



# United States Department of the Interior



## Fish and Wildlife Service

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In Reply Refer to:  
AESO/SE  
22410-2009-F-0368

December 4, 2009

#### Memorandum

To: Refuge Manager, Buenos Aires National Wildlife Refuge, Sasabe, Arizona 85633

From: Field Supervisor

Subject: Biological Opinion for Section 7 Consultation for the Buenos Aires National Wildlife Refuge Habitat Management Plan

Thank you for your request for consultation on the Buenos Aires National Wildlife Refuge (BANWR) Habitat Management Plan (HMP) with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request was dated June 5, 2009, and received by us on June 8, 2009. Supplemental information was provided as an amendment to the Biological Assessment (BA) on August 11, 2009. At issue are impacts to listed and candidate species that may result from the implementation of the HMP on the BANWR located in Pima County, Arizona. The proposed action may affect the endangered Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*), the endangered masked bobwhite quail (*Colinus virginianus ridgewayi*), and the candidate northern Mexican gartersnake (*Thamnophis eques megalops*).

You also requested our concurrence that the proposed action is not likely to adversely affect the endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), the threatened Chiricahua leopard frog (*Lithobates [=Rana] chiricahuensis*), the endangered Gila topminnow (*Poeciliopsis occidentalis occidentalis*), the endangered southwestern willow flycatcher (*Empidonax traillii extimus*) and its critical habitat, the endangered jaguar (*Panthera onca*), the threatened Mexican spotted owl (*Strix occidentalis lucida*) and its critical habitat, the endangered Kearney's blue star (*Amsonia kearneyana*), and the candidate yellow-billed cuckoo (*Coccyzus americanus*). We concur with your determinations, and our rationale is provided in Appendix A.

This biological opinion is based on information provided in your June 5, 2009 request for consultation, the biological assessment, supplemental information provided August 11, 2009, section 10(a)(1)(A) research and recovery permit reports, telephone conversations, field investigations, and other sources of information, all of which are incorporated herein by reference. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, habitat management and its effects, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

### **Consultation History**

- May 1, 2007 - BANWR provided a draft HMP to the FWS Arizona Ecological Services Office (AESO) and the AESO provided comments to BANWR on the HMP.
- June 5, 2009 – BANWR sent a request for consultation to FWS AESO.
- July 8, 2009 – AESO sent an electronic mail request to BANWR for some additional information and clarification on the request and BA.
- August 5, 2009 – Staff from AESO met with staff from BANWR to discuss information needs for the consultation.
- August 11, 2009 – BANWR provided an amendment to the BA that provided additional information requested at the August 5, 2009 meeting.
- October 22, 2009 – AESO provided BANWR the Draft Biological Opinion for review.
- November 19, 2009 – BANWR provided comments to AESO on the Draft Biological Opinion indicating it was ready to be finalized.

## **BIOLOGICAL OPINION**

### **DESCRIPTION OF THE PROPOSED ACTION**

This HMP is intended to be a step down plan that is based on the Goals, Objectives and Strategies stated in the BANWR's Comprehensive Conservation Plan (CCP). The BANWR CCP lists two goals which address habitat management and conservation. These are as follows:

#### CCP Goal 1: Resource Management

Restore, conserve and manage the natural abundance and diversity of wildlife and habitat utilizing strategies that focus on environmental and biological integrity.

#### CCP Goal 2: Resource Protection

Conserve high quality habitats through continued land acquisition from willing sellers within approved boundaries.

## THE HMP ZONE CONCEPT

The BANWR approaches habitat management on the refuge by defining habitat zones by which it will direct all management actions. By addressing zones, BANWR will target key habitat types and the full array of life forms within these types. Inherent in the zone concept of habitat management is the commitment to benefit a wide array of species utilizing every ecological niche within a zone, while focusing on a few key species and maximizing their habitat quality and/or quantity.

### Definition of a Zone

A zone represents a geographic area in which management for specific wildlife species or habitats are emphasized. Generally, these zones are broadly recognizable and based on common landscape features which may include particular soils, vegetation cover types, cover amounts, presence or absence of certain features or species, or the combination of these. Sometimes zones are generally accepted habitats or ecoregions (e.g. riparian zone). Other times they will represent the habitat required by a particular species (e.g. masked bobwhite zone).

Zones may represent current appropriate habitat or potential habitat (areas in which the refuge can create a particular kind of habitat). The boundaries of the zones may be based on characteristics of the landscape, soil types, natural barriers, presence of certain species or the potential presence of certain species, etc. Alternatively, zones may be bounded by artificial features, such as roads, for ease of management. Zones are expected to be dynamic, and boundaries may change at any point to reflect new information and changed circumstances.

Because not all of the management zones are addressed adequately in the CCP document, the HMP includes more detailed goals and objectives which are specific to each zone. The habitat requirements for focal species are taken into account to create a recipe for zone health. In addition, some goals and objectives transcend zone boundaries and are applicable refuge wide. For this reason, a separate section addresses refuge-wide goals.

For each zone, objectives are identified, habitat management strategies are formulated and specific prescriptions have been developed which will identify how, when, why and where the strategies will be implemented on the refuge. Based on the occurrence of the focal species, prior knowledge of habitat types and conditions, and resource management implications, eight habitat management zones are defined and described in the HMP. A brief description of these zones and the associated HMP actions are as follows:

### *Masked Bobwhite Zone*

The masked bobwhite zone (see Map 3 of BA) consists of multilayered brush canopies and open grassland with high percentages of forbs and native grasses and high species diversity. Open areas need to be highly interspersed with areas of shrub cover. Currently this zone is made up of the two portions of the refuge where wild bobwhites may be found and a corridor

connecting the two portions. In the future, if bobwhites begin to use areas outside the zone as currently defined, the new areas will be added as an “expansion zone” for the bobwhite.

**Objective 1:** Establish geographically defined bobwhite management areas (BMA) throughout the Masked Bobwhite Zone within 10 years.

Each BMA shall be established to ensure the appropriate development of habitat mosaics, vegetative ecotones and edge effects that are beneficial habitat conditions for bobwhites (Angelo et al. 2005, F. Hernandez pers.com.). Exceptions to this maximum size requirement may exist in areas where well defined artificial or natural boundaries do not exist. There is no minimum size limit to the delineation of these BMA units since there are many geographically defined smaller areas that contain all essential habitat components to support bobwhites.

BMAs will typically be delineated within existing burn units but may extend beyond a given burn unit boundary depending on existing and potential bobwhite habitat conditions. Criteria for boundary delineations will be based on the known locations of bobwhites, distribution of NVCS vegetation types, well defined geographic features (i.e. ridge tops and drainages, outwash plains, hills, etc.), artificial features (i.e. roads, buildings, fence lines, etc.), existing habitat conditions and connectivity of adjacent habitats. Initial focus for resource management actions will take place in BMAs previously defined as good bobwhite habitat and where the core populations of bobwhite may currently exist. These locations will function as expansion anchor sites and will provide needed habitat conditions for the potentially expanding population of bobwhites.

