occurred, or are likely to occur on the San Rafael Ranch during the term of the permit. However, they are not covered for purposes of receiving incidental take authorization. No activities undertaken by the applicants are likely to result in adverse effects to, or take of, these species. The northern aplomado falcon is currently an experimental non-essential (10j) population under the Act, and does not require incidental take authorization.

Although not proposed as covered species under the SRRHCP, the **Gila topminnow** and the **Chiricahua leopard frog** also are discussed in the SRRHCP. The Gila topminnow occurs on the San Rafael Ranch under a safe harbor agreement established between the Arizona Game and Fish Department and Fish and Wildlife Service (Service) in March 2008 to promote recovery actions for the species. An initial introduction of the Chiricahua leopard frog onto the San Rafael Ranch was made in October 2009 (Jim Rorabaugh, pers. comm.). These frogs are covered under a safe harbor agreement.

Any additional introductions of Chiricahua leopard frogs to the San Rafael Ranch will also be covered under the safe harbor agreement.

A major purpose of the SRRHCP is to provide a regulatory framework and early agreement to enable the San Rafael Cattle Company to cooperate with the Service, the Arizona Game and Fish Department, and/or other conservation organizations for the translocation and/or reestablishment of new populations of covered species on covered lands. The HCP and associated permit will allow for the incidental take of covered species that already exist on the covered lands and of new populations of covered species that are established by the cooperating agencies and organizations to promote recovery of these species, as a result of covered activities.

Measures to minimize take of covered species are included in the SRRHCP; these measures emphasize the use of riparian pastures and dispersed grazing to benefit Section 5.1 goals and objectives. Measures also are included in the SRRHCP that will minimize the effects to covered species of maintaining livestock ponds or tanks. The SRRHCP also promotes the conservation of covered species by undertaking actions to benefit those species through the mutual consent of the applicant and the Service. The term of this permit application is 30 years.

Section 1: Introduction and Background

1.1 Overview and Background

The San Rafael Ranch Low Effect Habitat Conservation Plan (SRRHCP) has been prepared to support an application by the San Rafael Cattle Company, Ross Humphreys and Susan Lowell, general partners of Brickyard Investments Limited Partnership, Limited Liability Limited Partnership, (San Rafael Cattle Company or applicant) to the U.S. Fish and Wildlife Service (Service) for an incidental take permit pursuant to Section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (Act). The permit would allow take of covered species by the applicant incidental to otherwise lawful activities undertaken by the San Rafael Cattle Company as a part of its normal cattle ranching operations. The applicant is requesting a permit be issued for a term of 30 years. The four animal species proposed for inclusion in the incidental take permit are listed below in section 1.4. Also, two federally listed plant species that may be adversely affected by covered activities are included in section 1.4.

In addition to covering activities that may incidentally take covered species, the SRRHCP is intended to provide the regulatory framework and agreement such that the ranch owners can fully cooperate with partners on conservation opportunities to improve the status and distribution of covered species on the ranch with a clear understanding of the obligations and protections contained in a Section 10(a)(1)(B) permit, and this supporting habitat conservation plan.

Since at least 1823, the San Rafael Ranch has been grazed continuously as a cow/calf cattle ranch. In 2000 the applicant purchased the San Rafael Ranch. The owners are implementing grazing practices that have improved range and habitat conditions by: 1) grazing at sustainable levels; 2) adding new water sources; and 3) implementing deferral of grazing in riparian pastures (pastures along perennial stretches of the Santa Cruz River and tributaries) (Figure 1) during the warm growing season from April to November, annually. This grazing system has added water sources that, along with pre-existing water sources, serve or will serve as habitat for one or more covered species. The grazing system also has improved riparian and upland habitat conditions that benefit one or more covered species. Thus, there are opportunities for conservation actions, including releases of covered species or other species, under the terms described herein.

1.2 Permit Holder/Permit Duration

The intended permit holder is the San Rafael Cattle Company. The term of the SRRHCP and the associated incidental take permit (ITP) issued pursuant to Section 10(a)(1)(B) of the Act is 30 years.

1.3 Permit Boundary/Covered Lands

The permit boundary includes the 18,500-acre San Rafael Ranch and the 3,560-acre area of grazing preference on the San Rafael Ranch Natural Area (Figure 1). This geographic area is referred to as the “covered area” in the SRRHCP and associated ITP if it is issued. Covered area and “San Rafael Ranch” are used interchangeably in this document. The covered area includes 18,375 acres of rangeland and 125 acres of irrigated pasture owned by the applicants, and 3,560 acres owned by Arizona State Parks and leased to the applicants for cattle grazing. The covered area is located in Santa Cruz County, Arizona, south of Patagonia, Arizona and directly north of the Mexico border.

1.4 Species to be Covered by Permit

The following species are referred to as "covered species" related to the Incidental Take Permit if it is issued.

Covered Species	Federal Status
[1]Canelo Hills Ladies’-Tresses (*Spiranthes delitescens*)	Endangered
[1]Huachuca Water Umbel (*Lilaeopsis schaffneriana* ssp*. recurva*)	Endangered
Sonora Tiger Salamander (*Ambystoma mavortium stebbinsi*)	Endangered
Northern Mexican Gartersnake (*Thamnophis eques megalops*)	Threatened
Gila Chub (*Gila intermedia*)	Endangered
Huachuca Springsnail (*Pyrgulopsis thompsoni*)	Candidate

[1]Plant species are addressed in the plan and included in the permit application even though the definition of take does not include the incidental take of plants. They are covered so no additional conservation measures will be required of the applicant if additional critical habitat is designated for these two plants.

The following species are discussed within the SRRHCP, but will not be covered under an Incidental Take Permit:

Species	Federal Status
Chiricahua Leopard Frog (*Lithobates chiricahuensis*)	Threatened
Gila Topminnow (*Poeciliopsis occidentalis occidentalis*)	Endangered
Northern Aplomado Falcon (*Falco femoralis septentrionalis*)	Endangered

Western Yellow-billed Cuckoo (*Coccyzus americanus*)	Threatened
Jaguar (*Panthera onca*)	Endangered
Ocelot (*Leopardus pardalis*)	Endangered
Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuenae*)	Endangered

1.5 Regulatory Framework

1.5.1 Federal Endangered Species Act

Section 9 of the Endangered Species Act (Act) and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species by annoying them to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Pursuant to section 11(a) and (b) of the Act, any person who knowingly violates section 9 of the Act or any permit, certificate, or regulation related to section 9, may be subject to civil penalties of up to $25,000 for each violation or criminal penalties up to $50,000 and/or imprisonment of up to one year.

Individuals and State and local agencies proposing an action that is expected to result in the incidental take of federally listed species are encouraged to apply for an incidental take permit under section 10(a)(1)(B) of the Act to be in compliance with the law. Such permits are issued by the Service when take is not the intention of and is incidental to otherwise legal activities. An application for an incidental take permit must be accompanied by a habitat conservation plan, commonly referred to as an HCP. The regulatory standard under section 10(a)(1)(B) of the Act is that the effects of authorized incidental take must be minimized and mitigated to the maximum extent practicable. Under section 10(a)(1)(B) of the Act, a proposed project also must not appreciably reduce the likelihood of the survival and recovery of the species in the wild, and adequate funding for a plan to minimize and mitigate impacts must be ensured.

Section 7 of the Act requires Federal agencies to ensure that their actions, including issuing permits, do not jeopardize the continued existence of listed species or destroy or adversely modify listed species' critical habitat.

"Jeopardize the continued existence of…" pursuant to 50 CFR 402.2, means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. Issuance of an incidental take permit under section 10(a)(1)(B) of the Act by the Service is a Federal action subject to section 7 of the Act. As a Federal agency issuing a discretionary permit, the Service is required to consult with itself (i.e., conduct an internal consultation). Delivery of the HCP and a section 10(a)(1)(B) permit application initiates the section 7 consultation process within the Service.

The requirements of section 7 and section 10 substantially overlap. Elements unique to section 7 include analyses of impacts on designated critical habitat, analyses of impacts on listed plant species, if any, and analyses of indirect and cumulative impacts on listed species. Cumulative effects are effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area, pursuant to section 7(a)(2) of the Act. The action area is defined by the influence of direct and indirect impacts of covered activities. The action area may or may not be solely contained within the HCP boundary. These additional analyses are included in this HCP to meet the requirements of section 7 and to assist the Service with its internal consultation.

1.5.2 The Section 10(a)(1)(B) Process - Habitat Conservation Plan Requirements and Guidelines

The Section 10(a)(1)(B) process for obtaining an incidental take permit has three primary phases: (1) the habitat conservation plan (HCP) development phase; (2) the formal permit processing phase; and (3) the post-issuance phase.

During the HCP development phase, the project applicant prepares a plan that integrates the proposed project or activity with the protection of listed species. An HCP submitted in support of an incidental take permit application must include the following information:

- impacts likely to result from the proposed taking of the species for which permit coverage is requested;
- measures that will be implemented to monitor, minimize, and mitigate impacts;
- funding that will be made available to undertake such measures; and procedures to deal with unforeseen circumstances;
- alternative actions considered that would not result in take; and
- additional measures the Service may require as necessary or appropriate for purposes of the plan.

The HCP development phase concludes and the permit processing phase begins when a complete application package is submitted to the appropriate permit-issuing office. A complete application package consists of: 1) an HCP; 2) an Implementing Agreement (IA), if applicable; 3) a permit application; and 4) a $100 fee from the applicant. The Service must also publish a Notice of Availability of the HCP package in the Federal Register to allow for public comment. The Service also prepares an Intra-Service Section 7 Biological Opinion and prepares a Set of Findings, which evaluates whether the Section 10(a)(1)(B) permit application meets the permit issuance criteria (see below). A National Environmental Policy Act (NEPA) compliance checklist, Environmental Assessment, or Environmental Impact Statement, which has gone out for a 30-day, 60-day, or 90-day public comment period, with an Environmental Action Statement, Finding of No Significant Impact, and/or a Record of Decision serves as the Service's record of compliance with the NEPA. An implementing agreement is typically required for an HCP unless the HCP qualifies as a low-effect HCP. A Section 10(a)(1)(B) incidental take permit is granted upon a determination by the Service that all requirements for permit issuance have been met. Statutory criteria for issuance of the permit specify that:

- the taking will be incidental;
- the impacts of incidental take will be minimized and mitigated to the maximum extent practicable;
- adequate funding for the HCP and procedures to handle unforeseen circumstances will be provided;
- the taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild;
- the applicant will provide additional measures that the Service requires as being necessary or appropriate; and
- the Service has received assurances, as may be required, that the HCP will be implemented.

During the post-issuance phase, the permittee and other responsible entities implement the HCP, and the Service monitors the permittee's compliance with the HCP as well as the long-term progress and success of the HCP. The public is notified of permit issuance by means of the Federal Register.

Section 2: Project Description/Activities Covered by Permit

2.1 Project Description

The San Rafael Cattle Company has established ranching management goals to maintain a balance of beef production, vegetation health, and wildlife diversity on the San Rafael Ranch. Specific goals are:

- To maintain a permanent, stable, and productive livestock operation that provides for efficient, sustained use of the forage crop.
- To prevent accelerated loss of soil, water, plant, or animal resources.
- To maintain or improve the condition of the soil, water, plant, and animal resources.
- To maintain or improve the natural ecological processes.
- To maintain or improve human uses and quality of life.

There are three residences and several barns on the ranch. Fences, roads, corrals, watering tanks, water diversion devices, wells, and irrigation systems are a part of the ranch.

The San Rafael Cattle Company proposes to maintain a viable ranching operation throughout the San Rafael Ranch, including operations under lease on the San Rafael State Natural Area, while maintaining, and improving to the extent practicable, the habitat for covered species. Maintaining a viable ranching operation requires maintaining an infrastructure of pastures separated by fencing, maintaining hay production for supplemental feeding of cattle, maintaining limited access roads for vehicular travel, maintaining and adding as necessary water sources for the cattle and wildlife, maintaining water control and diversion structures, and moving cattle for distributional, health, inventory, and marketing purposes.

2.2 Activities to be Covered by Permit

The activities covered by this permit are all related to livestock management on the San Rafael Ranch and on the San Rafael State Natural Area, consistent with lease terms. Also, this permit will increase opportunities for conservation actions for covered species on the San Rafael Ranch. The SRRHCP will not only address the effects of the incidental take that may result from covered activities to current populations of covered species, but also will address the incidental take that may occur from covered activities to populations of covered species which

may be established in the future under cooperative arrangements fostered by the SRRHCP.

Specific activities that may result in incidental take of covered species during the term of this permit include:

1. Grazing by cattle throughout the San Rafael Ranch and State Natural Area, including herding of cattle within pastures and between pastures. Watering of cattle at stock tanks and riparian habitats.

2. Operation and maintenance of stock tanks, wells, waterlines, fences, roads, and utility lines supporting these facilities.

3. Hay production for supplemental feeding.

4. Brush and invasive plant management.

2.2.1 Cattle grazing, herding, and watering.

The San Rafael Cattle Company grazes cattle year around in a rotational system using 31 pastures on the San Rafael Ranch and on San Rafael State Natural Area. The ranch maintains over 80 stock tanks for watering cattle, including 43 drinkers and 37 stock ponds. The drinkers are above ground tanks with troughs fed from specific point groundwater sources (e.g., springs or wells) and the stock ponds are earthen impoundments typically fed by ground surface runoff. Stock ponds may also be fed by overflow from nearby drinkers. Cattle regularly water in stock tanks throughout the year. Cattle occasionally water and graze in riparian pastures along six miles of the Santa Cruz River and its tributaries during the non-growing season from November 1 through March 31. The San Rafael Cattle Company implements rotational short duration grazing of the pasture containing Sheehy Spring. Grazing in this pasture is limited, and in some years this pasture is not grazed. Cattle are herded within and between pastures on the San Rafael Ranch throughout the year, changing the time of use and multi-year full rest periods regularly. About 125 acres of irrigated pasture are managed to provide cattle with supplemental feed.

2.2.2 Operation and maintenance of stock tanks, wells, waterlines, fences, roads, and utility lines supporting these facilities

The operation and maintenance of stock tanks, wells, waterlines, fences, roads and utility lines is a necessary part of management of the San Rafael Ranch. The maintenance of cattle watering sources and their associated infrastructure also serves to provide habitat for up to four covered species. Stock tanks must be periodically cleaned of sediment to maintain storage capacity. This occurs infrequently, averaging every 20-25 years. Also, stock tanks may be periodically dried to reduce or eliminate American bullfrog populations, nonnative fish, and aquatic vegetation. Roads are used for routine ranching activities, including herding, patrolling, access to maintain infrastructure, etc. Fencing divides the

San Rafael Ranch into individual pastures and allows for rotational grazing and cattle exclusion when necessary. Wells, waterlines, and utility lines provide water to drinkers and stock ponds. Maintenance of these facilities consists of periodic structural repairs, clearing of vegetation and brush, and grading of roads. All of these facilities will be maintained within their existing footprint.

2.2.3 Brush and invasive plant management

While the rangelands of the San Rafael Ranch are in good condition generally, there are areas of increasing occupation by non-native grasses such as Lehmann lovegrass (*Eragrostis lehmanniana*) and Cochise lovegrass (*Eragrostis lehmanniana* X *E. trichophora*). There also are areas generally less than an acre, occupied by slowly expanding populations of shrubs, including whitethorn acacia (*Vachellia constricta*) and Himalayan blackberry (*Rubus armeniacus*). Mechanical treatment of these areas is sometimes possible to remove the shrubs but often a more successful treatment is with the use of herbicides. The applicant will acquire a regulated grower permit from the Arizona Department of Agriculture when herbicides are planned to be used to control invasive vegetation, and follow any required permit. The applicant applies all pesticides in accordance with product labels, in compliance with state guidelines and in conformance with use recommendations of the Natural Resources Conservation Service (NRCS) (Arizona Revised Statute 3-363-10(a)), Natural Resource Conservation Service 2002).