Each of the BMAs will receive a variety of different habitat management actions depending on existing conditions and desired HMP objective targets. In some cases, broad-scale management actions, including soil aeration and re-vegetation, will be applied across an entire BMA. In other cases, geographically restricted management actions will take place within BMA boundaries including mottle and brush pile developments, mechanical and chemical mesquite eradication treatments, disking, divot and spreader dam developments, establishment of bobwhite food plots, and prescribed fire treatments. Mottes are defined as conglomerations of contiguous woody vegetation and may consist of any combination of dead woody material (i.e. brush piles) and live shrubs or trees which provide thermal and hiding cover for bobwhites (Guthery 2000). Areas between mottes will be relatively open and consist of herbaceous cover with limited woody vegetation. In places where limited raw material is available for full mottle development, multiple half-cut mesquite trees can be combined with other brushy plants to form smaller structures that provide beneficial cover for bobwhites. The net result of this strategy will be the development of a mosaic of various habitat conditions beneficial to masked bobwhites at a broader landscape scale.

Fire treatments will typically be applied exclusively within BMA boundaries where burning activities have not occurred in adjacent areas during a given year. Burns will be limited to 30 to 50 acre patch size to ensure the development of desirable mosaics and vegetation edge effects within and between BMAs (Wells 2005, Guthery 2000, Goodwin 2008). Multiple burn patches will be allowed within a BMA as long as more than 50% of the entire BMA

remains un-burned. These prescribed fire treatments may extend into an adjacent BMA within a given year if total burn patch size is less than 50 acres, and this action contributes to the improvement of bobwhite habitats. Prolonged reentry times of up to 15 years for prescribed fires will be encouraged to promote late seral vegetation conditions beneficial to bobwhites (Guthery 1997, Guthery et al. 2000, Spears et al. 1993).

Prescribed fires will not take place anywhere in this zone from July 1 through October 15 due to potential short term impacts to masked bobwhite breeding activities. These dates of fire exclusion can be adjusted from year to year depending on the presence or absence of

bobwhites and the variability in climatological conditions (i.e. precipitation patterns, warm temperatures, etc.) which may result in early breeding.

**Objective 2 (Canopy Coverage):** Create or maintain stands of vegetation consisting of the following canopy coverage condition within 10 years on 30% of the zone:

- 15% to 30% of woody vegetation cover (mid-story shrubs and trees 3 to 10 feet tall) (Johnson and Hoffman n.d.),
- $\geq 15\%$  forb cover (Simms 1989),
- $\geq 15\%$  native grass cover (Reichenbacher and Mills 1984) and,
- 0% to 25% unobstructed bare ground (Goodwin and Hungerford 1977).

The percentage levels described in this and subsequent objectives relate to perennial and/or annual vegetation present during the spring and summer. There is limited information in the literature regarding seasonal variation of vegetation occurrence relevant to bobwhite habitat even though a few publications do include plant species lists. Given the spring and summer bimodal nature of vegetation occurrence within the Sonoran semi-desert grassland ecosystem, and the importance of specific vegetation conditions beneficial to bobwhites during these seasons, the refuge biologists believe February-April and August-September are the best time periods to monitor and quantify vegetation conditions with respect to the achievement of objectives.

BANWR will identify areas of unacceptable canopy coverage and initiate habitat enhancement actions to create plant canopy coverage and species composition beneficial for bobwhites.

As is the case for many habitat enhancement actions, a combination of multiple resource management tools will likely be required to achieve this goal. In some areas, prescribed fire and/or mechanical treatments used in combination with herbicide treatments will be necessary to achieve the desired level of vegetation canopy coverage and vegetation characteristics. Inventory and monitoring results, fire effects monitoring results, and qualitative visual assessments will be used to evaluate the effectiveness of all resource management actions and provide pertinent information to improve these resource management techniques and actions if necessary.

In overly dense woodland thicket areas, the use of chaining, firewood cutting or other mechanical methods, prescribed fire, and herbicides may be implemented to reduce woody vegetation and encourage establishment of grasses and forbs.

Areas where woody vegetation is too sparse, soil disking, soil aeration, and re-vegetation/seeding techniques will be applied to stimulate growth of shrubs and trees. When prescribed fire treatments are to be applied, careful consideration of burn techniques must be given to ensure long term positive effects to the mid-story shrub/tree diversity and canopy coverage (Goodwin 1982).

Areas where herbaceous ground cover becomes too thick (i.e. < 25% bare ground), mechanical treatments may be used to reduce restrictive vegetation conditions and thereby improve mobility options for bobwhites. Mechanical treatments to reduce or remove vegetation will help reduce the threat from predators by creating or improving escape routes and hiding cover. Furthermore, these treatments can provide or improve access to otherwise inaccessible areas of good habitat within a given bobwhite home range. Tractor/mower, disking, roller-chopper or pasture aerator applications can be used to achieve these effects.

Additionally, the re-establishment of normal insect abundance levels must be taken into consideration when prescribed fire techniques and rotation periods are determined since insects are an essential food for bobwhites. Although little is known about the long term impacts to insects following prescribed burns, refuge staff biologists have observed an apparent reduction in insect abundance for one to three years following burn treatments. The recovery time to pre-burn insect abundance is likely extended during periods of drought.

**Objective 3 (Plant Species Diversity):** Create or maintain diverse stands of native vegetation consisting of a minimum of 8 – 12 native perennial grass species, a minimum of 12 – 16 perennial forb species, and a minimum of 3 – 6 mid-story shrub/tree species (Goodwin 1982, Simms 1989, USFWS 1983) within 10 years on 30% of the zone.

In drier upland sites, soil aeration will increase herbaceous species vigor and diversity (unpublished refuge vegetation monitoring results). The preferred time to implement this type of treatment may be early winter to ensure maximum water retention of precipitation from extended periods of winter rains. The aerator will also be used to sculpt bobwhite habitat areas to help define smaller management units within bobwhite habitats. In wetter bottomland areas, disking treatments may be applied which will have similar effects as the upland aerator treatments. The bottoms typically have more sandy/loam soil types making the disking treatment more applicable.

A minimum of 200 divots will be created or restored within 10 years in upland areas to enhance or maintain desirable plant species diversity vegetation conditions. Divots are intermittent or temporarily flooded shallow depressions like those created by Buenos Aires Ranch prior to 1985. Occurring in upland areas, the divots, which are typically the size of a bulldozer blade width, trap sheet water run-off from rain events. These areas may be re-

vegetated with native grass, forb and shrub species (other than mesquite) that provide good nest cover and food source for many ground-nesting bird species including the masked bobwhite.