Section 3: Environmental Setting/Biological Resources

3.1 Environmental Setting

3.1.1 Climate

Climate data is summarized from the National Weather Service record of the San Rafael Ranch weather station from 1892 through 2009. The summer (June-August) average temperatures in the covered area range from 56 to 89 degrees Fahrenheit. The winter (December through February) average temperature range is from 25 to 63 degrees Fahrenheit. Daily extreme temperatures are -11 degrees Fahrenheit and 105 degrees Fahrenheit. The average annual precipitation in the covered area is 17.94 inches and has ranged from 10.82 to 26.64 inches per year during the period of record. Most precipitation falls as rain. The greatest rainfall (approximately 70 percent of the total annual rainfall) occurs in July and August during the summer monsoon season.

3.1.2 Topography/Geology

The San Rafael Valley is a broad open valley. Elevations on the San Rafael Ranch range from 4,640 to 5,050 feet. The covered area is composed mostly of open rolling plains grassland, with oak savanna or woodlands at the higher elevations on both the eastern and western edges of the property (Brown and Lowe 1980). In the covered area, soil types are varied including clay and loamy upland, clay and loamy bottom, loamy hills, and limy slopes.

3.1.3 Hydrology: Streams, Rivers, Drainages

The covered area is within the southern portion of the Lochiel sub-basin of the Santa Cruz River Basin. The drainage area for this sub-basin is 82.2 square miles. The San Rafael Valley includes the headwaters of the Santa Cruz River and contains a small portion of the San Pedro River basin. Natural perennial surface flow of the Santa Cruz River occurs only in the San Rafael Valley over a stretch of about 15 miles. The covered area is bisected by the Santa Cruz River, which flows south into Mexico. Naturally occurring water on the covered area consists of spring-fed perennial flow in the Santa Cruz River for most of the length of the San Rafael Ranch. In tributaries to the Santa Cruz River, springs and ciénegas provide natural water sources, mostly within 0.25 mile of the river. Away from the river over 80 man-made stock tanks are maintained as water sources.

3.1.4 Vegetation

The dominant terrestrial plant community in the San Rafael Valley is plains grassland (Brown and Lowe 1980, Brown 1994). Typical grasses include, among others, plains lovegrass (*Eragrostis intermedia)*, side-oats grama (*Bouteloua curtipendula)*, and blue grama (*Bouteloua gracillis)*. Within the grasslands, stringers or groves of cottonwoods (*Populus fremontii*), willow (*Salix sp.)* and other wetland plants grow along some drainages and at ponds and springs. Several species of manzanita and oak form patchy woodlands or savannas on the upslope edges of the valley that gradually give way to pine-oak and mixed conifer woodlands at higher elevation (Brown and Lowe 1980, Brown 1994).

3.1.5 Existing Land Use

The San Rafael Ranch is operated solely for livestock grazing and conservation of natural resources. It is subdivided into 31 pastures (including the San Rafael State Natural Area), each containing one or more water sources such that livestock do not overgraze any pasture or excessively trample any area. Three irrigated farm fields grow annual and perennial forage plants that are grazed and harvested mechanically. There are three residences on the San Rafael Ranch for the owners and permanent ranch hands and their families, one of which doubles as a shop as well as quarters for occasional additional help. There also are four barns for horses and storage of feed and other materials.

3.2 Covered Wildlife and Fish Species

3.2.1 Sonora Tiger Salamander (*Ambystoma mavortium stebbinsi*)

Sources of information, unless otherwise noted, are the Federal Register Notice listing the Sonora tiger salamander (U.S. Fish and Wildlife Service 1997a), the Sonora Tiger Salamander Recovery Plan (U.S. Fish and Wildlife Service 2002), and the 2007 5-year Review: Summary and Evaluation (U.S. Fish and Wildlife Service 2007b).

Status and Distribution: The Sonora tiger salamander was listed by the Service as endangered, with no critical habitat designation on January 6, 1997 (62 FR 665). The state of Arizona considers the Sonora tiger salamander a species of greatest conservation need 1A (Arizona Game and Fish Department 2012).

The historical range of this distinct subspecies is thought to encompass the grassland and adjacent woodland communities of the San Rafael Valley of Santa Cruz County and Cochise County, Arizona and Sonora, Mexico. The San Rafael Valley lies between the Huachuca Mountains on the east, the Patagonia Mountains on the west, the Canelo Hills to the north, and extends approximately 19 miles into Sonora, Mexico on the south. The historical distribution of Sonora tiger salamanders within that range is not known for certain because of the paucity of surveys before the 1980s. In 2002, at the time the recovery plan was written, 53 sites at which salamanders had been documented were known from the San Rafael Valley, all within Arizona. From 2001-2006, Arizona Game and Fish Department documented salamanders at 37 of 139 sites surveyed in the San Rafael Valley of Arizona. In 1991 in the Sonora portion of the San Rafael Valley, a tiger salamander suspected to be this subspecies was found. Salamanders were found at two additional sites in the San Rafael Valley of Sonora in 2009 (Rorabaugh et al. 2013), and four others were found in 2015 (Hossack et al. submitted).

The species faces a number of threats, including a virulent and apparently introduced iridovirus (*Ambystoma tigrinum* virus or ATV); predation by non-native fish, bullfrogs, and crayfish; use as fishing bait; interbreeding with a non-native subspecies of tiger salamander; habitat degradation and destruction; and the increased probability of extirpation or extinction resulting from small population size.

Habitat Characteristics and Use: Historically, the Sonora tiger salamander probably inhabited natural springs and ciénegas with permanent or nearly permanent water. By the early 20th century, however, much of the San Rafael Valley's natural aquatic sites had disappeared. As a result, stock tanks created by ranchers for their cattle became almost the only suitable breeding habitat for the Sonora tiger salamander. At present, Sonora tiger salamander populations are found exclusively in human-constructed and maintained stock tanks.

The most essential habitat requirement for Sonora tiger salamanders is the availability of standing water from January through June. This gives the salamanders enough time to breed and metamorphose before a water source dries. Stock tanks with year-round water can be good breeding sites, but they may contain introduced fish, crayfish, and bullfrogs. Disease and predation by non-native fish and, to a lesser extent, bullfrogs are among the most serious and immediate threats facing the Sonora tiger salamander.

Aquatic breeding habitats are used by all life stages; however, upland habitats are also used by terrestrial juveniles and adults when not at the breeding ponds. Tiger salamander species in general are known to spend much of their time in mammal or other existing burrows to escape extreme environmental conditions above ground.

Occurrence within the Project Area: Sonora tiger salamander populations occupy stock tanks and ephemeral waters adjacent to drinkers on the covered area, although a complete inventory of all water sources has not been undertaken. They are also known to occur at drinkers near areas of water leakage from the drinker and pipelines. Sonora tiger salamander populations are not known to occur in any other types of aquatic habitats on the covered area, although some springs and sections of the Santa Cruz River still may be suitable breeding sites. Sonora tiger salamander populations are known to be dynamic, with the number and location of extant aquatic populations changing over time. During dry periods, numbers of occupied sites may be few, whereas after several years of good rainfall, salamanders may occur at many sites. Further, determining whether a population is extant in any given water source can be difficult. A lack of detection may result because the number of individuals is small or because individuals present in the area are terrestrial.

3.2.2 Northern Mexican Gartersnake (*Thamnophis eques megalops)*

Unless otherwise noted, the following information on the northern Mexican gartersnake is adopted from the Federal Register designating the species as Threatened (U.S. Fish and Wildlife Service 2014a), and the Species Information Sheet (U.S. Fish and Wildlife Service, unpublished web document dated July 2014).

Status and Distribution: The northern Mexican gartersnake was listed as a Threatened species in July 2014 (U.S. Fish and Wildlife Service 2014a). The listing decision includes a 4(d) rule that exempts the use of stock tanks by livestock on non-Federal lands, and construction and maintenance of the tanks, from Section 9 take prohibitions. Critical habitat, which includes the entire covered area, was proposed in July 2013 (U.S. Fish and Wildlife Service 2013a). However, the San Rafael Ranch is being considered for exclusion from the final rule under section 4(b)(2) of the Act. The northern Mexican gartersnake is categorized as a Tier 1A Species of Greatest Conservation Need by the Arizona

Game and Fish Department, and is listed as Threatened by the Mexican Federal government.

The northern Mexican gartersnake ranges in color from olive to olive-brown or olive-gray. Three stripes run the length of the dorsum of the body with a yellow mid-dorsal stripe down the back that darkens towards the tail. The lateral stripes occur on the third and fourth scale rows anteriorly. Maximum length is 44 inches total length. Ten subspecies of *Thamnophis eques* have been identified; however, only one, the northern Mexican gartersnake, occurs in the United States.

Sexual maturity in the northern Mexican gartersnake occurs at 2 years of age in males and 2 to 3 years in age in females. The eggs develop and hatch in the oviduct, and the young are born live. Mating occurs in April and May, followed by live birth of between 7 and 38 newborns in July and August. About half of the sexually mature females within a population reproduce in any one mating season.

Within the United States, the northern Mexican gartersnake historically occurred in perennial rivers, intermittent streams, and isolated wetlands throughout southeastern and central Arizona, with a limited distribution in western New Mexico and along the lower Colorado River. Within Mexico, the subspecies historically occurred from Sonora and Chihuahua south to Guanajuato and Hidalgo with an apparently isolated population in Nuevo León.

The Service, in its final rule listing the northern Mexican gartersnake as Threatened, determined that the species is extirpated or at low to very low densities in as much as 90 percent of its historical distribution in the United States. Within the United States, there are only five populations that appear to support viable populations: 1. Page Springs and Bubbling Ponds State Fish Hatcheries along Oak Creek; 2. Lower Tonto Creek; 3. The upper Santa Cruz River in the San Rafael Valley; and 5. The upper and middle Verde River.

The major threat to the northern Mexican gartersnake is predation by, and competition with non-native species, especially bullfrogs, crayfish, and fish. Recruitment of northern Mexican gartersnakes may be significantly impeded by non-native predation on the neonate and juvenile age classes. This snake coexists with non-native species at some sites, such as the upper Santa Cruz River in the covered area and the Page Springs and Bubbling Ponds Hatcheries, likely due to dense emergent and bankline vegetation that provides excellent concealment and escape cover. The northern Mexican gartersnake is also threatened by habitat loss and degradation from altering or dewatering of aquatic habitat through surface water diversion and groundwater withdrawals; climate change and drought; development within riparian areas and habitat destruction due to historical or unmanaged livestock grazing, and environmental contaminants in their habitat.

<u>Habitat Characteristics and Use</u>: The northern Mexican gartersnake occurs at elevations from 130 to 8,497 feet, but is most frequently found between 3,000 and 5,000 feet. It is a riparian obligate species that occurs chiefly in source-area wetlands (e.g., ciénegas and stock tanks), large river riparian woodlands, and

streamside gallery forests. Vegetation characteristics vary based on type of habitat. Source-area wetlands provide dense vegetation consisting of knot grass, spikerush, cattail, cottonwood, and willow are particularly important habitat for the northern Mexican gartersnake. In small streamside riparian habitat, this snake is often associated with sycamore, maple, cypress, walnut, juniper and oak. Along larger rivers with cottonwood and willow woodlands, or gallery forests with broadleaf and deciduous plant species, the northern Mexican gartersnake may be observed in the mixed grasses along the river bank or in the shallows, or around cobbles or debris.

This species is active on the ground in warm temperatures ranging from 71 to 91 degrees Fahrenheit. It basks on vegetation and on the ground, as well as spending some of its time in dense cover. The northern Mexican gartersnake is an active predator, foraging along vegetated banklines and in water for a primarily native prey base of amphibians, such as the lowland leopard frog and Chiricahua leopard frog, and fishes, including the Gila topminnow and desert pupfish. On the upper Santa Cruz River northern Mexican gartersnakes eat primarily bullfrogs and mosquitofish (Gartersnake Conservation Working Group 2014).

Occurrence within the Project Area: The northern Mexican gartersnake population in the Upper Santa Cruz River/San Rafael Valley Subbasin is considered by the Service to be one of only five viable populations in the United States. Appendix 1 of 79 FR 38678 summarizes historical and recent records for the area. The species has been documented in a number of aquatic locations in the Subbasin, including from Bog Hole Wildlife Management Area, Santa Cruz River, Sharp Spring, Upper 13 Reservoir, Forest Service 799 Tank, and Sheehy Spring.

3.2.3 Gila Chub (*Gila intermedia*)

Unless otherwise noted, the following information on the Gila Chub is adopted from the Federal Register Notice of listing (U.S. Fish and Wildlife Service 2005).

Status and Distribution: The Gila chub, a member of the minnow family, was listed by the Service as endangered with critical habitat on November 2, 2005 (U.S. Fish and Wildlife Service 2005). The Arizona Game and Fish Department recognizes the Gila chub as a species of greatest conservation need 1A (Arizona Game and Fish Department 2012).

Historically, Gila chub were recorded from approximately 43 rivers, streams, and spring-fed tributaries within the Gila River basin in southern Arizona, southwestern New Mexico, and extreme northeastern Sonora, Mexico. The Service estimated that the Gila chub has been eliminated from approximately 85 to 90 percent of its formerly occupied habitat. As of 2005, only 29 populations were known to still occur, and all of these are small and isolated. These 29 populations occur in tributaries of the Agua Fria, Babocomari, Gila, San Francisco, San Pedro, Santa Cruz, and upper Verde rivers in Cochise, Coconino, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz, and Yavapai counties, Arizona

and in Grant County, New Mexico. The Santa Cruz Subbasin supports three remnant populations in Cienega Creek, Sabino Canyon, and Sheehy Spring. The Gila chub is considered highly susceptible to threats because of the small size of most populations and their fragmented distribution.

Critical habitat consists of 160.3 miles in 24 rivers and creeks within the Gila River basin, including portions of the Agua Fria, Babocomari, Gila, San Francisco, San Pedro, Santa Cruz, and upper Verde rivers in the counties listed above.

Threats to the species include predation by and competition with non-native fishes, bullfrogs, and crayfish; habitat loss and degradation from surface water diversions and groundwater withdrawals; habitat destruction and alteration resulting from extensive and/or poorly managed grazing; mining operations within occupied watersheds; and human recreation.

Habitat Characteristics and Use: Gila chub typically inhabit pools in small to mid-sized streams, ciénegas, and created impoundments, often in headwaters, at elevations between 2,000 to 5,500 feet. Riparian plants often associated with chub habitat include willow, tamarisk, cottonwood, seep-willow, and ash. Typical aquatic vegetation includes watercress, horsetail, rushes, and speedwell.

Gila chub are highly secretive and are often found either in quiet, deeper waters of pools or in areas with available cover such as overhanging terrestrial vegetation, boulders, and/or fallen logs. Adults are often found in deep pools and eddies below areas with swift currents. Young-of-the-year inhabit shallow water with vegetation or debris, while older juveniles use faster flowing areas.

Occurrence within the Project Area: A small population of Gila chub is known to occur in the covered area at Sheehy Spring (U.S. Fish and Wildlife Service 2005). Surveys conducted periodically starting in 1977, and yearly from 2001 to 2014, have never found more than a few hundred chub and typically less than one hundred (unpublished data, Service files). The Service considers this population to be unstable and threatened; potential threats include fire and non-native species. There is no critical habitat for Gila chub in the covered area.

3.2.4 Huachuca Springsnail (*Pyrgulopsis thompsoni*)

Sources for the following information on the Huachuca springsnail are the Species Information Sheet (U.S. Fish and Wildlife Service dated April 2010), and the Huachuca Springsnail Species Assessment and Listing Priority Form (U.S. Fish and Wildlife Service April 2009).

Status and Distribution: The Huachuca springsnail is a candidate species (74 FR 57803). It first became a Candidate on February 28, 1996. It is a small aquatic snail measuring 0.07 to 0.13 inch in height. The Huachuca springsnail is endemic to Santa Cruz and Cochise counties in southeastern Arizona and adjacent portions of Sonora, Mexico. The species appears to occur in up to 16 springs and ciénegas in southeastern Arizona (14 sites) and adjacent portions of

Sonora, Mexico (2 sites). It is known from nine sites in the upper San Pedro River drainage, including several in the Huachuca Mountains, Canelo Hills, and San Rafael Valley in Arizona. It is also known from four sites in the upper Santa Cruz River drainage, including the Sonoita Creek drainage, and Ojo Caliente Spring in Sonora, Mexico. Other potential locations of the species have not been verified, including Rancho Los Fresnos in Sonora. There is additional suitable habitat within the range of the species that has not been surveyed for Huachuca springsnail. There is relatively new information that shows significant genetic divergence between populations of this species, particularly between populations on the east slope of the Huachuca Mountains and those at lower elevations along Sonoita Creek and in the San Rafael Valley.

Potential threats to the Huachuca springsnail include loss or degradation of spring and wetland habitat resulting from improper grazing, timber harvest, water depletion, altered fire regimes, and human activity/recreation. Like other species with small and isolated populations, the snail is vulnerable to extirpation and/or extinction.

Habitat Characteristics and Use: The Huachuca springsnail inhabits springs and ciénegas at elevations between 4,500 to 7,200 feet. These sites are generally marshy areas characterized by aquatic and emergent plant species typically associated with plains grassland, oak and pine-oak woodland, and coniferous forest communities. The snail is usually found in the more shallow areas of these springs and ciénegas, often in rocky seeps at the spring source. Based on current knowledge, important habitat elements appear to include: 1) permanent free-flowing springs; 2) shallow, unpolluted water; 3) coarse firm substrates such as pebble, gravel, cobble, and woody debris; and 4) native aquatic macrophytes, algae, and periphyton.

Occurrence within the Project Area: The Huachuca springsnail is known to occur in the covered area only in Sheehy Spring.

3.3 Covered Plant Species

3.3.1 Canelo Hills Ladies' Tresses (*Spiranthes delitescens*)

Information provided below, unless otherwise noted, is from the Federal Register Notice listing Canelo Hills ladies' tresses (U.S. Fish and Wildlife Service 1997).

Status and Distribution: Canelo Hills ladies'-tresses, a member of the orchid family, was listed as endangered with no critical habitat on January 6, 1997 (U.S. Fish and Wildlife Service 1997). Under Arizona Plant Law, Canelo Hills ladies'-tresses is a Highly Safeguarded species.

Canelo Hills ladies'-tresses is known from five sites in the Santa Cruz River and San Pedro River watersheds in Cochise and Santa Cruz counties, Arizona. The total amount of occupied habitat is less than 200 acres. Estimating Canelo Hills ladies'-tresses population size and stability is difficult because non-flowering

plants are very hard to find in the dense herbaceous vegetation, and yearly counts underestimate the population because dormant plants are not counted. It is generally agreed, however, that the species is declining overall.

Threats to the species include improper livestock grazing, improper fire management, competition with non-native plant species, and water impoundment, diversion, or pumping. Further, few populations, small population sizes, and reliance on a rare and declining habitat make this species vulnerable to extinction.

Although no specific cases of illegal commercial collecting have been documented; commercial dealers, hobbyists, and other collectors are widely known to be a significant threat to natural orchid populations.

Habitat Characteristics and Use: Canelo Hills ladies'-tresses occurs in marshy wetland or cienega habitat intermixed with other species. The dominant vegetation associated with Canelo Hills ladies'-tresses includes grasses, sedges, rushes, spike rush, cattails, and horsetails. The species appears to do best on slopes with highly organic soils, that while saturated remain drained. All known populations occur at elevations between 4,500 and 5,000 feet. All Canelo Hills ladies'-tresses populations occur where scouring floods are very unlikely.

Occurrence within the Project Area: A population of Canelo Hills ladies'-tresses is known in the covered area from Sheehy Spring. A 1999 survey of that site counted 731 blooming plants. Based on that number, Sheehy Spring may be the largest colony of Canelo Hills ladies'-tresses (Arizona Game and Fish Department 2000). Casual observations by Service personnel and the applicant have continued to find ladies'-tresses, although none were observed in 2014 or in 2015.

3.3.2 Huachuca Water Umbel (*Lilaeopsis schaffneriana* ssp. *recurva*)

Status and Distribution: The Huachuca water umbel, a semi-aquatic perennial plant in the parsley family, was listed by the Service as endangered on January 6, 1997 (U.S. Fish and Wildlife Service 1997). Critical habitat for the species was designated by the Service on July 12, 1999 (U.S. Fish and Wildlife Service 1999). The Service completed a 5-Year Review of the status of the species in August 2014 (U.S. Fish and Wildlife Service 2014). Unless otherwise noted, information on the Huachuca water umbel is drawn from the two Federal Register Notices and the 5-Year Review. The Huachuca water umbel is designated a Highly Safeguarded species under the Arizona Native Plant Law.

The species is currently known from 30 naturally occurring locations in Santa Cruz, Cochise, and Pima counties, Arizona, and 21 locations in Sonora, Mexico. Extant sites occur in five major watersheds – San Pedro River, Santa Cruz River, Río Yaqui, Río Sonora, and Río Concepción. The potential exists for the

water umbel to inhabit ciénegas and other wetlands with appropriate conditions throughout southeastern Arizona and adjacent portions of Sonora, Mexico. Critical habitat for Huachuca water umbel includes a total of 51.7 miles of streams or rivers in Santa Cruz and Cochise counties, Arizona.

The main threat to this species is the loss or degradation of wetland habitat in southeastern Arizona as a result of groundwater pumping, water diversions, improperly managed grazing, regional drought, and climate change. Other activities, such as mining, road building, agriculture, and recreation also contribute to wetland habitat loss and degradation.

Habitat Characteristics and Use: The Huachuca water umbel grows in ciénegas, rivers, streams, and springs at 3,500 to 6,500 feet elevation within Sonora Desert scrub, grassland, oak woodland, and coniferous forest communities. Plants are found on wet soils or in shallow water (typically two to six inches deep, but occasionally as deep as ten inches) with saturated, highly organic soil. Huachuca water umbel requires perennial surface water or saturated soils and gentle stream gradients.

In upper watersheds that rarely experience scouring floods, as in parts of the San Rafael Valley, the Huachuca water umbel occurs in micro sites where interspecific plant competition is low. Water umbel is typically found along the edge of a wetland or channel mixed with other species in low density or in small openings in the understory.

The plant can also occur lower in the watershed in stream and river habitats in the main channel, backwaters, side channels, and nearby springs. After a flood, the Huachuca water umbel is capable of rapidly expanding its population in disturbed habitat. This expansion of water umbel populations appears to depend on the presence of protected sites where the plant can escape the effects of scouring floods. However, clumps of water umbel can be dislodged during flood events and establish themselves at new sites downstream. Rhizomes and seed retained in the soil can also maintain plants at a site despite scouring floods. Other important habitat requirements are watersheds with relatively natural water flow and a healthy riparian community that stabilizes the channel.

The primary constituent elements of designated critical habitat for the Huachuca water umbel include: (1) sufficient perennial base flows to provide a permanently or nearly permanently wetted substrate for growth and reproduction; (2) a stream channel that is relatively stable, but subject to periodic flooding that provides for rejuvenation of the riparian plant community and produces open microsites for expansion; (3) a riparian community that is relatively stable over time and in which non-native species do not exist or are at a density that has little or no adverse effect on resources available for growth and reproduction; and (4) in streams and rivers, refugia sites in each watershed and in each reach, including but not limited to springs or backwaters of mainstem rivers, that allow each population to survive catastrophic floods and recolonize larger areas.

Occurrence within the Project Area: The Huachuca water umbel occurs or has been observed in the covered area along the perennial stretches of the Santa

Cruz River, and at Sheehy, Sharp, and Heron Springs. Surveys in 2007 and 2008 documented 39 patches of umbel within the San Rafael State Natural Area (Stingelin, et al. 2009). Critical habitat for the Huachuca water umbel in the covered area includes approximately 2.7 miles of the Santa Cruz River. Specifically, the area designated as critical habitat includes that portion of the Santa Cruz River beginning at about 31˚22'30" N latitude and 110˚35'45" W longitude and extending about 2.7 miles downstream to the south boundary of section 14, T.24 S., R. 17. E. The designated critical habitat also includes a tributary (Sharp Spring) that begins at approximately 31˚21'10" N latitude and 110˚34'16" W longitude and runs downstream for approximately 1.9 miles to its confluence with the Santa Cruz River.

In 2013, botanists surveyed for water umbel at all four of the sites in the covered area, mentioned above. Suitable habitat was found at each location; however, water umbel was only found at the Santa Cruz River, and only a few plants were observed there. The botanists concluded that all four locations likely still support Huachuca water umbel in small quantities, but water umbel was undetectable due to the density of competing understory vegetation and possibly due to the time of year when the survey was conducted.

The types of microsites required by Huachuca water umbel were generally lost from the main stems of the San Pedro and Santa Cruz Rivers when channel entrenchment occurred in the late 1800s. The upper Santa Cruz River and associated springs in the San Rafael Valley, however, provide the habitat requirements for Huachuca water umbel to survive.

Section 4: Potential Biological Impacts/Take Assessment

4.1 Direct and Indirect Impacts

4.1.1 Livestock Watering and Grazing

Cattle regularly water in stock tanks occupied by Sonora tiger salamanders and potentially northern Mexican gartersnakes. Direct effects of cattle watering in stock tanks could include trampling of: 1) eggs, juveniles, metamorphs, or adults of Sonora tiger salamanders, and 2) juveniles or adults of northern Mexican gartersnakes. From November 1st through March 31st, cattle also water and forage in riparian pastures that contain stream habitats occupied by northern Mexican gartersnake and Huachuca water umbel. Trampling of gartersnakes and umbel could occur during the use of these pastures, although gartersnakes are primarily inactive during this period.

The Gila chub, Huachuca springsnail, and Canelo Hills ladies'-tresses are only known to occur in Sheehy Spring, although they may be found or repatriated to other suitable habitat within the SRRHCP. The pasture containing Sheehy Spring may be grazed for short durations annually at any time of the year,

depending on pasture rotations for a given year. Direct effects of livestock watering and grazing of Sheehy Spring and adjacent habitats may include trampling of: 1) juveniles or adults of northern Mexican gartersnake; 2) eggs or fry of Gila chub; 3) eggs, veliger larvae, or adult Huachuca springsnails; and 4) Canelo Hills' ladies-tresses. Adult Gila chub are expected to swim away when livestock are watering. Livestock herbivory of Canelo Hills' ladies'-tresses may also occur. Huachuca water umbel also may be trampled by cattle grazing in the riparian and spring habitats where it occurs.

When cattle are herded within and between pastures, they may directly trample and collapse burrows occupied by adult Sonora tiger salamanders. There also is a small chance of trampling of northern Mexican gartersnakes in upland habitats when snakes may be dispersing between aquatic habitats.

Indirect effects may include increased predation on amphibians, spread of amphibian disease, and diminished water quality and habitat quality for all covered species. Livestock watering and grazing may diminish water quality by temporarily increasing turbidity in stock tanks and riparian areas via trampling and defecation. This is limited to those stock tanks where cattle have direct access. Most tanks are fenced and water is piped or pumped to drinkers. Livestock grazing may reduce available cover, which can have adverse effects on water quality and temperature, and may also increase predation of northern Mexican gartersnakes by bullfrogs. Livestock could transport *Ambystoma tigrinum* virus (ATV) from one aquatic site to another. For this to occur there would need to be an aquatic microclimate that could sustain the iridovirus for the trip from one water to another, such as in mud on the animal. This is also true of all wildlife species that may travel from one aquatic site to another, such as white-tailed deer, javelina, waterfowl, and aquatic insects. Livestock are known to spend a disproportionate time in stock tanks and riparian areas and therefore have the potential to impact the quality of habitat of all of the covered species in the SRRHCP.

The detrimental ecological effects of historical overgrazing are well documented. Historical livestock grazing practices are believed to have been one of the most significant factors contributing to regional stream channel downcutting (the entrenchment of stream channels and creation of arroyos) in the late 1800s. Livestock grazing can destabilize stream channels and disturb riparian ecosystem functions (Hereford 1992, Tellman et al. 1997). Livestock can negatively affect riparian habitat through removal of riparian vegetation (Clary and Webster 1989; Clary and Medin 1990; Schulz and Leininger 1990; Armour et al. 1991; Fleishner 1994), with subsequent reduced bank stability, fewer pools, and higher water temperatures (Meehan 1991; Kauffman and Krueger 1984; Swanson et al. 1982; Minckley and Rinne 1985; Fleishner 1994; Belsky et al. 1999). Livestock grazing can also cause increased sediment in the stream channel, due to streambank trampling and riparian vegetation loss (Weltz and Wood 1986; Waters 1995; Pearce et al. 1998). Livestock physically alter streambanks through trampling and shearing, leading to bank erosion (Platts and Nelson 1989; Trimble and Mendel 1995). Loss of riparian vegetation and bank erosion can alter channel morphology, including increased erosion and deposition, downcutting, and an increased width/depth ratio, which reduces pool

habitats required by the Gila chub, and a loss of shallow side and backwater habitats used by larval chub (Trimble and Mendel 1995; Belsky et al. 1999).

Hendrickson and Minckley (1984) described Southwestern ciénegas and traced their history. These climax wetland communities have declined and undergone significant alteration over the last century and a half. Although causal forces at specific sites are often allusive, the authors list the following likely contributing factors in the decline of ciénegas: water diversions, groundwater pumping, watershed degradation and channel entrenchment caused by overgrazing and other factors, drought, invasion by non-native plants and animals, and other anthropomorphic adverse impacts. They discuss the incised Sharp Spring, and note a lack of apparent arroyo cutting but non-native plants present at Sheehy Spring. They postulate that the Sharp Spring ciénega is younger than Sheehy Spring. The authors also note that, although not well-documented, ciénegas elsewhere in the valley (including the Sonora portion) were formerly more widespread than at present. They found black, organic deposits in the cut banks of most arroyos and cite numerous historical documents that indicate in the 19th century, wetlands, including ciénegas, were more abundant and the Santa Cruz River was much less incised than today.

The San Rafael Valley suffered from the detrimental effects of drought and historical overgrazing starting in the mid- to late- 1800's. Many springs and ciénegas disappeared, and considerable rangeland damage occurred, during the droughts of 1880-1890, 1918-1921, and 1933-1934 (Hadley and Sheridan 1995). But the San Rafael Ranch experienced less severe damage and less brush invasion than other rangelands of southern Arizona due to fewer ranchers, fewer cattle, more fencing, vegetation management, and some early water development. Early ranch ownership starting in 1903 began adding fencing and water sources to better control grazing impacts (Hadley and Sheridan 1995).

Grazing can have beneficial effects for several covered species when vegetation control is important for their conservation. Disturbance resulting from limited grazing may actually help Huachuca water umbel and possibly Canelo Hills ladies'-tresses indirectly by decreasing competition with other plant species. Particularly in headwater springs and ciénegas not subject to regular flooding, cattails, sedges, and other aquatic plants can form large, dense mats that Huachuca water umbel cannot emerge through and grow. Dense vegetation surrounding Canelo Hills ladies' tresses, such as non-native Johnson grass and Bermuda grass, is possibly a great threat to the survival and growth of these small orchid plants. The 5-year review for the water umbel noted a quantity of competing understory vegetation that might have limited occurrence or detection of the species at sites in the covered area. Reducing vegetation in stock tanks through grazing can benefit the Gila chub and Sonora tiger salamander by maintaining or improving more open aquatic conditions that support these species. On the other hand, the northern Mexican gartersnake on the Santa Cruz River likely benefits from dense riparian vegetation, which conceals the snake from American bullfrogs and other predators. The same may be true at Sheehy Spring, or in stock tanks. Finding a balance among the needs of these species so they all may coexist in an altered ecological setting may be challenging.

The grazing management employed in the covered area, however, is designed to reverse the effects of past overgrazing. Twenty-one water sources have been added to the San Rafael Ranch since the current owners purchased the property. In addition, 14 preexisting water sources have been enhanced with submersible pumps to permit larger herds to graze in individual pastures less frequently than in previous regimes, providing substantially more recovery for grasslands between grazing periods. Some dirt stock tanks have been fenced to limit access by grazing cattle. Properly managed grazing has been shown to improve habitat conditions for California tiger salamander by helping maintain grassland communities supporting burrowing animals, reducing emergent vegetative structure that supports aquatic predators, and increasing wetted period duration by compacting pond bottoms (Bobzien and DiDonato, 2007). The addition of riparian pastures in the covered area along the Santa Cruz River corridor in 1990 and 2000 where grazing only occurs in the non-growing season, has likely significantly improved the overall condition of riparian and aquatic habitat for Huachuca water umbel, and northern Mexican gartersnake. This improved condition also may provide habitat for Gila chub in the future, should non-native fish species be reduced or eliminated.