Additional habitat enhancement actions could include but will not be limited to the planting of native plants, use of approved non-native/non-invasive plant species such as milo (*Sorghum spp.*) and millet (*Panicum spp.*) to create food plots, supplemental feeding and watering, use of herbicides to improve plant species compositions, irrigation, and soil improvements (i.e. fertilizers, mycorrhizae and nutrient inoculations, erosion control, creation or enhancement of spreader dams, etc.).

**Objective 4 (Vegetative Structure):** Develop hiding, thermal and nesting cover, and brood habitat conditions for bobwhites within 10 years throughout 20% of the zone. This will be accomplished through the management of vertical and horizontal vegetation structure (Guthery 2000).

In areas where dense stands of woody vegetation exist, groupings of three or more mottes at least 50 feet diameter each will be formed by removing surrounding areas of woody vegetation. Mottes shall not be further than 150 feet from bobwhite feeding areas. Mechanical removal of woody vegetation (chaining, grubbing, shearing, cutting, aeration, disking and bulldozing) will be done between the mottes. Prescribed fire treatments may also be applied between and surrounding the mottes in many situations if appropriate measures are taken to insure they are protected against fire.

In areas where limited stands of woody vegetation exist, mottes will be formed with the creation of large brush piles 50 ft. in diameter and no further than 150 ft. from bobwhite feeding areas. This may require the hauling in of dead woody raw material from other areas. Additionally, manual plantings of desired shrub and trees may be required to provide the living component to the motte in this situation. Over time, this multi-layer conglomeration of live and dead vegetation will create favorable micro-habitat conditions for the recruitment and establishment of additional naturally occurring plants beneficial to bobwhites (Angelo et al. 2005).

Traditional brush piles without the live shrub component will also be built in some situations to improve vegetation structure conditions. As is the case with mottes, these brush piles will be constructed 50 ft in diameter and no further than 150 feet from bobwhite feeding areas. Brush piles should be constructed in such a fashion as to provide an open space underneath to ensure access to bobwhites and other wildlife.

Vertical and horizontal vegetation structure can also be improved using half-cutting and/or pruning techniques on selected mesquite trees (USFWS 1995). Sites where there is too little cover may be improved by cutting mid-story tree limbs half-way through and bending them downward. This essentially creates a 'living brush pile' with desirable cover and structure conditions. Additionally, sites where the tree canopy needs to be reduced may be pruned to

lower the canopy within the upper portion of the tree. Re-sprouts of limbs in pruned trees will result in an increase canopy density closer to the ground and reduce the possibility the tree will be used as perch for predators.

Resource management actions will then take place to establish 300 to 500 clumps of perennial bunchgrasses within every acre of each BMA in order of priority. Each bunchgrass clump will be a minimum of 8 inches tall and 9 inch canopy diameter. Prescribed fire treatments, re-vegetation, active irrigation, mechanical treatments, herbicide application techniques and other resource management tools will be used to achieve this level of bunch grass abundance and structure beneficial to bobwhites. Grass species targeted for this management action include but are not limited to vine mesquite, sacaton, cane beardgrass (*Bothriochloa barbinodis*), and Arizona cottontop.

Bobwhite brood habitat conditions will be inspected and assessed during field site visits within or adjacent to pre-existing nest habitat areas and/or in places where establishment of new nest habitat is the primary objective. Management actions intended to improve brood habitats will likely include implementation of fall or winter treatments. Ground disturbing treatments that take place this time of year are likely to promote the establishment of ragweed and other plants that benefit brood habitat conditions and minimize the establishment of plants that are detrimental to brood habitat conditions such as pigweed (Evans 2008). The timing of treatments and the treatment technique used will be evaluated with post-treatment follow-up site visits and results from vegetation monitoring work.

**Objective 5:** Evaluate changes in bobwhite population status and trends annually and expand the HMP Masked Bobwhite Quail Zone boundaries based on abundance and distribution patterns of this species. The boundaries of this zone should be dynamic and may be modified annually to accommodate newly discovered areas of bobwhite occurrence outside the zone.

Annual bobwhite surveys will continue to be used to monitor the population status of bobwhites on the refuge and surrounding lands. Survey results will be included in the bobwhite GIS database. Refuge staff will evaluate population and distribution trends annually to assess potential zone expansion areas. Expansion and re-delineation of the Masked Bobwhite Quail zone boundaries identified in Map 3 of the BA will be allowed to take place prior the HMP expiration date. This action is merited given the urgency to expedite the restoration of the masked bobwhite population on the refuge and will help reduce the potential for masked bobwhite extinction.

**Objective 6:** Investigate the potential use of predator control measures for the benefit of bobwhites within three years.

Using best available survey data, known occurrences of predatory species and knowledge of field vegetation cover conditions, the refuge biologists will actively assess impacts and/or potential impacts to bobwhites from predators within three years. Recommendations and expertise from AZGFD and other agencies will be requested to assist in the determination of species specific impacts to bobwhites from predatory animals. If it is determined that

predators represent a significant threat to the restoration effort of bobwhites, the refuge will take all actions necessary to implement predator control measures. The development of a predator control plan will be required prior to the implementation of any predator control actions.

### *Pima Pineapple Cactus Zone*

The Pima pineapple cactus (PPC) zone (see Map 4 of the BA) represents a wide-spread area of the refuge wherever the refuge Geographic Information System (GIS) predictive model indicates that there is a high or moderate probability of PPC occurrence and where these cacti are actually located. Existing PPCs would generally be afforded priority protection from detrimental activity throughout this zone. An area for maximum PPC protection is designated within this zone and will provide the greatest level of protection for these cacti by not only allowing for protection of existing cacti, but also providing for undisturbed establishment of the species.

**Objective 1:** Protect all known, live PPC plants from potentially detrimental activities including, but not limited to, prescribed fires, brush clearing, road maintenance and construction, recreational activities, hiking trails, and off road vehicular traffic.

Implement intensive PPC ground surveys to locate and protect these plants where land management actions may impact these cacti. Newly discovered and previously mapped PPC sites will be visited to record viability and other biological data regarding the species. Surveys are required in areas previously not surveyed and where previously completed surveys have taken place more than five years prior to the resource management activities per FWS guidance.

Surveys will take place in all areas mapped as predicted habitat identified by the BANWR's GIS PPC habitat model and which coincide with planned management actions. Surveys will not be required in any area designated as PPC non-habitat given the extremely low probabilities for their occurrence in these areas.

In places where prescribed fires are scheduled to take place within this zone, vegetation surrounding all known viable PPCs will be cleared to minimize fire impacts to these cacti. The vegetation should be cleared in a doughnut shaped area 1 to 11 feet away from the PPC to protect it from fire and to provide beneficial micro-habitat conditions immediately adjacent to these plants. Ladder fuels from overhanging vegetation (i.e. mesquite limbs) will be removed from PPC sites. Pre and post burn monitoring of PPCs will take place to evaluate impacts to these plants and provide additional information to improve protection measures.