The managed grazing of the pasture containing Sheehy Spring also has improved habitat conditions for Gila chub, northern Mexican gartersnake, and Canelo Hills' ladies'-tresses. Although this pasture may be grazed at any time of the year, depending on pasture rotation, the total time it can be grazed is limited to no more than 6 weeks annually. Managed grazing has likely improved habitat condition for these covered species.

4.1.2 Facilities Maintenance

Maintaining and managing the stock tanks that are occupied by Sonora tiger salamander, Gila chub, and northern Mexican gartersnake represent a long-term benefit to these species, although there are likely to be adverse impacts from maintenance activities. The maintenance of permanent water in stock tanks may have negative impacts on the northern Mexican gartersnake because the stock tanks provide habitat for non-native bullfrogs, which are predators of the snake. In addition, stock tanks must be cleaned of sedimentation every 20-25 years to maintain storage capacity. Stock ponds also may be periodically dried to reduce or eliminate American bullfrog populations, non- native fish, and aquatic vegetation. Although the purpose of this maintenance can be highly beneficial by maintaining the habitats that might otherwise become unusable, adverse impacts to these species are likely to occur when sediment and vegetation are removed. Direct mortality may result by drying of ponds before sediment removal, displacement of individuals occupying the ponds, and crushing by heavy equipment used to remove sediment or vegetation. This may result in incidental take of Sonora tiger salamander and Gila chub. However, any mortality or injury to northern Mexican gartersnakes from stock tank maintenance does not constitute take under section 9 of the ESA since there is a 4(d) rule that exempts that activity from constituting take of this species.

Maintenance of wells, waterlines, roads, and fences are unlikely to impact most covered species as the habitat found around these facilities is rarely suitable for

occupancy. However, rodent holes near these facilities may provide some estivation habitat for terrestrial Sonora tiger salamanders. Thus, there is the chance of destroying estivation habitat for Sonora tiger salamanders or burying individuals if they occupy such burrows within road beds or well, waterline, or fence project areas. Maintaining fencing that is around some stock tanks will continue to improve cover conditions that likely benefit the northern Mexican gartersnake and Sonora tiger salamander. A few fences pass over dirt tanks, so there is a small chance that maintenance activities of these fences could disturb, or result in mortality of Gila chub or Sonora salamanders.

4.1.3 Brush and Invasive Plant Management

Areas where brush or invasive grasses are problematic on the San Rafael Ranch are generally well removed from areas regularly occupied by covered species, and currently the effects of treatment are not likely to adversely affect covered species. However, because the future distribution of invasive weeds is not known, treatment could impact covered species during the life of the SRRHCP. Mechanical or chemical invasive plant control activities conducted in upland, ciénega or riparian areas surrounding water sources could result in downstream mobilization of sediments or herbicides, which ultimately may find their way into the aquatic environments. This may negatively impact all covered species indirectly by decreasing water quality or introducing chemical contaminants.

4.1.4 Hay Production

Hay production occurs along a portion of the Santa Cruz River on the San Rafael Ranch. Direct effects of hay production could include injury or death of northern Mexican gartersnakes or Sonora tiger salamanders if snakes or salamanders are dispersing through the hay fields at the time that harvest occurs. Snakes or salamanders could be crushed by vehicles or cut by harvest equipment. Indirect effects also could result from groundwater pumping that supplies water to the fields. Groundwater pumping can reduce river flows and thus affect the riparian habitat used by northern Mexican gartersnakes and Huachuca water umbel. However, pumping of water for the hay fields on San Rafael Ranch occurs from depths of 30 and 150 feet, is of limited volume, and occurs for limited periods, such that there are no discernible effects to the river flow.

4.1.5 Beneficial Actions

One of the primary goals of the SRRHCP is to promote the conservation of the covered species. The maintenance of cattle watering sources is not only essential to the cattle operations, but also currently provides habitat for two covered species and could provide habitat for a third. Maintaining and managing stock tanks that are occupied by Sonora tiger salamander and northern Mexican gartersnake and may be occupied by Gila chub is a benefit to these species, although there are likely to be short-term adverse impacts from maintenance activities. The San Rafael Cattle Company has added 21 watering sources to improve distribution and lessen impacts of grazing on the covered area. Also, fencing of many dirt tanks has led to improved cover conditions that likely benefit the northern Mexican gartersnake. Maintaining fencing and managing trespass cattle so that grazing of

riparian pastures is limited to the non-growing season also lessens impacts to all covered species. A major purpose of the SRRHCP is to provide incidental take authorization for covered activities when additional sites become occupied by covered species as a part of conservation actions undertaken in cooperation with the Service, Arizona Game and Fish Department, and others. The SRRHCP will foster additional conservation actions like the Small Scale Exotic Species Removal in the San Rafael Valley undertaken cooperatively with the Arizona Game and Fish Department and the Service (U.S. Fish and Wildlife Service 2006). As a result of all of the conservation actions noted above, the SRRHCP is expected promote the conservation and recovery of the covered species.

4.2 Anticipated Take of Covered Wildlife or Fish Species

4.2.1 Sonora Tiger Salamander

Although a complete inventory of Sonora tiger salamander occurrences has not been undertaken, it is anticipated that over the long term the number of occupied stock tanks will remain stable at a minimum, and should increase as a result of positive conservation actions. It is possible that, during the life of the permit, all tanks may be occupied for some period of time. However, the number of occupied sites will fluctuate from year to year depending on wet and dry cycles and prevalence of disease. As noted in the listing decision and recovery plan for Sonora tiger salamanders, well managed grazing of uplands by livestock, including operations and range improvements, is not anticipated to result in take (U.S. Fish and Wildlife Service 2002). However, take of Sonora tiger salamander is anticipated to occur occasionally in the form of injury or mortality from trampling of adults, eggs, and metamorphs by livestock at all occupied stock tanks where cattle have access. Additionally, take of this salamander in the form of injury and mortality is anticipated to occur as a result of periodic stock tank maintenance activities, including excavating each stock pond on average every 20-25 years. Livestock grazing and watering in stock tanks also may result in take in the form of harm and harassment to Sonora tiger salamanders by the destruction or removal of aquatic or emergent vegetation, or shoreline vegetation, of occupied stock ponds. Movement of livestock between pastures and facilities maintenance activities may result in take in the form of harm or killing of Sonora tiger salamanders from trampling of estivation habitat. Movement of livestock between pastures may also result in take in the form of harm or killing by increased potential for infection by ATV. Incidental take also may occur by vehicle crushing on ranch roads, or during harvesting of hay. Take of Sonora tiger salamanders is also possible, although unlikely, in the form of harm or killing due to diminished water quality resulting from mechanical or chemical brush control.

4.2.2 Northern Mexican Gartersnake

Although trampling of northern Mexican gartersnakes by cattle may occur on occasion, it is likely very rare due to their ability to avoid cattle, and it is not

considered to pose a significant threat where livestock grazing is well managed, as the Service points out in its final rule listing the subspecies as Threatened (79 FR 38678, July 8, 2014). Thus, take of the northern Mexican gartersnake is anticipated to occur rarely in the form of injury or mortality from possible trampling by cattle of juveniles or adults at springs or riparian areas, including debris piles or other cover used by snakes during cold periods in these habitats. Incidental take also may occur by vehicle crushing on ranch roads, or during harvesting of hay. Harm of northern Mexican gartersnakes may occur if cattle graze or trample vegetation at springs or other wetlands where snakes are active, and if the grazing decreases vegetation cover such that little escape habitat is available. The reduction in vegetation may lead to harm of gartersnakes by increasing the likelihood that bullfrogs or other predators can successfully prey on the snakes.

Any injury or mortality of northern Mexican gartersnakes as a result of periodic stock tank construction, use, or maintenance activities is not considered incidental take, as these activities are exempt from Section 9 of the ESA under the section 4 (d) rule included in the final listing of the species.

4.2.3 Gila Chub

On the San Rafael Valley, the Gila chub is currently known to occur only in Sheehy Spring, but may be reestablished in the perennial portion of the Santa Cruz River or other waters in the covered area during the life of the SRRHCP. Sheehy Spring is in a pasture that may be grazed at any time of year for short periods. Adults and fry likely avoid cattle by swimming away when they detect their approach. However, there is some chance that chub could be stranded in small channels leading to the springs, and therefore be subject to trampling. Also, eggs could occur in these channels during spawning periods. Therefore, take is anticipated to occur in the form of harassment, harm, or killing of eggs, fry, or small fish when the pasture containing Sheehy Spring is grazed.

If Gila chub occur in the Santa Cruz River or are released elsewhere in the covered area during the life of the SRRHCP, take will primarily be limited to harassment during the grazing period of associated riparian pastures (November 1st through March 31st). The presence of eggs is unlikely during these months (Minckley 1973), and adults and fry are large enough that they likely avoid trampling by cattle.

4.2.4 Huachuca Springsnail

In the covered area, the Huachuca springsnail is known only from Sheehy Spring. Take in the form of mortality from trampling is anticipated to occur when livestock occur in the pasture containing Sheehy Spring.

4.3 Anticipated Impacts on Covered Plant Species

4.3.1 Canelo Hills Ladies'-Tresses

In the covered area, the Canelo Hills ladies'-tresses is known only from Sheehy Spring. It occurs in a limited area of approximately 10 acres. Anticipated impacts include herbivory by livestock, trampling, and temporary degradation of habitat. The level of impacts from herbivory and trampling of Canelo Hills ladies'-tresses is expected to be minimal since the area is managed with limited grazing. This limited time that livestock spend in Canelo Hills ladies'-tresses habitat in Sheehy Spring, minimizes impacts to the species. During times of prolonged drought, it is possible that impacts from livestock herbivory could be detrimental to this population, which is currently one of five extant populations of the species. However, the Sheehy Spring population of Canelo Hills ladies'-tresses has persisted with the current grazing management practices for which the applicants seek coverage under the SRRHCP.

A threat to the survival and growth of *Spiranthes* is dense vegetation surrounding the small orchid plants. Limited grazing may actually help the species by preventing other species, such as blackberry, cattails, Johnson and Bermuda grass, and sedges, from forming large, dense mats that *Spiranthes* cannot grow through or shading out the *Spiranthes*, thus limiting its available habitat.

4.3.2 Huachuca Water Umbel

The Huachuca water umbel is limited in distribution in the covered area to the perennial flow portions of the Santa Cruz River and to Sheehy, Sharp, and Heron Springs. Anticipated impacts include trampling of habitat by livestock. The level of these impacts from trampling by livestock is expected to be minimal, and degradation of habitat is unlikely. For the occurrences found on the Santa Cruz River, the riparian pastures are grazed only during the non-growing season (November 1 through March 31). During this time, rains are adequate to encourage dispersal of cattle and cold temperatures discourage cattle from lingering in river bottoms and further trampling plants. Impacts to critical habitat from trampling by cattle walking down the banks to the river bottom are minimal because banks in the covered area are armored with thick riparian vegetation, and there appears to be an upward trend in riparian condition in the covered area since the applicant purchased it in 2000 (M. Falk, Pers. Comm. 2014). Well-managed livestock grazing and Huachuca water umbel are compatible, as explained in the listing rule for the species:

"Livestock grazing potentially affects *Lilaeopsis* at the ecosystem, community, population, and individual levels. Cattle generally do not eat *Lilaeopsis* because the leaves are too close to the ground, but they can trample plants. *Lilaeopsis* is capable of rapidly expanding in disturbed sites and could recover quickly from light trampling by extending undisturbed rhizomes" (Warren et al. 1991). Light trampling also may keep other plant density low, providing favorable *Lilaeopsis* microsites. Well-managed livestock grazing and *Lilaeopsis* are compatible. The fact that *Lilaeopsis* and its habitat occur in the upper Santa Cruz and San Pedro

river systems in the San Rafael Valley attests to the good land stewardship of past and current landowners. Poor livestock grazing management can destabilize stream channels and disturb cienega soils, creating conditions unfavorable to *Lilaeopsis*, which requires relatively stable stream channels and ciénegas. Such management can also change riparian structure and diversity, causing a decline in watershed condition. Poor livestock grazing management is widely believed to be one of the most significant factors contributing to regional channel entrenchment in the late 1800's." (62 FR 3)

4.4 Effects on Critical Habitat

Critical habitat for the Huachuca water umbel is designated on portions of the San Rafael Ranch. The critical habitat consists of the Santa Cruz River, the Sharp Spring drainage, and adjacent areas out to the beginning of upland vegetation (64 FR 37441, July 12, 1999). The primary constituent elements include: (1) sufficient perennial base flows to provide a permanently or nearly permanently wetted substrate for growth and reproduction; (2) a stream channel that is relatively stable, but subject to periodic flooding that provides for rejuvenation of the riparian plant community and produces open microsites for expansion; (3) a riparian community that is relatively stable over time and in which non-native species do not exist or are at a density that has little or no adverse effect on resources available for growth and reproduction; and (4) in streams and rivers, refugia sites in each watershed and in each reach, including but not limited to springs or backwaters of mainstem rivers, that allow each population to survive catastrophic floods and recolonize larger areas. The establishment and management of riparian pastures along the Santa Cruz River, combined with stocking rates that will assist in maintaining and improving riparian condition, and the managed grazing of the pasture containing Sharp Spring, will assure that the primary constituent elements are maintained and improved through time.

Critical habitat has been proposed for the northern Mexican gartersnake in the upper Santa Cruz River basin, including the San Rafael Valley (U.S. Fish and Wildlife Service 2013a). The proposed critical habitat also includes a proposal to exclude the San Rafael Ranch from final designation of critical habitat pursuant to Section 4(b)(2) of the Act. This discussion is included here in the event that final critical habitat is designated and does not exclude the San Rafael Ranch from the designation. It also is included here because this Plan covers livestock grazing on the San Rafael State Natural Area, which is included in the proposed designation of critical habitat.

The northern Mexican gartersnake proposed critical habitat primary constituent elements include: (1) aquatic or riparian, including perennial or intermittent streams; lentic wetlands such as livestock tanks, springs, and ciénegas; shoreline habitat; and aquatic habitat that can support native amphibian prey; (2) adequate terrestrial habitat (600 feet) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions; (3) a prey base consisting of viable populations of native amphibian and native fish species; and (4) an absence of harmful non-native fish species, bullfrogs, and/or crayfish; or

occurrence of these species at low enough levels that recruitment of northern Mexican gartersnakes and maintenance of native fish or soft-rayed non-native fish populations is still occurring. Within this Upper Santa Cruz Subbasin Unit, the Service believes primary constituent elements 1, 2, and 3 are generally met, but element 4 (absence or low level of harmful non-native species) is deficient. Like conditions for the water umbel critical habitat, implementation of winter grazing only in riparian pastures along the Santa Cruz River, and managed grazing of upland pastures will likely assure maintaining or improving primary constituent elements 1, 2, and 3. The periodic maintenance of stock tanks and management of waters as described in Section 5.2.2 herein are a part of the conservation actions of this plan, will help to reduce or eliminate some non-native predator populations (element 4) found in this proposed critical habitat unit by periodic drying of ponds that the non-native predators depend on.

4.4 Anticipated Impacts to Non-covered Listed Species

4.4.1 Chiricahua Leopard Frog

The Patagonia Mountains/San Rafael Valley comprises a Management Area within Recovery Unit 2 of the Chiricahua Leopard Frog Recovery Plan (U.S. Fish and Wildlife Service 2007). Chiricahua leopard frogs are known historically from valley bottom ciénegas, such as Sheehy Spring and still occur at the Empire Cienega in the upper Santa Cruz River drainage. They also occurred historically at stock tanks and in the Santa Cruz River, and could still persist somewhere in the valley, although no native populations have been found since 1999. Chiricahua leopard frogs were found at a stock tank in the Canelo Hills, just outside the northern edge of the valley in 2003 and were successfully reestablished in Scotia Canyon on the western flank of the Huachuca Mountains in 2009.

The Service and the Arizona Game and Fish Department developed a Safe Harbor Agreement for the Chiricahua Leopard Frog to encourage the re-establishment of Chiricahua leopard frogs in Arizona (Arizona Game and Fish Department and U.S. Fish and Wildlife Service 2006). The San Rafael Cattle Company signed a certificate of inclusion (CI) prepared under the Safe Harbor Agreement in 2009. The CI currently only covers Chiricahua Leopard frogs in two pastures on the San Rafael Ranch. An initial release of the Chiricahua leopard frog onto the San Rafael Ranch was made in October 2009 (Jim Rorabaugh, pers. comm.). Any additional releases or colonization of sites by the Chiricahua leopard frog to the covered area will be under the terms of a Safe Harbor Agreement. Thus, the SRRHCP does not seek incidental take authorization for the Chiricahua leopard frog.

The Chiricahua Leopard Frog Recovery Plan notes that conservation efforts directed toward the frog could be combined with recovery of the Sonora tiger salamander in the Patagonia Mountains-San Rafael Valley Management Area (U.S. Fish and Wildlife Service 2007). Other species that could benefit from such

conservation efforts include the Huachuca water umbel, Canelo Hills ladies'-tresses, Gila chub, and the northern Mexican gartersnake, among others.

4.4.2 Gila Topminnow

Gila topminnow historically occurred in the San Rafael Valley in the Santa Cruz River, Sheehy Spring, Sharp Springs, and Heron Springs, but has since been extirpated. It was last known to occur naturally in the covered lands in 1993. Gila topminnow has more recently been released to the San Rafael Ranch under a Safe Harbor Agreement (see below).

The Service and the Arizona Game and Fish Department developed a Safe Harbor Agreement for topminnow and pupfish to encourage the re-establishment of these fishes in Arizona on non-federal lands (Arizona Game and Fish Department 2007). Any releases of the Gila topminnow to the San Rafael Ranch will be under the terms of the Safe Harbor Agreement. Thus, the SRRHCP does not seek incidental take authorization for the Gila topminnow.

4.4.3 Northern Aplomado Falcon

The northern aplomado falcon has been observed in the San Rafael Valley historically and may well occur again as a migrant or winter inhabitant. However, the covered ranching activities will not adversely affect the northern aplomado falcon, as the San Rafael Valley does not support suitable nesting habitat. Only in the instance of nesting is there some chance that grazing activities might disturb nesting northern aplomado falcons to such a degree as to rise to the level of harm or harassment. Because northern aplomado falcons in Arizona are an experimental non-essential population under Section 10(j) of the Act, the SRRHCP does not need incidental take authorization for this species.

4.4.4 Yellow-billed Cuckoo

The yellow-billed cuckoo usually nests in structurally complex, large patches of riparian habitat throughout Arizona (U.S. Fish and Wildlife Service 2014c). Known breeding populations occur not far from the San Rafael Valley along Sonoita Creek, the San Pedro and Santa Cruz Rivers, and numerous other areas supporting complex riparian habitat. These types of large patches of contiguous riparian habitat do not occur on the San Rafael Ranch. Small patches and relatively narrow strips of riparian woodland are common, particularly on the Santa Cruz River. Thus, it is likely that the yellow-billed cuckoo occurs on occasion as a transient, but nesting now or in the future is unlikely, even with continued improvement in riparian woodlands due to implementation of the riparian pasture. Even if cuckoos were to nest here in the future, cattle grazing under San Rafael management practices, with seasonal closures of riparian pastures, would not adversely affect the species and certainly not lead to harm or harassment. Yellow-billed cuckoos should not be present when the Santa Cruz River riparian pasture would be grazed (November 1st through March 31st). Thus, the SRRHCP does not seek incidental take authorization for the yellow-billed cuckoo.

4.4.5 Jaguar

Jaguar observations have occurred in the mountain ranges surrounding the San Rafael Valley in Arizona. Thus, there is a chance that jaguars may pass through the covered area as they travel between surrounding mountains that contain suitable shelter and food. However, no covered activities will adversely affect jaguars as no activities affect jaguar food, shelter or movement. Thus, the SRRHCP does not seek incidental take authorization for the jaguar.

4.4.6 Ocelot

Like the jaguar, ocelot observations have occurred recently in the mountain ranges surrounding the San Rafael Valley and their numbers may be increasing in Arizona and nearby in Sonora. The surrounding mountains provide suitable foraging and sheltering habitat. Thus, there is a chance that ocelots may pass through the covered area as they disperse between mountain ranges. However, no covered activities will adversely affect ocelots, as no activities affect ocelot food, shelter or movement. Thus, the SRRHCP does not seek incidental take authorization for ocelot.

4.4.7 Lesser Long-nosed Bat

Lesser long-nosed bats utilize a number of post-maternity day roosts in the mountain ranges surrounding the San Rafael Valley (see Service 1997 and 2007 for a summary). Their numbers appear to be increasing, based on survey results at known roosts throughout their range, and the Service has recently determined that substantial information exists such that the subspecies may warrant reclassification to Threatened status (Service 2007, 2013b). In Arizona, the lesser long-nosed bat forages on the nectar and fruits of columnar cacti and nectar and pollen of paniculate agaves. Agave flowers are critical to the species in late summer after the bats have left their maternity roosts and moved to southeastern Arizona in July and August. While in southeastern Arizona, the bats primarily feed on flowers of Palmer's agave (*Agave palmeri*) as it blooms in late July through mid-September (Scott 2004). Parry's agave (*Agave parryi*) occurs in small numbers on the San Rafael Ranch; however, it blooms too early to provide much forage value for the bats (Ober, et al. 2000)

Livestock, as well as wildlife, graze on agave stalks for food. However, given the sparse occurrence of agave and questionable timing of agave flowering, it is highly unlikely that any covered activities could harm the lesser long-nosed bat by affecting agave. Furthermore, no caves or mines occur on the ranch, precluding the possibility that lesser long-nosed bats day roost on the property. Therefore, the SRRHCP does not seek incidental take authorization for the lesser long-nosed bat.

4.5 Cumulative Impacts

HCPs analyze cumulative impacts as incremental impacts of the action on the environment when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. The geographic area for analysis should be defined by the manifestation of direct or indirect impacts as a result of covered activities. Cumulative impacts under section 10 of the Act can result from individually minor, but collectively significant actions taking place over time.

Because the San Rafael Ranch is protected from development with conservation easements, is primarily surrounded by public lands, and has limited access to urban development, there are few reasonably foreseeable cumulative impacts in the action area. Reasonably foreseeable actions in the covered area during the life of the SRRHCP include increasing recreation activities, trespass, conservation actions, illegal immigration and smuggling, mining in the Patagonia Mountains of Arizona and the Sierra San Antonio Mountains of Mexico, and U.S. Customs and Border Protection activities. The impacts of these actions are short term and, when combined with the proposed action, are minor and negligible impacts to the environment given the short-term and temporary nature of the impacts from these activities, as described in 4.5.1 and 4.5.2.

4.5.1 Conservation Projects

Conservation actions in the covered area may be undertaken in cooperation with the Service, Arizona Game and Fish Department, and others. Such projects might include removal of non-native aquatic species, creation of new stock tanks, addition of wells, upgrading of existing wells, and additional fencing around stock tanks. These projects are not covered by the SRRHCP as they would most likely be funded through sources such as the Partners for Fish and Wildlife Program or Farm Bill programs and addressed under corresponding ESA Section 7 consultations. These activities might result in short-term harm, harassment, and direct mortality of covered species, but these impacts would decline in the long-term through exclusion of livestock from portions of occupied habitat, protection for riparian vegetation development, and decreased competition with and predation by non-native species.

4.5.2 Illegal Immigration, Smuggling, and Other Trespass

Activities such as illegal immigration and smuggling along the U.S./Mexico border, Border Patrol enforcement actions, as well as trespass from recreationists will likely continue in the covered area during the life of the SRRHCP. Impacts from these activities include increases in human traffic, deposition of trash, new trails from human traffic, soil compaction and erosion, fire risk from human traffic, water contamination, damages to fences, gates left open until ranch staff close them, and introduction and spread of non-native species. Soil compaction and erosion can result in increased sediment transport in run-off and, consequently, cause adverse impacts to the Sonora tiger salamander, northern Mexican gartersnake, and Gila

chub through water quality degradation. Fires could have temporary catastrophic effects to watersheds with potential for ash and sediment flow into habitats of all covered species, and associated erosion of channels. The introduction and spread of non-native species could impact all covered species.

4.6 Anticipated Effects of the Taking

This section describes the anticipated effect of the take on the covered wildlife species, or recovery unit where applicable, through the issuance of an incidental take permit.

4.6.1 Sonora Tiger Salamander

The effects of any incidental take of Sonora tiger salamander resulting from covered activities other than stock tank maintenance will in most instances be minor, of short duration, and of minimal impact to the species. The losses from trampling by cattle are likely minor given that the covered area has many stock tanks, but some stock tanks will be heavily used during the warmest and driest times of the year. However, heavy use will be limited to a few stock tanks at any one time due to rest and rotation of pastures and since four tanks are fenced to prevent direct cattle access. Therefore, the grazing and trampling impacts from cattle do not likely have an effect great enough to cause the loss of a population from a stock tank. These effects will be balanced by the overall conservation program that will be a part of the SRRHCP, including enhanced ability to control non-native predators through management of stock tanks.

The largest impact to Sonora tiger salamanders would be from the periodic need to clean a stock tank. Take from this activity could be significant in the short term, although measures will be implemented to reduce this, as discussed later in the document. However, maintenance is likely to occur when a tank is dry or nearly so. As tanks dry, those aquatic forms of the salamander that are able to metamorphose, do so and move away from the tank. Some larvae will be too small to complete metamorphosis, and many aquatic adults are not capable of transforming. These animals would die, but most would perish from desiccation, rather than subsequent tank maintenance. As a result, effects to salamanders from stock tank maintenance are expected to be few to none. Furthermore, evaluation of these short-term take events must be viewed in the larger long-term context of the needs of the species. The Sonora Tiger Salamander Recovery Plan recognizes that the species is now essentially dependent upon the maintenance of stock tanks for its existence (U.S. Fish and Wildlife Service 2002). The long-term benefit of the availability of reliable aquatic habitat that stock tanks provide for Sonora tiger salamanders outweighs the relatively minor effects to the species that may result from occasional incidental take associated with stock tank maintenance. The lands covered by the SRRHCP are an essential link between populations found on National Forest lands to the north, west, and east. Thus, implementation of the SRRHCP can contribute a key component to the recovery of this species.

4.6.2 Northern Mexican Gartersnake

Any take of northern Mexican gartersnake in covered pastures/grassland would likely be limited since their distribution is limited and riparian pastures are not grazed except in winter when snakes are not likely actively foraging. Take may occur by trampling when cattle are utilizing springs as cattle may occur at the springs at any time of year. Take also may occur from crushing or cutting during hay production, or from crushing by vehicles on ranch roads. Gartersnakes may be taken by these activities while traveling on the ground or while occupying burrows. Stock tank maintenance and use by cattle is covered by the 4(d) rule, and therefore any impacts are exempt from the take prohibitions of Section 9 of the Act.

Implementation of the SRRHCP conservation program described in section 5 of this document is designed to minimize and mitigate effects of take to the species. Take of northern Mexican gartersnake may increase over time if their population status improves from positive conservation actions fostered by this HCP and other conservation actions undertaken by resource agencies, such as actions to remove bullfrogs.

4.6.3 Gila Chub

The effects of any incidental take of Gila chub resulting from covered activities will be minor, of short duration, and have minimal effects to the species. Grazing of Sheehy Spring is restricted to short durations annually, thus minimizing effects of take to the population. The SRRHCP will at a minimum help maintain this disjunct population that the Service considers threatened and unstable. The SRRHCP also likely will lead to continued improvement in habitat condition and extent within the upper Santa Cruz River from resting the pastures during the growing season such that conservation actions may repatriate the chub to the river in the future. Releases of chub also may occur into stock tanks on San Rafael Ranch lands as a conservation action undertaken under this plan. Implementation of the SRRHCP conservation program in section 5 is designed to minimize and mitigate effects of take to the species.

4.6.4 Huachuca Springsnail

Any take of the Huachuca springsnail resulting from covered activities will be minor, of short duration, and have minimal effects on the species. Grazing and watering that occurs in the pasture containing Sheehy Spring is rare and is restricted to short durations. In some years, grazing and watering of cattle will not occur in this pasture. Consequently, no take will occur in those years. The SRRHCP will at a minimum help maintain this disjunct population, and likely will lead to continued improvement in habitat through plan implementation. During times of prolonged drought, it is possible that impacts from livestock watering in Sheehy Spring could increase as cattle are limited to fewer areas to water and find shade. However, the Sheehy Spring population of Huachuca springsnails, currently one of 14 extant populations of the species, has persisted with the

current grazing management practices. Implementation of the SRRHCP conservation program in section 5 is designed to minimize and mitigate effects of take to the species.

Section 5: Conservation Program/Measures to Minimize and Mitigate for Impacts

5.1 San Rafael Ranch Habitat Conservation Plan Goals and Objectives

Section 10(a)(2)(A) of the Act requires that an HCP specify the measures that the applicant will take to minimize and mitigate to the maximum extent practicable the impacts of the taking of any federally listed animal species as a result of activities addressed by the plan. In addition, as part of the "Five Point" Policy adopted by the Service in 2000, HCPs must establish measurable biological goals and objectives (65 *Federal Register* 35242, June 1, 2000). The purpose of the biological goals is to ensure that the operating conservation program in the SRRHCP is consistent with the conservation and recovery goals established for the species. These goals are developed based upon the species' biology, threats to the species, the potential effects of the Covered Activities, and the scope of the SRRHCP.

The SRRHCP goals are followed by their respective objectives.

5.1.1 Maintain the ecological health of the San Rafael Ranch, including soil stability, biotic integrity, and watershed function.

5.1.1.1 Maintain riparian vegetation conditions and improve riparian habitat when opportunities and funding allow. Maintenance can include emergent vegetation control, maintaining water volume, or maintenance of livestock exclusion barriers. Improvements can include establishing emergent vegetation where none exists, increasing the volume of an aquatic site, or erecting livestock exclusion devices, where appropriate.

5.1.1.2 Continue effective grazing management practices on the San Rafael Ranch that maintain and improve livestock performance and the overall health of the herd as well as the covered species' habitat.

5.1.2 Ensure that covered ranch management activities are undertaken in a manner consistent with protection and enhancement of covered species and their habitats.

5.1.2.1 Follow measures to minimize impacts in Section 5.2.2

5.1.2 Conserve and, where practicable, improve riparian, aquatic, and spring habitats that support covered species.

5.1.2.1 Maintain or improve water quantity, quality and distribution for livestock and wildlife. Establish alternative water sources to the Santa Cruz River to provide livestock and wildlife access to water while protecting aquatic and riparian habitat.

5.1.3 Provide a regulatory framework and early agreement for conservation activities that may result in covered species occupying additional sites.

5.1.3.1 Where agreed to and practicable, work with the Service to increase the numbers and distribution of covered species, consistent with applicable recovery goals for the species.

5.1.3.2 Support non-native species removal programs for all riparian, aquatic, and spring habitats, including stock tanks, on the San Rafael Ranch, such as proposed by the Service for several tanks in the San Rafael Valley (U.S. Fish and Wildlife Service 2006).

5.1.4 Create an environment of regulatory certainty that enables long-term business decisions regarding the San Rafael Ranch.

5.1.4.1 Maintain the discretion of the San Rafael Cattle Company to manage the San Rafael Ranch in accordance with its economic interests while fulfilling species conservation objectives by acquiring a 10(a)(1)(B) permit.

5.2 Avoidance, Minimization, and Mitigation Measures

5.2.1 Measures to Avoid Impacts

An oral and written educational program will be developed within one year of permit issuance and provided to the Service for review and approval. The educational program will be used to inform employees and known users of the covered area working under the direction of the San Rafael Cattle Company of the unique species and habitats found on the ranch and measures that are to be taken to protect these resources. The education program will include a description of the covered species and their habitats, the conservation program being undertaken in the covered area in cooperation with the wildlife agencies, the general provisions of the Act, and measures to be followed while working on or visiting the ranch to avoid violating section 9 of the Act. It will include identification of areas that should not be impacted by ground-based activities and measures to eliminate the transfer of non-native species from source to source.