Similar PPC protection measures will take place where non-fire related resource management activities occur as well. All known PPC sites will be flagged and protected against any potentially damaging management action including but not limited to soil aeration, disking, water catchment developments, re-vegetation, mechanical removal of mesquite, and chaining.

**Objective 2:** Establish a PPC Maximum Protection Area (PPC-MPA) east of Arizona Highway 286 and north of Pozo Nuevo Road in which BANWR will protect 5878 acres of PPC habitat from ground disturbance until evidence can be obtained which will indicate whether ground disturbance impedes establishment and persistence of PPCs.

The prescription is essentially the same as in Objective 1. Intensive surveys will be done prior to any potentially detrimental activities, data will be collected on each PPC, and all PPCs will be monitored through time to assess their viability and health. Protection from prescribed fire activities will be as in Objective 1, but ground-disturbing actions including, but not limited to aeration, disking, excavation, and chaining will not be allowed within the PPC-MPA.

### *Cavity Nester Zone*

This includes areas which are used for nesting and dispersing by numerous cavity nesting birds. The needs of the cactus ferruginous pygmy-owl (CFPO) are emphasized, since they are representative of the needs of most cavity nesting species.

This zone is divided into the maximum protection area and the moderate protection area (see Map 5 of BA) which are described in detail in the HMP sections on goals, objectives, strategies and prescriptions for the zone.

**Objective 1:** Protect large diameter trees (>8"dbh) within the zone boundary from the effects of prescribed fire and allow for the regeneration of future cavity substrates. A maximum of 5% mortality of large diameter trees resulting from resource management actions will be allowed anywhere within this zone.

Use prescribed fire techniques which will keep stand altering fire out of important drainages throughout this zone in order to protect large trees. Such techniques may include cool-season burns for fuel reduction or other techniques. Protection of large stands of potential nest trees may require mechanically constructed fire breaks or use of fire retardant.

In areas where mechanical (non-fire) resource management techniques are applied, selective cutting and removal of trees will take place to ensure the protection of existing cavity bearing trees and the recruitment of future cavity bearing trees.

Protection of large trees from prescribed fire in drainages will be a high priority. Careful consideration for the use of helicopter ignition techniques should take place for prescribed fires within and/or surrounding drainages where large trees occur to minimize potential fire damage to cavity bearing trees. A buffer will be maintained around stands of large trees. Buffer distance will be site specific and will vary depending on fuel conditions, wind speed, etc. Whenever possible, hand ignition techniques will be encouraged.

**Objective 2:** Protect all saguaros from the effects of prescribed fire.

BANWR will use volunteers, interns, or staff to mechanically clear a doughnut shaped area 3 to 13 feet away from saguaros and respective nurse-tree(s) to protect them from fire and to provide beneficial micro-habitat conditions. Wherever possible, ladder fuels will be reduced or removed to minimize above ground fire threats.

**Objective 3:** Assure that corridors of connectivity exist amongst all known CFPO locations on the refuge and that a well-defined north-south corridor is maintained to allow movement of owls from Mexico into the United States. These connective corridors will consist of suitable breeding and dispersal habitat for CFPO and other cavity nesting species. A minimum of 20 acres per year of cavity nesting habitat improvements will take place within these corridors.

Fire fuels will be reduced to minimize the risk of wildfires within the drainages of this area. A combination of treatments will ensure the maximum protection of the larger cavity bearing trees and the ultimate establishment of late seral, cavity rich woodlands within these drainages. This will be accomplished with a combination of prescribed fires, herbicide treatments and/or mechanical removal of woody material. Implementation of cool season burns will be restricted to the drainages to minimize undesirable effects of these burns in adjacent upland areas. However, prescribed fire would not take place in this area during the owl breeding season or during the post-breeding dispersal period.

Artificial cavity enhancements will be allowed on a limited basis and where appropriate as determined by staff. However, recruitment of natural cavity sites will be emphasized through resource management actions.

As in many areas of the refuge, the upland areas within the maximum protection area of this zone will be managed to reduce undesired woody plants and promote the establishment and enhancement of grasslands. Warm season prescribed fires will be allowed in these upland areas.

Areas dominated with saguaros will be managed to maintain the current level of abundance.

Any new CFPO locations will be connected to other owl locations via newly designated habitat corridors which will then be incorporated into the cavity nester zone. Use of warm season prescribed fire treatments intended to reduce woody vegetation within drainages of the maximum protection area will be discouraged whenever possible. However, cool season burns may be done in order to protect woody vegetation from being destroyed by wildfire. Prescribed fire crews will attempt to keep fire out of drainages designated as being in the moderate protection area.

BANWR will utilize artificial cavities to help create nesting habitat according to protocols developed by CFPO conservation experts. At the time of this writing, 60 CFPO nest boxes have been installed within refuge boundaries. These artificial nest cavities were installed for experimental purposes to evaluate the effectiveness of this resource management activity.

Baseline data originally acquired at the time of nest box establishment and results from ongoing monitoring efforts will be used to help guide future use of this management technique. These artificial nest boxes were built and placed in accordance with official guidelines and will be protected from fire. If the refuge recommends establishment of additional nest boxes in the future, BANWR will build and install them according to official guidelines and protect them from fire as well.

### *Arivaca Creek Zone*

This zone encompasses the cottonwood/willow/hackberry/velvet ash association riparian vegetation which occurs along Arivaca Creek and open water, marshland and moist soil wetlands which occur in the Arivaca Cienega (see Map 6 of BA). This zone is separate from

the Wetland/Riparian Vegetation Zone described below due to the CCP management unit designation, unique resource management needs, water use issues in the Arivaca watershed, and proximity to adjacent urban and agricultural areas.

**Objective 1:** Restore five miles of the cottonwood/willow riparian community along Arivaca Creek at a rate of a minimum of 40 viable trees per mile over a 10 year period.

BANWR will continue discussions with Arizona Game and Fish Department and other key players regarding periodic water releases from Arivaca Lake. As a stop gap measure, until such time as natural regeneration is initiated, cottonwoods and willows should be planted at certain locations along the creek. These areas are yet to be designated, and will be dependent upon scouting the areas, researching the depth of the water table, and searching for naturally moist locations or areas where water could be artificially provided easily to the plantings.

**Objective 2:** Protect and preserve riparian vegetation along entire length of Arivaca Creek.

BANWR will actively suppress any wildfire occurring on Arivaca Creek. The refuge Fire Management Plan states that all fires on Arivaca Creek will be suppressed.

BANWR will monitor the creek and cienega for signs of hazardous waste/substances and properly remove/dispose of them. Monitoring will also determine if it is necessary to regulate human activity on the creek to prevent harm to natural resources. Harm may include vandalism or habitat damage due to trespass cattle. BANWR will maintain and repair fences to eliminate damage caused by trespass cattle or vehicles and to prevent illegal trespass into closed areas. BANWR will also monitor Arivaca Creek for the presence of exotic plant species, particularly salt cedar, and eliminate them if/when they are found.

**Objective 3:** Create or maintain two areas of open water within the Arivaca Cienega for use by ducks and wading birds and for viewing such birds by the public. The area should constitute less than 4 acres (3.5 percent) of the total acreage of the Cienega and will be appropriate for public viewing of water birds within 2 years.

BANWR will remove cattails in the “viewing pond” and elsewhere as needed. Techniques could include mechanical treatments which may include, but are not limited to, scooping out cattails either manually or with heavy equipment and cutting cattails below the surface of the water. Other treatments which may be used are spraying or wicking with herbicides or prescribed fire followed by flooding.

**Objective 4:** Maintain current acreage of native marshland consisting of 40-70% upright emergent vegetation lacking large amounts of residual vegetation and interspersed with shallow pools and mudflats. Water depths less than 30 cm in depth are preferred.

BANWR will draw down water levels within marsh areas and perform prescribed burns to rejuvenate stands and create openings whenever needed.

**Objective 5:** Maintain current acreage of native sacaton bottomlands in a healthy, vigorous condition.

BANWR will initiate prescribed burns in stands of sacaton during the period from October to May. Soil moisture conditions will be evaluated prior to implementation of prescribed fire treatments to minimize potential impacts to wetland vegetation root systems.

#### *Pronghorn/Grassland Bird Zone*

The habitat or proposed habitat in this area is large areas of open grassland with few shrubs or trees. This zone is either currently being inhabited by pronghorn and grassland birds or, with habitat enhancement activities, would become appropriate for use by these species (see Map 7 of BA).

**Objective 1 (Pronghorn Cover):** Within 10 years, 25% of the zone should have grass cover averaging 15%, shrub cover averaging 10%, tree cover 5% or less, and forb cover ranging between 50-90%.

**Objective 2 (Grassland Bird Cover):** Within 10 years, 25 % of the zone should have open grassland habitat with <35% bare ground, averaging 72% grass cover.

**Objective 3 (Grassland Structure):** Restore or maintain grasslands with low growing vegetation, averaging 25-46 cm and having less than 5% canopy cover of trees. Twenty percent of the zone should have this composition within 10 years.

BANWR will reduce overall mesquite and shrub cover with all means available including but not limited to the use of prescribed fire, woodcutting, commercial charcoal operations, chaining, herbicide, root plow, pasture aerator, roller chopper, and tree shears (Tree Terminator). Implementation of any treatment method will include measures to minimize short term impacts to wildlife and breeding habitats on which they depend. Commercial charcoal operations and wood cutting activities will likely take place during non-breeding time periods for pronghorn antelope and masked bobwhite quail.

Aggressive use of large acreage prescribed fire will take place in the early summer to maximize the reduction of woody plants.

**Objective 4:** Assure distribution of water at intervals of no more than two miles apart throughout the zone.

BANWR will use GIS to map existing stock tanks and look for gaps (areas with inadequate water) within the zone. They will perform any necessary repairs on existing tanks or construct new water features (guzzlers, tanks) as necessary. Where possible and as necessary, tanks will be systematically filled using water tanker trucks and/or whatever means available during the May through June time period. It is critical for the pronghorn to

have available water sources during these pre-monsoon months since this is the hottest and driest time of the year. Additionally, available water sources will help support pronghorn breeding success because mid-May is when peak fawning occurs.

**Objective 5:** Create or restore a minimum of 1 sq km of pronghorn fawn neonatal habitat within 1 km of water sources within 10 years.

BANWR will use GIS to map locations to create or restore neonatal fawn habitat. These habitat improvements will be accomplished using one or more resource management techniques including planting, prescribed fire, disking, aerating, etc. Specific treatment techniques will be determined based on study results and site-specific conditions.

#### *Wetland/Riparian Vegetation Zone*

This zone includes all wetland and riparian vegetation areas throughout the refuge outside the Arivaca Creek zone. Stock tanks present in the refuge represent significant wetland features and encompass the locations where Gila topminnow and Chiricahua leopard frog currently occur, and where the northern Mexican gartersnake could potentially occur. Management actions may include identification of new locations where these species might be introduced, protection from bullfrog predation, and maintenance of permanent open water conditions. Water quality improvements may take place in this zone.

**Objective 1:** Within 10 years, maintain or improve permanent or semi-permanent water conditions in all the refuge stock tanks where the endangered Chiricahua leopard frog and Gila topminnow species occur.

Once Section 404 permits are acquired, earth moving equipment will be used to shore up, deepen, and/or repair degraded earthen impoundments to ensure long-term permanent water conditions essential for rapid species and the northern Mexican gartersnake. This will take place only on stock tanks with degraded or compromised impoundments.

Re-stocking of leopard frogs in any of the permanently flooded stock tank within the refuge may take place to replenish or re-establish populations of this species. This action will increase the distribution of the frogs and help to minimize the possibility of extinction for

this species. Maintenance of perennial water in these tanks will also benefit Mexican gartersnakes.

In addition to the tanks identified in this objective, the refuge will strive to develop and/or maintain an appropriate distribution of tanks with various water regimes as specified in the Draft Chiricahua Leopard Frog Recovery Plan (USFWS 2005). This will include tanks separated at a distance no greater than 1 mile overland, 3 miles along ephemeral drainages, 5 miles along perennial drainages, or some combination thereof. This distribution and density of tanks is necessary to ensure frog dispersal success per FWS guidance. It will also improve the distribution of potential Mexican gartersnake habitat.

Whenever equipment is used and/or management actions take place in the tanks, sanitation procedures specified in Appendix G of the Draft Chiricahua Leopard Frog Recovery Plan (USFWS 2005) will be required to reduce the risk of chytridomycosis fungal infestation. When adjacent upland management actions involving soil disturbance take place, special conservation measures will be implemented to minimize sedimentation into the tanks. These measures include, but are not limited to, construction and/maintenance of silt traps and placement of weed seed free straw bales or sedimentation socks around the tanks to keep soil erosion from entering the open water of the tanks.

**Objective 2:** Reduce bullfrog predation on Chiricahua leopard frogs in all of the tanks identified in Objective 1 within 10 years.

BANWR will eradicate bullfrogs wherever possible and prevent further spread of the species in order to enhance survivorship and viability of northern Mexican gartersnakes, Chiricahua leopard frogs and Gila topminnows. Priority for bullfrog removal will take place on all permanent or semi-permanently flooded tanks on the refuge south of Arivaca Road and north of San Luis wash. Additionally, beneficial effects to leopard frogs and topminnows that occur within the refuge can be achieved with the removal of bullfrogs from strategically located stock tanks located outside the refuge (C. Schwalbe pers.com.). The refuge will therefore support efforts to remove bullfrogs from New Frog tank on Coronado National Forest and Noviyo Tank west of the refuge on Arizona State Trust lands to help circumvent dispersal of bullfrogs.