5.2.2 Measures to Minimize Impacts

The grazing management program employed on the covered area has reversed the effects of historical overgrazing on species covered under the SRRHCP. The

addition of 21 stock waters and upgrade of 14 stock tanks with submersible pumps to date on the San Rafael Ranch allows larger herds to graze in individual pastures less frequently than in previous grazing management regimes. This will continue to provide substantially more rest for grasslands between grazing periods, as well as decrease exposure of covered species to impacts from cattle watering and grazing in their respective habitats. However, if not managed properly, the additional perennially available waters will increase non-native predators (i.e., bullfrogs) in the covered area. Rotational short duration grazing of the riparian pastures along the Santa Cruz River will only occur from November 1st through March 31st. Limited grazing in all pastures will minimize take of the Gila chub, Sonora tiger salamander, northern Mexican gartersnake, Huachuca springsnail, Canelo Hills ladies'-tresses, and Huachuca water umbel.

Maintaining fencing around all pastures will prevent access by cattle when pastures should not be grazed. Maintaining fences around some (currently four) stock ponds will limit access by cattle. The San Rafael Cattle Company will also continue to develop alternative water sources such as double tank systems, fence livestock ponds, and eradicate non-native aquatic species as funding is available.

With the addition of 21 stock drinkers and improvement of 14 other waters, there is high potential to create a larger bullfrog and non-native fish problem in the covered area and throughout the San Rafael Valley. When water levels in stock ponds are manageable and cattle can be grazed elsewhere in the covered area, the San Rafael Cattle Company will periodically allow certain stock ponds to go dry to minimize the establishment of non-native predators such as bullfrogs and fish.

All stock tank maintenance will be conducted following guidelines provided in Appendix B, which were based on recommendations in the Sonora Tiger Salamander Recovery Plan (U.S. Fish and Wildlife Service 2002). Any refilling of stock tanks will be from groundwater sources and runoff and not other stock tanks to prevent the spread of non-native species (and disease organisms) that may be present in surface water sources.

The San Rafael Cattle Company will not knowingly engage in the release of non-native fish, amphibian, or invertebrate species within the covered area, nor allow other people or groups to conduct such releases. This includes, but is not limited to bullfrogs, non-native tiger salamanders, crayfish, mosquitofish, sunfish, and other non-native fish.

The San Rafael Cattle Company will implement brush and invasive plant management activities using best management practices to prevent associated sediments and herbicides from entering aquatic habitats. Best management practices include adhering to the Service' guidelines, which are currently addressed in *Recommended Protection Measures for pesticide Management Applications in Region 2 of the U.S. Fish and Wildlife Service* (White 2007). Herbicides will not be used in Huachuca water umbel habitat or Canelo Hills ladies'-tresses habitat.

5.2.3 Measures to Mitigate Unavoidable Impacts

Implementation of the SRRHCP may result in incidental take of covered species as discussed in Section 4. The incidental take may be in the form of direct mortality, harm, and harassment. It is anticipated that through the implementation of the SRRHCP conservation program, take avoidance measures, and take minimization measures, the level of incidental take would be minimal and limited in time and scope for all covered species. Adverse effects are not expected to affect the covered species at a population level, although some individuals would be lost. Long-term beneficial effects of the SRRHCP are also expected.

Unlike incidental take minimization measures, which are designed to reduce the amount of take, mitigation measures are designed to offset or compensate for the actual effects of incidental take that occur under the SRRHCP. Mitigation for such incidental take typically includes compensating for the loss of individuals and habitat through long-term protection of intact habitats of the affected species. The ranch management practices employed throughout the covered area inherently provide perpetual protection of intact habitats of covered species as well as uncovered species.

The San Rafael Cattle Company will continue to maintain and improve riparian condition through its effective range management practices. These improvements will maintain and enhance the ability of the Ranch to support covered species. The maintenance of the 80-plus stock tanks and associated infrastructure allows for excellent distribution of cattle within and between pastures. This distribution, combined with frequent movement of cattle among pastures and limited use of riparian pastures should improve conditions on a landscape level for the habitat of covered species. The corresponding increase in non-native predator habitat will be mitigated through continued cooperation with the wildlife agencies and Natural Resource Conservation Service to renovate stock ponds and manage water presence to control non-native species. The San Rafael Cattle Company will also continue to cooperate with these agencies in projects to minimize opportunities for livestock to enter stock ponds occupied by covered species and to add drinkers for livestock use adjacent to these stock ponds.

Furthermore, the San Rafael Cattle Company will cooperate with the Service, AGFD, and others to allow the establishment of new populations of covered species on the covered lands, which will promote their recovery. This HCP and the incidental take permit will cover the incidental take of those new populations that may occur as a result of the covered activities.

Therefore, it is anticipated that the long-term benefits of conservation actions in the SRRHCP over the 30-year period of the permit should more than mitigate for the temporary and small-scale effects of the incidental take of the proposed covered species from the covered activities identified within the SRRHCP.

5.3 Monitoring

Monitoring tracks compliance with the terms and conditions of the HCP and permit. There are three types of monitoring: (1) compliance monitoring tracks the permit holder's compliance with the requirements specified in the HCP and permit; (2)

effects monitoring tracks the impacts of the covered activities on the covered species; and (3) effectiveness monitoring tracks the progress of the conservation strategy in meeting the HCP's biological goals and objectives (includes species surveys, reproductive success, etc.). Monitoring provides information for making adaptive management decisions.

5.3.1 Compliance and Effects Monitoring

The Service, in conjunction with the San Rafael Cattle Company, shall annually review the terms and conditions of the San Rafael Cattle Company's incidental take permit and SRRHCP to determine whether the San Rafael Cattle Company is implementing such terms and conditions and the effectiveness of that implementation. The San Rafael Cattle Company shall provide the Service a summary of implementation of the SRRHCP terms and conditions, covered activities undertaken during the year, and any take observed by ranch personnel resulting from the covered activities during the year. This information will be included in the annual report described in section 5.7.

Effects monitoring during actions that may cause take shall occur and is the responsibility of the San Rafael Cattle Company. Information collected shall include the specific action taken, the covered activity under which the action was taken, how many of each species were taken, and the extent of each species' habitat affected (e.g., stock pond acres).

5.3.2 Effectiveness Monitoring

The purpose of effectiveness monitoring is to determine the success of the SRRHCP conservation program as measured by tracking habitat condition and species status. Effectiveness monitoring tracks the progress of the conservation strategy in meeting the biological goals and objectives, including detecting changes in habitat quality for covered species (water availability, plant community composition and species cover) over time, early detection of invasive plants and animals, and providing feedback for adaptive management.

Effectiveness monitoring will be accomplished through the establishment of permanent photo plots by the applicants and through existing Service species monitoring programs. Photo monitoring will be designed to address habitat condition and any changes in habitat availability. The San Rafael Cattle Company will establish photo monitoring plots for: 1) up to six stock tanks known to be occupied by Sonora tiger salamander; 2) Sheehy Spring, which is known to be occupied by Gila chub, Huachuca springsnail, and Canelo Hills ladies'-tresses, and may be occupied by northern Mexico gartersnake; and 3) three representative photo plots of perennial portions of Santa Cruz River. These photo plots will be established in cooperation with the Service. Photo plots will be used to monitor integrity of aquatic habitat, integrity of fencing, vegetative cover, and any readily identifiable non-native species. Each photo point will be identified by a permanent marker or landscape feature. Photos will be taken during October annually, catalogued with photo point name or number, date, photographer's name, and maintained for comparative purposes.

In addition, the San Rafael Cattle Company will meet with the Service annually to establish a plan for population monitoring that will be accomplished by the Service, or other entities acceptable to the San Rafael Cattle Company, for the upcoming year to determine the status of covered species recovery activities. Each year, the San Rafael Cattle Company and Service will determine where and when individual species monitoring will take place, who will accomplish it, and how notice will be made by these individuals to the San Rafael Cattle Company to achieve access to the San Rafael Ranch for monitoring activities. The San Rafael Cattle Company and the Service will also plan for translocation and/or establishment of new populations of covered species in the upcoming year for recovery purposes. Population monitoring of the covered species performs two functions. The first function is to determine whether the San Rafael Ranch and activities covered by this HCP continue to provide habitat for those species. The second function is for purposes of tracking the effectiveness of conservation programs undertaken by the Service in cooperation with the San Rafael Cattle Company. Covered species populations are known to change over time, including disappearing, independent of covered activities. Thus, consistent with the USFWS No Surprises rule, the results of species monitoring will have no consequences to covered activities operations, or permit terms and conditions, unless changes to covered activities operations are agreed to through the Adaptive Management Strategy.

Monitoring of the Sonora tiger salamander throughout its range is called for every five years in accordance with the species' recovery plan. A range-wide monitoring was most recently completed in 2013. This monitoring included presence/absence of Sonora tiger salamanders, non-native aquatic animal species, and detection of disease. Annual monitoring of the Gila chub takes place at Sheehy Spring and three locations on the main stem of the Santa Cruz River in the covered area. Funding for this monitoring may be obtained through the Bureau of Reclamation as a part of implementation of the Central Arizona Project recovery implementation. Arizona Game and Fish Department, in cooperation with Arizona State Parks, conducts monitoring of northern Mexican gartersnakes on the San Rafael State Natural Area. In addition, the Service or a mutually agreed-upon designated party will, subject to funding and staff availability, monitor populations of Huachuca water umbel, Huachuca springsnail, and Canelo Hills ladies'-tresses according to established protocols in the covered area. Upon the approval of the applicant, these agency monitoring programs can be conducted in the covered area when adequate funding and personnel are available during the life of the SRRHCP. The Service or other entity acceptable to the San Rafael Cattle Company will conduct the habitat monitoring described above to determine the status of recovery actions. This additional monitoring of the covered species will inform the effectiveness of the conservation measures conducted as part of this HCP. When adequate agency funding and/or personnel are not available, the San Rafael Cattle Company will be responsible for ensuring that monitoring of covered species on the San Rafael Ranch is accomplished. The San Rafael Cattle Company's annual expenditure for this monitoring shall not exceed $500/year over a 3 year running average, thus not exceeding $1500 in any 3-year period. Qualified biologists will do the monitoring.

5.4 Performance and Success Criteria

The criteria for determining the success of the SRRHCP will be that habitats of covered species will be maintained or improved in the covered area during the term of the permit. If the status of a covered species' habitat, as determined by monitoring, declines over a 6-year period, the Service and the applicants will meet to discuss whether covered activities actions are contributing to the decline. If covered activities are contributory, then adaptive management provisions will be implemented. The thresholds for decline over any 6-year period are as follows:

- A decreasing trend of stock tanks available (i.e., maintain water) to Sonora tiger salamanders and northern Mexican gartersnakes.

- A decreasing trend of available riparian vegetation cover at Sheehy Spring and along the mainstem of the Santa Cruz River, determined by photo monitoring.

5.5 Adaptive Management Strategy

The SRRHCP will implement an adaptive management approach that allows specific terms of the conservation program to be revised or adjusted through time to ensure that the SRRHCP's goals and objectives are being met. Changes may be made to the SRRHCP's conservation program in response to new scientific information on the life history of covered species, monitoring data, or better information on the effectiveness of minimization and mitigation measures. Amendments to the SRRHCP (see 9.1.1) may be undertaken to address:

A. Changes in monitoring methods of species or habitats based on new scientific information or development of better monitoring methods.

B. Any minor or technical revisions to the avoidance, mitigation, and/or minimization measures.

C. Changes to performance and success criteria based on new scientific information or changes to monitoring methods.

D. Any other revision of a technical or minor nature that is consistent with the overall goals and objectives of the SRRHCP and does not make significant changes to the SRRHCP's conservation program or result in significant new or different environmental impacts.

The San Rafael Cattle Company and the Service will meet annually within 60 days after the submittal of the annual report, pursuant to 5.6 below, to discuss the annual report, review monitoring results, and discuss the monitoring schedule for the upcoming year as described in Section 5.3.2. At 6-year intervals after permit issuance, both parties will meet to determine if the SRRHCP conservation program is meeting its stated goals. Should either the applicants or the Service identify possible changes to the SRRHCP, the process for adopting changes to the HCP

as a result of the Adaptive Management Strategy is the same as established in Section 9.1.1 for minor amendments.

5.6 Plan Implementation

The San Rafael Ranch HCP will be implemented with the assistance of the Service and any other agencies deemed appropriate by the applicant on an annual basis. The San Rafael Cattle Company will work closely with the Service, as has been its practice, to fulfill the purposes of the SRRHCP. Any proposed changes will first be discussed with the Service and then implemented consistent with the terms of the SRRHCP.

The San Rafael Ranch Cattle Company will be responsible for implementing the education and reporting requirements, photo point establishment and monitoring, as well as implementation of minimization measures for covered activities of the SRRHCP. The Service will provide technical and monitoring assistance and will be lead for regulatory compliance purposes for any proposed introductions of covered species to the San Rafael Ranch, unless another agency provides funding and, therefore, must comply with appropriate regulations.

5.7 Reporting

The San Rafael Cattle Company will provide an annual report to the Service by July 1 following the first full year of implementation of the SRRHCP, and will continue to provide annual reports to the Service by that date for the 30-year life of the permit.

Annual Reports to the Service will include:

1. A summary of all actions implemented as required by the SRRHCP, including conservation actions. This will include a brief discussion of stock pond maintenance or other restoration actions.

2. A description of any take that may have occurred as a result of implementation of covered activities (including cause of take, form of take, take amount, location of take and time of day, and disposition of dead or injured individuals).

3. Monitoring results (compliance, effects, and effectiveness monitoring), photos taken from annual photo monitoring plots, and survey information (if applicable).

4. A summary of all education program activities.

5. A summary of any covered species observations made during the prior calendar year.

6. A summary of changes noted in habitat conditions or species status relative to prior reports, to assist in evaluating the effectiveness of the overall conservation program.

7. A description of circumstances that made adaptive management necessary and how the adaptation was implemented, if any.

8. A description of any changed or unforeseen circumstances that occurred and how they were dealt with, if any.

9. Any changes to the annual budget for the upcoming year.

10. A description of any minor or major amendments.

The San Rafael Cattle Company also will provide individual reports on any tank maintenance projects within 120 days of completion of a project. Species presence before and after maintenance will be noted and reported. This will serve the purpose of providing more detail of methods and results of implementation, including measures to minimize the incidental take of covered species.

Section 6: Funding

6.1 Costs of HCP Implementation

The costs of implementation of the SRRHCP fall into 4 categories: monitoring, maintenance and improvement of water sources, education, and report preparation. The San Rafael Ranch will provide funding and/or labor related to maintenance of water sources, and will implement take minimization and conservation measures as committed to in the SRRHCP. Although this budget projects the costs of maintaining one water resource annually, it is far more efficient for maintenance to be performed for several tanks or ponds at the same time. Thus, this budget projects an average annual cost across the life of the plan, but it is more likely that no maintenance may occur in many years, while a number of tanks or ponds would be maintained in a few years. The San Rafael Ranch also will fund photo plot monitoring and development of an education program to be used for keeping employees and users of the ranch informed of the species protected under the SRRHCP. Also, annual reporting as required under the SRRHCP will be funded by the San Rafael Cattle Company. The table below estimates costs that will be borne by the San Rafael Cattle Company:

Table 1. Costs of HCP Implementation

Activity	*Assumptions*	*Est. Unit Cost*	*Year 1 Cost*	**Total Cost (30 years)**
Water Source Maintenance	Maintain an Average of 1 Water Source Annually (on a rolling 5 year average)	$500 cost per tank/pond maintenance	$500	$15,000
Education Program	Primarily one-time cost	$2500	$2500	$2500
Photo Monitoring	Annual Cost	2 days @ $600/day	$1200	$36,000
Prepare Annual Report	Annual Cost	2 days @ $600/day	$1200	$36,000
15% Contingency[1]			$810	$24,300
Total				$113,800

[1]Species monitoring costs borne by San Rafael Cattle Company as described in 5.3.2 would be covered out of contingency funds.