BANWR will install and maintain bullfrog exclusion barrier fences around selected tanks to limit bullfrog distribution and movements.

BANWR will not actively pursue water developments east of the Pronghorn Zone and south of Arivaca Creek to help reduce threats to leopard frogs and topminnows from bullfrogs. This action is necessary to limit potential staging sites for bullfrogs and help to minimize the distribution and movements of predatory bullfrogs. Any permanent or semi-permanently flooded wetland currently existing in this area of the refuge will receive priority for installation of predator barriers and bullfrog eradications.

**Objective 3:** Within 10 years, repair and/or maintain 60 stock tanks in addition to those identified in Objective 1 in a condition to hold water when adequate precipitation occurs. Field surveys and GIS analyses will be implemented to rank the tanks and prioritize resource management actions needed for repair and habitat enhancement.

Once restoration sites have been identified and prioritized, Nationwide Permit Number 27 “Stream and Wetland Restoration Activities”, issued by the U.S. Army Corps of Engineers, will be used to implement wetland and riparian vegetation management actions. Restoration of these tanks may include use of heavy equipment to repair impoundments, enhance water inlet channels, clean out sediment traps, and increase the water holding capacity. Additional restoration activities may include installation and maintenance of water control structures and the removal of cattails.

Installation of enclosure fences may also take place to protect and/or restore tanks and associated natural resources (i.e. riparian and wetland vegetation). Due to recent resource damage from unauthorized cattle, Carrizo and Carrizo Dam tanks will initially be targeted for this management action. Fences may be installed around an unspecified number of tanks on an as needed basis for resource protection and/or restoration purposes as directed by the refuge manager. In all cases, these fences must be constructed in a ‘wildlife friendly’ fashion, leaving the lower 18” of the fencing open.

**Objective 4:** Restore, improve or maintain 15% of all riparian vegetation and naturally occurring or artificially enhanced wetland features, other than stock tanks, within 10 years.

Specific actions needed to accomplish this objective include the following:

- Identify restoration potential of key wetlands and riparian areas using geospatial and non-geospatial analytical tools and site visits. This will depend, to a large degree, on the use of NWI data described in Goal 1, Objective 3 of this of this HMP zone;
- Maintain or improve wetlands or riparian vegetation in drainages throughout the refuge. Gabion and/or other erosion control measures may be used in these areas to stabilize stream banks;
- Restore the normal hydrologic function of Bailey wash and other tributaries of Aguirre Lake within 5 years;
- Improve water flow and distribution conditions in Mormon Lake, Aguirre Lake and Grebe Pond to ensure the maximum water retention potential; and
- Conduct vegetation management within wetlands including the removal of cattails, Johnson grass and pigweed and the enhancement of desired native wetland vegetation.

Heavy equipment, including large bulldozers, may be used to repair and enhance degraded sections of impoundments and earthen diversion dams. This action will take place mostly in Puertocito and Brawley wash flood plain areas.

Heavy equipment will also be used to repair and/or create spreader dams, restore the natural hydrologic conditions in Bailey Wash, repair degraded Aguirre Lake banks and improve cut banks along streams and washes.

Installation of gabions and other erosion control devices, and implementation of innovative erosion control techniques including, but not limited to, those described by Zeedyk and Jansens (2006) may take place within or in proximity to any drainage on the refuge where severe channel downcutting and habitat degradation has occurred.

Many small areas targeted for wetland restoration will be enhanced using manual labor with minimal dependence on potentially damaging heavy equipment. These may include the streambed rock treatments to minimize erosion and support the establishment of native wetland or riparian plant species.

### *Brown Canyon*

The Madrean Evergreen Woodland (Brown 1982) type habitat is included in this zone. It consists largely of oak, juniper and pine as well as sycamore, hackberry, ash and mesquite. Vegetation is dense brush and cacti, including saguaros, are prevalent. This zone is administratively defined (see Map 8 of BA).

**Objective 1:** Implement pro-active and passive resource management actions to reduce or eliminate deterioration of vegetation, soil, geological or hydrological features within the canyon.

BANWR will periodically remove fuels in the main canyon area especially in the lower elevations to reduce wildfire threats. This may be done with the establishment of fire breaks and by cutting and removing lower limbs of trees which may become ladder fuels in the event of wildfire.

BANWR will implement a phased approach to cool season burns to remove overly dense mimosa, acacia, mesquite woodlands and thickets to reduce wildfire threats. All prescribed fire treatments must include protection for all saguaros, sycamores, most agave plants, potential CFPO nest trees and endangered species (i.e. Kearney's bluestar, lesser long-nosed bat). Wildfire fuel reduction prescribed fires will likely take place in late spring/early summer (April to mid-May) because the best vegetation burn conditions typically occur during this time frame and because hot shot fire crews are available at that time. However, fall/winter wildfire fuel reduction burns are preferred given potential impacts to nesting birds present in the canyon in the spring/early summer. An immediate suppression strategy for wildfires will be implemented.

BANWR will remove feral cows, pigs or other non-native animal species in the canyon either by capturing them or using lethal means for un-catchable individuals. Refuge boundary line fences will be maintained to help control encroachment of non-native mammals. BANWR will immediately eradicate buffelgrass, salt cedar or any other invasive exotic plants detected in the canyon. Annual surveys of exotic vegetation along the main road and hiking trails will take place for this purpose. All places where these species have been discovered will be revisited by refuge staff to ensure eradication status of these exotics.

BANWR will implement road erosion control measures by using appropriate techniques such as placing water slowing structures (straw bales, one rock dams) in road-side ditches, developing retention and diversion structures (i.e. rolling dips, diversion drains and swales and berms), and using appropriate healing techniques such as induced meandering (Zeedyk and Jansens 2006) . A minimum-tool approach will be used for any resource management actions requiring physical disturbance.

BANWR will maintain live-in caretaker staff in the canyon to ensure upkeep of buildings, provide wildfire early detection info, report un-authorized access to the canyon, and to provide public outreach resource education functions.

#### *Refuge-Wide Zone*

This zone encompasses the entire refuge and includes site specific spot resource management actions which may or may not be tied to the management objectives for a specific HMP zone in which these actions take place. Management activities may include general land stewardship actions that prevent or reduce soil erosion and wetland and riparian vegetation degradation, as well as stream/wash reclamation, road maintenance, etc.