6.2 Funding Source(s)

The funds for the costs identified in Table 1 will be the responsibility of the San Rafael Cattle Company.

6.3 Funding Mechanism and Management

Funding for costs identified in Table 1 will come from an allocation of the normal operating activities of the ranch. Annual operating expenses on the ranch, including labor, equipment usage and utilities, average over 40 percent of annual revenue from the sale of cattle. Annual expenses from conservation practices identified in Table 1 are less than $4000, generally less than one percent of annual revenue.

6.4 Additional Funding for Conservation Actions

Funds for purposes of conservation actions on the ranch over and above those to be implemented by the San Rafael Cattle Company under the terms of the SRRHCP will be pursued from several sources including: the Service, Partners for

Fish and Wildlife Program; the Natural Resources Conservation Service, Environmental Quality Improvement Program, and other granting entities.

In addition, the approval of this HCP will provide the basis for funding under the Service's non-traditional section 6 program for HCP land acquisition grants. The purpose of such land acquisitions would be to further enhance the covered species and other listed species' recovery opportunities in the San Rafael Valley.

Section 7: Alternatives

7.1 Summary

Section 10(a)(2)(A)(iii) of the Act, [and 50 CFR 17.22(b)(1)(iii)(C) and 17.32(b)(1)(iii)(C)] requires that alternatives to the taking of species be considered and reasons why such alternatives are not implemented be discussed. The preferred alternative is the issuance of a permit authorizing the activities and programs described in the SRRHCP.

7.2 No Action Alternative

The current conditions and activities that will not cause take of federally listed species could continue, but additional conservation actions to benefit covered species would not likely be undertaken, including future introductions of covered species. Some important conservation actions, such as stock tank or pond maintenance where salamanders are present, cannot be undertaken without resulting in take of covered species. The continued implementation of cooperative conservation programs for several of the covered species would be evaluated by the San Rafael Cattle Company on a case by case basis. Thus, the no action alternative may lead to delays or no conservation action taken in some cases. The no action alternative could lead to the deterioration of baseline conditions of some covered species. Access now provided by the San Rafael Ranch for agency personnel to undertake monitoring of species and habitats on the Ranch could be reduced or terminated.

Section 8: Changed and Unforeseen Circumstances

8.1 Changed Circumstances

8.1.1 Summary of Circumstances

Section 10 regulations [(69 FR 71723 as codified in 50 Code of Federal Regulations (CFR), Sections 17.22(b)(2) and 17.32(b)(2))] require that an HCP specify the procedures to be used for dealing with changed and unforeseen circumstances that may arise during the implementation of the HCP. In addition, the HCP No Surprises Rule [50 CFR 17.22 (b)(5) and 17.32 (b)(5)] describes the obligations of the permittee and the Service. The purpose of the No Surprises Rule is to provide assurance to the non-Federal landowners participating in habitat conservation planning under the Act that no additional land restrictions or financial compensation will be required for species adequately covered by a properly implemented HCP, in light of unforeseen circumstances, without the consent of the permittee.

Changed circumstances are defined in 50 CFR 17.3 as changes in circumstances affecting a species or geographic area covered by an HCP that can reasonably be anticipated by plan developers and the Service and for which contingency plans can be prepared (e.g., the new listing of species, a fire, or other natural catastrophic event in areas prone to such events). If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances and these additional measures were already provided for in the HCP's operating conservation program (e.g., the conservation management activities or mitigation measures expressly agreed to in the HCP or IA), then the permittee will implement those measures as specified in the plan. However, if additional conservation management and mitigation measures are deemed necessary to respond to changed circumstances and such measures were not provided for in the plan's operating conservation program, the Service will not require these additional measures absent the consent of the permittee, provided that the HCP is being "properly implemented" (properly implemented means the commitments and the provisions of the HCP have been or are fully implemented).

8.1.2 Newly Listed Species

If any species becomes listed during the term of the permit that is not addressed as a covered species in the SRRHCP, it will not be covered by the permit and will not be treated as a covered species. If there is the potential for take of a newly listed species, discussions with the Service should occur to determine take avoidance measures and whether those measures can be implemented. The San Rafael Cattle Company will consider amending the SRRHCP to request addition of the newly listed species to the permit, at its discretion.

8.1.3 New Critical Habitat Designation

If any new critical habitat is designated for a covered species on the San Rafael Ranch, no change will be required as this operating conservation program already conserves the habitat of covered species. If a new critical habitat is designated for a non-covered species, and the Service determines that covered activities may adversely modify the new critical habitat, then the San Rafael Cattle Company will consider amending, at its discretion, the SRRHCP to address measures to eliminate the adverse modification, and request an amendment by the Service of the permit.

8.1.4 Drought/Climate Change

Drought is a periodic, natural event in the project area and the frequency and/or duration of droughts may increase over time due to climate change. Drought reduces stream flows and the extent of perennial stream available as habitat for several covered species. Drought also can lead to drying of springs and stock ponds occupied by covered species. In the event that extreme drought seriously impacts the habitat available for covered species, the San Rafael Cattle Company will consult with the Service on appropriate measures that could be implemented to reduce the chance of extirpation of covered species. Measures that may be considered include salvage of covered species from drying ponds, operating wells during periods they would not normally be operated, trucking of water if wells run dry, and/or rest of riparian pastures.

8.1.5 Large or Catastrophic Wildfires

Wildfires are a common occurrence on the San Rafael Ranch, and adjusting stocking rates and timing in response to changes in forage are a part of normal ranch management. However, if an extremely large fire occurs that severely disrupts habitat and forage condition, it is possible that the ranch may not be able to maintain its commitment to meeting the goals and objectives described in Section 5.1. In the event of such a circumstance, the San Rafael Cattle Company will meet with the Service to determine whether any terms of the conservation program need to be modified to incorporate the changes caused by a large scale fire.

8.1.6 Flood Event

Floods are a natural occurrence in Arizona, particularly during the summer monsoon season. These floods can at times be of such magnitude that they can destroy or significantly modify stock ponds, riparian areas, or springs that are occupied by covered species. In the event of a flood that causes the loss of a population of covered species on the San Rafael Ranch, the Company will meet with the Service to determine how best to restore or mitigate for the lost habitat and population and whether any terms of the conservation program need to be modified to incorporate the changes caused by a large flood.

8.1.7 Invasive non-native plants or animals

Invasive non-native plants can destroy or significantly modify stock ponds, riparian areas, or springs that are occupied by covered species. Invasive non-native animals that currently do not exist in the covered area of the SRRHCP can have detrimental effects to covered species. For instance, if crayfish became established in the Santa Cruz River in the covered area, they could devastate northern Mexican gartersnakes through predation. In the event that any additional invasive non-native plants or animals become established in the covered area, the San Rafael Cattle Company will meet with the Service to determine whether any terms of the conservation program need to be modified to incorporate the changes caused by the presence of invasive non-native species.

8.2 Unforeseen Circumstances

Unforeseen circumstances are defined in 50 CFR 17.3 as changes in circumstances that affect a species or geographical area covered by the HCP that could not reasonably be anticipated by plan developers and the Service at the time of the HCP's negotiation and development and that result in a substantial and adverse change in status of the covered species. The purpose of the No Surprises Rule is to provide assurances to non-Federal landowners participating in habitat conservation planning under the Act that no additional land restrictions or financial compensation will be required for species adequately covered by a properly implemented HCP, in light of unforeseen circumstances, without the consent of the permittee.

In case of an unforeseen event, the San Rafael Cattle Company will immediately notify the Service staff assigned as the principal contact for the proposed action. In determining whether such an event constitutes an unforeseen circumstance, the Service shall consider, but not be limited to, the following factors: size of the current range of the affected species; percentage of range adversely affected by the HCP; percentage of range conserved by the HCP; ecological significance of that portion of the range affected by the HCP; level of knowledge about the affected species and the degree of specificity of the species' conservation program under the HCP; and whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the affected species in the wild. The Service will have the burden of demonstrating that unforeseen circumstances exist, using the best scientific and commercial data available, and the findings must be clearly documented.

If the Service determines that additional conservation and mitigation measures are necessary to respond to the unforeseen circumstances where the HCP is being properly implemented, the additional measures must be as close as possible to the terms of the SRRHCP and must be limited to modifications within any conserved habitat area or to adjustments within lands or waters that already set-aside in the HCP's operating conservation program. Additional conservation and mitigation measures shall not involve the commitment of additional land or financial compensation or restrictions on the use of land or other natural resources

otherwise available for development or use under original terms of the HCP without the consent of the San Rafael Cattle Company.

Section 9: Permit Administration

9.1 Amendments

9.1.1 Minor Amendments

Minor amendments are changes that do not affect the scope of the HCP's impact and conservation strategy, change amount of take, add new species, or change significantly the boundaries of the HCP. Examples of minor amendments include correction of spelling errors or minor corrections in boundary descriptions, stock tank numbers, and pasture configurations. The minor amendment process is accomplished through an exchange of letters between the permit holder and the Service.

The San Rafael Cattle Company or the Service may propose minor amendments. The proposed amendment must be presented in writing to the other party. The written statement must provide the reasons for the proposed amendment, and an analysis of the effect of the proposed amendment on the environment, covered species, covered activities, and the implementation of the SRRHCP. The party receiving the proposed amendment will use its best efforts to respond to the proposed minor amendment within 60 days of receipt of the notice. The proposed minor amendment becomes effective upon the written agreement between the San Rafael Cattle Company and the Service.

9.1.2 Major Amendments

Major amendments to the HCP and permit are changes that do affect the scope of the HCP and conservation strategy, increase the amount of take, add new species, or change significantly the boundaries of the HCP. Major amendments often require amendments to the Service's decision documents, including the NEPA document, the biological opinion, and findings and recommendations document. Major amendments will often require additional public review and comment.

9.2 Suspension/Revocation

The Service may suspend or revoke the Section 10(a)(1)(B) permit if the San Rafael Cattle Company fails to implement the SRRHCP in accordance with the terms and conditions of the permits, or if suspension or revocation is otherwise required by law. Suspension or revocation of the Section 10(a)(1)(B) permit, in whole or in part, by the Service shall be in accordance with 50 CFR 13.27-29, 17.22(b)(8), 17.32(b)(8).

9.3 Permit Renewal

The San Rafael Cattle Company likely will wish to renew its permit at the time of expiration. Before expiration, the Section 10(a)(1)(B) permit may be renewed without the issuance of a new permit, provided that the permit is renewable, and that biological circumstances and other pertinent factors affecting covered species are not significantly different than those described in the SRRHCP. To renew the permit, the permittee shall submit to the Service, in writing:

1. a request to renew the permit;
2. reference to the original permit number;
3. certification that all statements and information provided in the original HCP and permit application, together with any approved HCP amendments, are still true and correct, and inclusion of a list of changes;
4. a description of any take that has occurred under the existing permit; and
5. a description of any portions of the project still to be completed, if applicable, or what activities under the original permit the renewal is intended to cover.

If the Service concurs with the information provided in the request, it shall renew the permit consistent with permit renewal procedures required by Federal regulation (50 CFR 13.22). The permittee must have complied with all annual reporting requirements and implemented the HCP fully to qualify for a permit renewal.

9.4 Permit Transfer

In the event of a sale or transfer of ownership of the property during the life of the permit, the following will be submitted to the Service by the new owner(s): a new permit application, permit fee, and written documentation providing assurances pursuant to 50 CFR 13.25. The new owner(s) will commit to all requirements regarding the take authorization and mitigation obligations of the SRRHCP unless otherwise specified in writing and agreed to in advance by the Service and current owners.

9.5 Other Measures as Required by Director

In general, the Director requires an Implementing Agreement between the permit applicant, the Service, and the appropriate State resource agency (when State-listed species are involved). However, an Implementing Agreement is not required for low effect HCPs.

Section 10: Literature Cited

Arizona Game and Fish Department. Arizona's State Wildlife Action Plan: 2012-2022. Arizona Game and Fish Department, Phoenix, AZ. 183 pp. plus appendices.

_____. 2000. *Spiranthes delitescens*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4pp.

_____. 2007. Safe Harbor Agreement for topminnows and pupfish in Arizona. Arizona Game and Fish Department. Phoenix, AZ. 36pp.

_____ and U.S. Fish and Wildlife Service. 2006. Safe Harbor Agreement for the Chiricahua leopard frog in Arizona. Nongame and Endangered Wildlife Program, Arizona Game and Fish Department, and Arizona Ecological Services Office, U.S. Fish and Wildlife Service, Tucson (AESO/SE 02-21-03-I-0083). 75pp

Armour, C.L., D.A. Duff, and W. Elmore. 1991. The effects of livestock grazing on riparian and stream ecosystems. Fisheries 16:7-11.

Belsky, A.J., A. Matzke, and S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. Journal of Soil and Water Conservation 54:419-431.

Bobzien, S. and J.E. Didonato. 2007. The status of the California tiger salamander, California red-legged frog, foothill yellow-legged frog, and other aquatic herpetofauna in the East Bay Regional Park District, California. East Bay Regional Park District. 67 pp.

Brown, D.E. 1994. Biotic communities: Southwestern United States and Northwestern Mexico. University of Utah Press. Salt Lake City.

Brown, D.E. and C.H. Lowe. 1980. Biotic communities of the Southwest (map). Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-78.

Clary, W.P and B.F. Webster. 1989. Riparian grazing guidelines for the Intermountain Region. Rangelands 12:209-212.

Clary, W.P. and D.E. Medin. 1990. Differences in vegetation biomass and structure due to cattle grazing in a northern Nevada riparian ecosystem. General Technical Report INT-263, U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Ogden, Utah. 11 pp.

Fleischner, T.F. 1994. Ecological costs of livestock grazing in western North America. Conservation Biology 8:629-644.

Gartersnake Conservation Working Group. 2014. Notes from October 2014 Annual Meeting. Safford, Arizona. 18 pp.

Hadley, D. and T.E. Sheridan. 1995. Land use history of the San Rafael Valley, Arizona (1540-1960). Gen. Tech. Rep. RM-GTR-269. U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station. 279 pp.

Hendrickson, D.A. and W.L. Minckley. 1984. Ciénegas – vanishing climax communities of the American Southwest. Desert Plants 6(3):131-175.

Hereford, R. 1992. Geomorphic evolution of the San Pedro River channel since 1900 in the San Pedro Riparian National Conservation Area, in southeast Arizona. U.S. Geological Survey, Open File Report 92-339, Denver, Colorado. 71pp.

Hossack, B.R., E. Muths, J.C. Rorabaugh, J.A. Lemos Espinal, B.H. Sigafus, T. Chambert, G. Carreón Arroyo, D. Hurtado Felix, D. Toyos Martinez, and T.R. Jones. Submitted. Distribution of the Sonora Tiger Salamander (*Ambystoma mavortium stebbinsi*) in Mexico. Phyllomedusa.

Kauffman, J.B. and W.C. Krueger. 1984. Livestock impacts on riparian ecosystems and streamside management: a review. Journal of Range Management 37:430-438.

Meehan, W.R. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, Maryland. 751 pp.

Minckley, W.L. 1973. Fishes of Arizona. Arizona Game and Fish Department. Phoenix, AZ. 293 pp.

Minckley, W.L. and P.C. Marsh. 2009. Inland fishes of the greater southwest: chronicle of a vanishing biota. University of Arizona Press. 426 pp.

Minckley, W.L. and J.N. Rinne. 1985. Large woody debris in hot-desert streams: an historical review. Desert Plants 7(3):142-153.

Natural Resource Conservation Service. 2002. USDA NRCS Conservation Practice Standard Arizona: Pest Management, Code 595.

Ober, H.K., R.J. Steidl, V.M. Dalton. 2000. Foraging ecology of lesser long-nosed bats. School of Renewable Natural Resources, University of Arizona, Tucson, AZ.

Pearce, R.A., M.J. Trlica, W.C. Leininger, D.E. Mergen, and G. Fraser. 1998. Sediment movement through riparian vegetation under simulated rainfall and overland flow. Journal of Range Management 51(3):301-308.