**Objective 1:** Reduce soil erosion by restoring 30 acres of eroded land within 10 years.

BANWR will re-vegetate denuded areas, take corrective measures to heal gullies, restore or develop water spreader dams, and reduce down-cutting of wash banks. In highly erodible upland areas that are sparsely vegetated, a pasture aerator will be used to promote water infiltration. Aeration will promote establishment of forbs and grasses already in the seedbank. Additionally, seeding native plants in conjunction with aeration may work to speed up the establishment of native vegetation. BANWR will utilize straw bales, straw log wattles, rock dams, gabions or other methods to slow passage of water in gullies which are beginning to form. Road grading techniques (i.e. rolling dips, diversion drains, creation of swales and berms) will be utilized to prevent gully formation and to conserve water for vegetation and wildlife.

**Objective 2:** Significantly reduce or eliminate several exotic and/or invasive plant species and prevent further establishment.

Species targeted will include, but may not be limited to salt cedar, buffelgrass, Johnson grass, Lehmann's lovegrass, rose Natal grass (*Melinis repens*), velvet mesquite, and pigweed. Buffelgrass and salt cedar, currently present at low levels, will be eradicated within 10 years barring undetected re-establishment. Within 10 years, a minimum of 200 acres of Johnson

grass and 2000 acres of velvet mesquite will be eradicated. Lehmann's lovegrass will be reduced by 500 acres in 10 years. BANWR will use all means available to eliminate or control exotic plants including, but not limited to, the use of prescribed fire, herbicides, mechanized equipment, and biological control techniques. Mesquite abundance and density will be reduced in selected upland areas to levels appropriate for management goals. Integrated approaches may be tried in order to achieve desired results. Such approaches may include planting natives in conjunction with some of the eradication methods in order to provide a competitive advantage over the targeted exotics. Introduction of natural predators of the exotics (such as beetles specialized to feed upon certain exotics) may also be used to achieve this strategy. Prior to the release of any bio-control species, potential effects to focal and listed species will be evaluated and addressed.

**Objective 3:** Reclaim lands occupied by structures previously used for, but no longer needed, as human habitation or refuge infrastructure. Demolish unnecessary buildings, remove or modify fences, and restore habitat to appropriate native vegetation within 10 years.

BANWR will identify all structures which will not be needed for housing, storage, maintenance facility, or other official usage. As money and time become available, such structures will be demolished and the debris moved off-site to an appropriate land fill. The site will then be rehabilitated by removing any non-native plants and shrubs and restoring native vegetation. Because bats often use old buildings and other structures as day and night roost sites, lesser long-nosed and Mexican long-tongued bat surveys will be implemented prior to the removal of any structure to ensure adequate protections for these species.

BANWR will use volunteers, hunters, conservation organizations, interns, youth program enrollees or cooperative education student labor to remove or modify fences. Given the importance fence removal to pronghorn management, priority for the removal and modification of fences will take place in the pronghorn/grassland bird zone. Most interior refuge fences can be entirely removed. The fences bordering the highways can have lower wires removed or raised or replaced with non-barbed wire at least 18 inches above ground level. The fence along Garcia Road is an important fence to keep intact for the exclusion of trespass Mexican cattle. However, modifications to this fence could be made such as replacing the bottom strand of barbed wire with smooth wire placed 18 inches above ground.

**Objective 4:** Experiment with various habitat treatments to determine the most appropriate techniques for use on the refuge.

BANWR will encourage the design of research experiments which would test effects of grazing in appropriate areas, browsing, various herbicides, mechanical removal, aeration, disking, planting of natives, prescribed fire and various combinations of the above to determine effective ways of controlling velvet mesquite and Lehmann's lovegrass. Timing of experimental treatment should vary so that the best time during the year to achieve the desired results can be determined.

**Objective 5:** Maintain roadsides in a mowed condition following the breeding season for most wildlife.

BANWR will identify roads which have either high vehicular traffic or high incidence of wildlife and moderate vehicular traffic. After October 1 of each year, the Refuge will mow roadsides meeting these criteria in order to increase visibility to eliminate or help to prevent vehicle-wildlife collisions. Small trees or overhanging limbs, which can hide wildlife near the roadsides, will be removed.

**Objective 6:** Reduce the attraction of wildlife to roadsides.

BANWR will encourage research and/or conduct small trials to determine usage of various seed mixes by wildlife. In particular, BANWR will determine whether mule and white-tailed deer, javelina, quail and doves may prefer a particular mix. If possible, mixes which are not exceptionally palatable to wildlife species should be considered for planting along roadsides to prevent collision mortalities. If feasible, consider other alternatives to roadside plantings such as gravel, asphalt or other coverings or placement of erosion-control structures. BANWR will utilize plantings/seedlings of palatable species in the interior of the refuge in order to draw animals away from the roadsides.

**Objective 7:** Minimize the extent to which fire may affect wildlife during the critical time of nesting, birthing, and neonatal care.

As a general rule, a limit of approximately 9,000 acres or less would be burned annually during the critical April 1-September 30 time frame to minimize short-term impacts to habitats for many organisms inhabiting these areas during their breeding season. This acreage amount represents 10% of the valley physiognomic region of the refuge and is an acceptable level of impact given the long-term potential benefits these burns may present. In certain zones (i.e. pronghorn/grassland bird, masked bobwhite) it will be appropriate to further limit acreage, adjust timing, or eliminate fire completely during breeding/neonatal rearing or other time frames specific to the individual target species (see individual zone discussions in the BA). For the entire year, a maximum of approximately 14,000 acres could be burned, including the 9,000 acre spring/summer limit. All annual burn acreage limits described here include the combined total of both prescribed burn treatments and wildfires.

Prescribed fire treatments will be applied within existing burn unit boundaries where adjacent prescribed fire has not occurred during a given year to ensure establishment of a broad-scale mosaic of this treatment. Furthermore, within burn units mosaics will be encouraged by the use of point source or hand ignition techniques. This fire strategy will spread out the short-term negative impacts to wildlife and help to establish beneficial edge effects over a greater landscape area. Burning of very large contiguous areas (i.e. burn units greater than 2,000 acres) will be discouraged for these reasons.

Prescribed fire acreages will ultimately be adjusted up or down depending on the results of fire effects monitoring relative to the achievement of desired vegetation effects. Acreages and locations of burns will likely be adjusted as more information is obtained on specific

locations used by individual species for production and rearing of offspring. The effects of fire on listed species has been and will be evaluated and addressed in BANWR's Fire Management Plan and not in this document.

Mechanical means of vegetation control and use of herbicides will be employed as an alternative or a supplement to prescribed fire.

**Objective 8:** Repair and/or maintain all existing wells and water storage tanks on the refuge and construct more as deemed necessary.

BANWR will test each well for water production capability. GIS will be used to map wells on refuge maps to identify gaps in water availability. BANWR will assess functionality of wells to provide water to various refuge sites.

**Objective 9:** Construct wildlife drinkers/waterers and new stock tanks in locations wherever needed. Repair of existing stock tanks is addressed in the wetland and riparian zone discussion.