Platts, W.S. and R.L. Nelson. 1989. Stream canopy and its relationship to salmonid biomass in the intermountain west. North American Journal of Fisheries Management. 9:446-457.

Rorabaugh, J.C, J.M. Servoss, V.L. Boyarski, E. Fernandez, D. Duncan, C. Robles Elías, and K.E. Bonine. 2013. A Comparison of the Herpetofaunas of Ranchos Los Fresnos and El Aribabi in Northern Sonora, Mexico. Pages 103-109 *in* G.J. Gottfried, P.F. Ffolliott, B.S. Gebow, L.G. Eskew, L.C. Collins (compilers),

Proceedings: Merging science and management in a rapidly changing world: Biodiversity and management of the Madrean Archipelago III and 7th Conference on Research and Resource Management in the Southwestern Deserts. May 1-5 2012. Tucson, AZ. RMRS-P-67. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 593 p.

Schulz, T.T., and W.C. Leininger. 1990. Differences in riparian vegetation structure between grazed areas and exclosures. Journal of Range Management 43(4): 295-299.

Scott, P.E. 2004. Timing of Agave palmeri flowering and nectar-feeding bat visitation in the Peloncillos and Chjricahua Mountains. The Southwestern Naturalist 49(4): 425-434.

Stingelin, A., S. Blackman, R. Mixan, and M. Ingraldi. 2009. Post-fire vegetation monitoring, invasive species mapping, and sensitive species inventory and monitoring on the San Rafael State Natural Area, Santa Cruz County, Arizona. Arizona Game and Fish Department, Phoenix, AZ. 63 pp.

Swanson, F.J., S.V. Gregory, J.R. Sedell, and A.G. Campbell. 1982. Land-water interactions: the riparian zone. Pages 267-291 in R.L. Edmonds, editor. Analysis of Coniferous Forest Ecosystems in the Western United States. Hutchinson Ross Publishing Company, New York, NY.

Tellman, B., R.Yarde, and M.G. Wallace. 1997. Arizona's Changing Waters: How people have affected the rivers. Issue Paper 19, Water Resources Research Center, College of Agriculture, University of Arizona. 198 pp.

Trimble, S.W. and A.C. Mendel. 1995. The cow as a geomorphic agent -- a critical review. Geomorphology 13(1995):233-253.

U.S. Fish and Wildlife Service. 1997a. Endangered and threatened wildlife and plants; Determination of endangered status for three wetland species found in southern Arizona and northern Sonora. Final rule. 62 FR 665.

_____. 1997b. Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuenae*) Recovery Plan. U.S. Fish and Wildlife Service. Phoenix, Arizona. 49 pp.

_____. 1999. Endangered and threatened wildlife and plants; Determination of critical habitat for the Huachuca water umbel; a plant. Final rule. 64 FR 37441.

_____. 2002. Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) recovery plan. U.S. Fish and Wildlife Service. Phoenix, Arizona. iv + 67 pp.

_____. 2005. Endangered and threatened wildlife and plants; Listing Gila chub as endangered with critical habitat. Final rule. 70 FR 66664.

_____. 2006. Final Environmental Assessment: small scale exotic species removal in the San Rafael Valley, Arizona. U.S. Fish and Wildlife Service, Phoenix, AZ. 35 pp.

_____. 2007a. Chiricahua leopard frog (*Rana chiricahuensis*) recovery plan. U.S. Fish and Wildlife Service. Albuquerque, New Mexico. 148 pp. plus appendices.

_____. 2007*b*. Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service. Phoenix, Arizona. 14 pp.

_____. 2007c. Lesser long-nosed bat 5-year review: summary and evaluation. U.S. Fish and Wildlife Service. Phoenix, Arizona. 43 pp.

_____. 2010a. Huachuca springsnail general information sheet. U.S. Fish and Wildlife Service. Phoenix, Arizona. 1 p.

_____. 2010b. Huachuca springsnail species assessment and listing priority assignment form. U.S. Fish and Wildlife Service. Albuquerque, New Mexico. 16 pp.

_____. 2013a. Endangered and threatened wildlife and plants; designation of critical habitat for northern Mexican gartersnake and narrow-headed gartersnake; proposed rule. 78 FR 41550.

_____. 2013b. Endangered and threatened wildlife and plants; 90 day finding on a petition to delist or reclassify from endangered to threatened 5 southwest species. 78 FR 55046.

_____. 2014a. Endandered and threatened wildlife and plants; Threatened status for the northern Mexican gartersnake and narrow-headed gartersnake; final rule. 79 FR 38677.

_____. 2014b. Huachuca water umber (*Lilaeopsis schaffneriana ssp. Recurva*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service. Tucson, Arizona. 60 pp.

_____. 2014c. Endangered and threatened wildlife and plants; determination of threatened status for the western distinct population segment of yellow-billed cuckoo. Final rule 79 FR 5991.

Warren, P.L., D.F. Gori, L.S. Anderson, and B.S. Gebow. 1991. Status report for *Lilaeopsis schaffneriana* ssp. *recurva*. Contract report for U.S. Fish and Wildlife Service, Ecological Services, Phoenix, Arizona.

Waters, T.F. 1995. Sediment in Streams: Sources, Biological Effects and Control. American Fisheries Society, Monograph 7, Bethesda, Maryland. 251 pp.

Weltz, M. and M.K. Wood. 1994. Short-duration grazing in central New Mexico: effects on sediment production. Journal of Soil and Water Conservation. 41:262-266.

White, J.A. 2007. Recommended Protection Measures for pesticide Management Applications in Region 2 of the U.S. Fish and Wildlife Service. U.S. Fish and Wildlife Service, Austin ,Texas. 199 pp.

Personal Communications

Mima Falk, Arizona Ecological Services Field Office, U.S. Fish and Wildlife Service, Tucson Arizona (retired).

Acknowledgements

The San Rafael Cattle Company thanks the staff of Arizona Ecological Services Office, U.S. Fish and Wildlife Service, for assistance in the preparation of this HCP. In particular, we acknowledge the helpful assistance by, and encouragement from, Doug Duncan and Cat Crawford. In addition, Jim Rorabaugh, Tiki Harlow, Tom Scott and George Ruyle provided very helpful comments and assistance on the plan.

Appendices

A. Maps/Figure

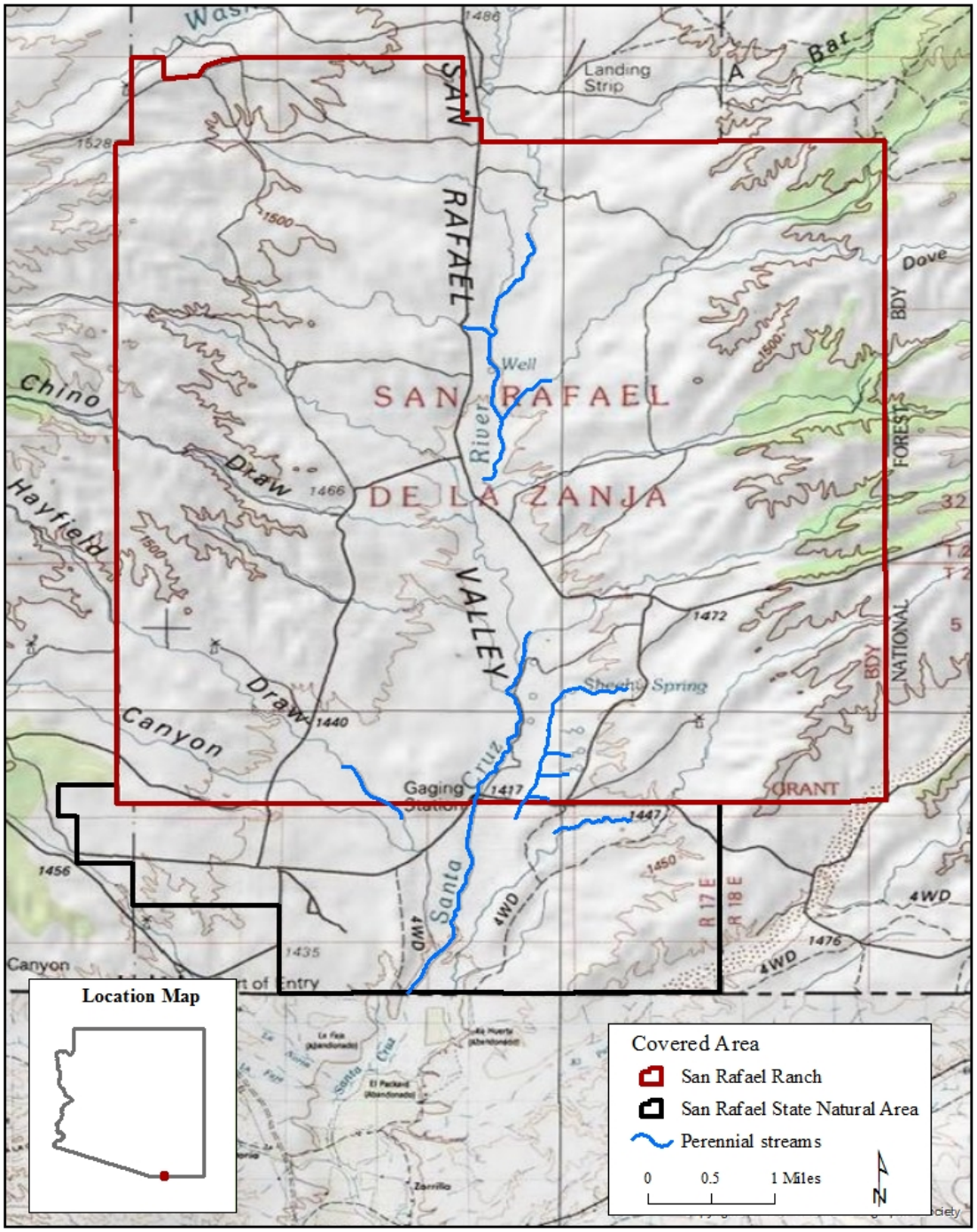
B. Stock Pond and Tank Management and Maintenance Guidelines on the San Rafael Ranch.

C. Covered Species Criteria

D. Evaluation Species

Appendix A

Figure 1. Covered Area for the San Rafael Ranch Habitat Conservation Plan



Appendix B

Stock Tank Management and Maintenance Guidelines For the San Rafael Ranch

The following guidelines for management and maintenance of stock tanks (including stock ponds and drinkers) on the San Rafael Ranch have been developed based on the Sonora Tiger Salamander Recovery Plan (U.S. Fish and Wildlife Service 2002) and the Chiricahua Leopard Frog Recovery Plan (U.S. Fish and Wildlife Service 2007). The San Rafael Cattle Company agrees to implement these guidelines as a part of the San Rafael Ranch Habitat Conservation Plan. As new information becomes available, these guidelines may be modified upon the written mutual agreement between the Service and the San Rafael Cattle Company following procedures set forth for minor amendments at Section 6.4.1.

Because Sonora tiger salamanders are known to occur in some tanks, and over the course of the term of the permit, could occur in virtually any stock tank in the covered area, presence will be assumed for this species. The following guidelines are intended to minimize incidental take of Sonora tiger salamander and northern Mexican gartersnake, and will also benefit the Chiricahua leopard frog.

The following guidelines for stock tank maintenance will be followed:

1. The San Rafael Cattle Company will notify the Service in writing 30 days in advance of undertaking any surface disturbing activities of stock tanks. The purpose of this notification is to coordinate timing of salvage operations.
2. Maintenance, dredging, and cleaning of occupied stock ponds shall not occur from January 1 through May 31, except by agreement with the Service.
3. At the discretion of the Service, stock tanks will be seined by the Service or a qualified and permitted biologist, and captured Sonora tiger salamanders, northern Mexican gartersnakes, and/or Chiricahua leopard frogs will be held temporarily in suitable tanks, aquaria or holding ponds. The salamanders, snakes, and frogs will be returned to the stock tank after maintenance is complete and the tank has refilled to levels adequate to maintain the species. Non-native species will be dispatched and disposed of appropriately.
4. If the stock tank needs to remain dry, it will be at the Service's discretion to carry out salvage operations for Sonora tiger salamanders, northern Mexican gartersnakes, and/or Chiricahua leopard frogs.
5. All equipment and vehicles brought into the area for use in stock tank maintenance will be cleaned, dried, and/or sterilized before moving to another aquatic site to avoid the introduction and spread of non-native invasive weeds and amphibian diseases.
6. Oil, fuel, and other equipment fluid will be stored away from occupied stock tanks and outside of drainages in secure containers. Any leaks will be cleaned up and disposed of properly.
7. Disturbance of vegetation will be minimized to the extent practicable.
8. During maintenance activities, the number of underwater objects (logs, rocks, etc.) will be maintained or increased, to the extent feasible and reasonable, to provide cover structure for egg deposition.
9. Stock tanks that are to be treated for the removal of non-native invasive species, particularly the American bullfrog, will be treated following procedures

established by the Service for removal of exotic species (U.S. Fish and Wildlife Service 2006).

Appendix C

Covered Species Criteria
San Rafael Ranch Habitat Conservation Plan

The following criteria were applied to reviewing species that are known to occur, or are likely to occur within the life of the permit application, on the San Rafael Ranch. Those species that meet all of the criteria will be included in the San Rafael Ranch Habitat Conservation Plan. The applicants will seek an incidental take permit pursuant to Section 10 (a) of the Act for most of the species addressed in the Plan. However, two or more species also will be addressed in the Habitat Conservation Plan, although a permit will not be required as their incidental take will be covered under other regulatory mechanisms provided for under the Act.

1. Does the species occur on the San Rafael Ranch, or is it likely to occur within the term of the permit?

2. Is the species federally listed under the Act, a candidate; or is there a reasonable likelihood of listing in the foreseeable future?

3. Are there adverse effects from covered activities that may result in incidental take of the species?

4. Are there adequate data on the status of the species, its life history, and habitat requirements, such that an analysis of the effects of the covered activities can be addressed and a meaningful conservation program, including monitoring and adaptive management, can be developed and implemented?

Appendix D

Evaluation Species
San Rafael Ranch Habitat Conservation Plan

Common Name	***Scientific Name***	***Federal Status[1]***	***State Status[2]***	***Occurs***	***Likely Affected by Covered Activities***	***Adequate Information***	***Include in HCP***
Sonora tiger salamander	*Ambystoma mavortium stebbinsi*	E	SGCN 1A	Yes	Yes	Yes	Yes
Northern Mexican gartersnake	*Thamnophis eques megalops*	T	SGCN 1A	Yes	Yes	Yes	Yes
Gila chub	*Gila intermedia*	E	SGCN 1A	Yes	Yes	Yes	Yes
Huachuca springsnail	*Pyrgulopsis thompsoni*	C	SGCN 1A	Yes	Yes	Yes	Yes
Canelo Hills ladies'-tresses	*Spiranthes delitescens*	E	HS	Yes	Yes	Yes	Yes
Huachuca water umbel	*Lilaeopsis schaffneriana* ssp. *recurva*	E	HS	Yes	Yes	Yes	Yes
Chiricahua leopard frog	*Lithobates chiricahuensis*	T	SGCN 1A	Yes	Yes	Yes	No[3]
Gila topminnow	*Poeciliopsis occidentalis occidentalis*	E	SGCN 1A	Yes	Yes	Yes	No[3]
Northern aplomado falcon	*Falco femoralis septentrionalis*	T(10j)	SGCN 1A	Yes	No	Yes	No
Yellow-billed cuckoo	*Coccyzus americanus*	T	SGCN 1A	Maybe	No	Yes	No
Jaguar	*Panthera onca*	E	SGCN 1A	Maybe	No	Yes	No
Ocelot	*Leopardus pardalis*	E	SGCN 1A	Maybe	No	Yes	No
Lesser long-nosed bat	*Leptonycteris yerbabuenae*	E	SGCN 1A	Yes	No	Yes	No

[1] E=endangered; T=threatened; C=candidate, T(10j)=experimental, non-essential population
[2] HS=highly safeguarded; SGCN 1A=species of greatest conservation need 1A (Arizona Game and Fish Department 2012)
[3] Occurs on San Rafael Ranch under a Safe Harbor Agreement