Using the refuge GIS database, the BANWR will examine the locations of existing stock tanks, water catchments, above-ground tanks, etc. Depending on the spacing desired, BANWR will identify areas devoid of water sources and plan appropriate construction. Construction would involve use of heavy equipment to dig out basins for water catchments and guzzlers and scoop up dirt to provide berms around the basin of new stock tanks. In addition, waterways and sediment traps may need to be constructed. Placement of culverts to allow for flow of water between sediment traps and stock tanks is standard. In the case of water catchments, an apron of metal is usually placed on the ground to collect water which then flows into an underground storage tank. If the design allows, predator exclusion devices would be installed.

**Objective 10:** Construct or re-construct piped water delivery system to provide water for wildlife.

BANWR will pipe water to drinkers requiring an additional water source. This will require laying the pipe underground. Currently, the location of such a system has not been identified or planned. The now defunct ranch system had a series of pipes running from refuge headquarters to Arivaca Rd. and from Figueroa Spring to an above-ground storage tank on Arivaca Rd. northward and may be able to be restored. The locations will be dependent upon refuge objectives and needs.

**Objective 11:** Construct irrigation systems, as needed, to water food plots and irrigate native vegetation or individual plantings.

While the location of the irrigation system has not been determined, the objective is the connection of water pipes to a delivery system. In the case of drip irrigation, typically an above-ground water tube with offshoot tubing delivers the water to its destination. With

traveling or pivot type irrigation, metal piping from the water source will be attached to the sprinklers to deliver the water.

### Zone Overlap Areas

It is important to note that there is a considerable amount of acreage within the refuge where two or more zones overlap (see Map 9 and Table 4 in the BA) and conflicts in management strategies may occur. Conflicts within these overlap areas will be resolved in different ways. In most cases, all resources will be able to be accommodated without any negative impacts to non-targeted focal species. In other cases, compromises in management strategies may be required. In the most extreme cases, one zone may need to take priority over another zone when focal species require extensive measures to insure their survival. In all cases, when management needs conflict, the masked bobwhite zone and necessary habitat management strategies will be given priority.

In overlap areas outside the masked bobwhite zone, management strategies will be evaluated on a case-by-case site-specific basis. This approach will be necessary to determine which combination of resource management actions are required to ensure a maximum benefit for targeted focal species concerned. No management actions will be allowed in these areas if such actions would potentially harm any of the non-targeted focal species.

### **Conservation Measures**

The following measures will be taken by the BANWR as part of the action to reduce adverse impacts to and conserve listed species:

#### Pima Pineapple Cactus

Surveys will be done for PPCs prior to implementation of ground disturbance and fire-related actions. Surveys will be within the suitable (formerly high or medium probability of occurrence) area as shown on the Buenos Aires National Wildlife Refuge Pima Pineapple Cactus Predictive Model map (see HMP Map 4)). All PPCs will have the standard data collected, UTM coordinates will be obtained, cacti will be assigned a unique identifier, and the location will be marked both with flagging surrounding the cactus and with a row of rocks pointing north from each cactus. Prior to treating the area, a 1 ft. to 11 ft radius will be cleared around each cactus as needed. This is typically done by mowing the grass and weeds in a doughnut-shaped ring.

To protect against possible effects from mechanical treatment and to provide for a control area for comparison with mechanically treated areas, a Maximum Protection Area in the northern part of the refuge will be established. Within this area, prescribed fire will be allowed, but no mechanical treatments will be done. Known PPC locations in the area of mechanical or other non-fire HMP actions will be identified and protected.

### Kearney's Bluestar

In advance of any proposed action within the vicinity of Kearney's bluestar plants, each known plant will be evaluated to determine the treatment needed to protect it from effects of prescribed fire or any mechanical actions. A buffer of 50 feet will be established around individual plants or groups of plants. Clearing around individual plants may be needed, manual weeding (if exotic invasion occurs) might be required, or blocks of habitat containing bluestar may need to be protected by firebreak or other means. Supplemental information provided by BANWR indicated that locations and Kearney's bluestar are known and will be avoided by any HMP actions. In most cases, HMP actions will occur in areas unoccupied by Kearney's bluestar.

### Masked Bobwhite Quail

Surveys throughout the refuge will be done during the summer monsoon season. This will detect calling males indicating habitat occupation. In addition, during surveys for Pima pineapple cacti, sightings of masked bobwhite will be noted, providing an additional source of information.

Generally, mechanical disturbance will be small scale and compatible with persistence of quail coveys using the area. In the event of planned large scale disturbance (prescribed fire, primarily, but possibly mechanical or other), presence of quail will be determined and if present, potential effects mitigated by providing for the retention of a mosaic of habitat.

If nesting activity is detected within the proposed action area, measures will be taken to minimize impact. The action may be postponed until there is a reasonable likelihood that chicks have hatched and are mobile; the area of the nesting activity will be excluded from the proposed activity area by use of natural dividing lines (washes, roads) or constructed fire breaks; the activity will be cancelled for that particular year; or a protective area around the nest will be established with a broad connection to an adjoining untreated area. As a general rule, potentially harmful mechanical or fire treatments would not be implemented during the July-September breeding/nesting season. If birds are believed to be within a unit and conditions are appropriate for a spring nesting season (good rainfall, presence of abundant forbs), then prescribed fire would not be implemented during the normal May-June burn season. Mechanical treatment of very limited scale and duration could be done, however, with extreme caution, surveying for nests in advance of the equipment.

### Southwest Willow Flycatcher and Western Yellow-billed Cuckoo

While no surveys are planned for these species, protection measures will be implemented for the riparian habitat in the Arivaca Creek drainage and Brown Canyon which will benefit these species. These measures will consist of protection for the riparian zone, to the extent possible. This will include fire suppression, protection of sensitive riparian tree species from effects of any prescribed burns (by exclusion), recreation management, and protection of riparian areas during any mechanical treatments or herbicidal applications.

### Lesser Long-nosed Bat

Located primarily in the Brown Canyon area of the refuge, this species feeds primarily on the nectar of agaves and saguaro cacti. Conservation measures intended to ameliorate or prevent effects of any of the proposed actions will include maintenance of a habitat mosaic in any large-scale action (such as prescribed fire). BANWR's objective is to impact no more than 20% of the existing agaves and to protect all known saguaros (by clearing around them primarily), thus retaining adequate lesser long-nosed bat foraging habitat.

### Jaguar

No conservation measures are planned for jaguars due to their large home range size and apparent infrequent occupancy of the refuge. It is difficult to implement some sort of measure to ameliorate the effects of actions when it is not clear where or if a jaguar is present. All actions within the HMP should provide benefits to jaguars through maintenance of a healthy, diverse landscape.

### Gila Topminnow/ Chiricahua Leopard Frog

In areas where either the topminnow or leopard frog exist, soil disturbing activities will not occur within 30 m of the tank, the immediate area where flow from rainwater may enter the tank and cause silt and debris to be deposited. If the disturbance activity is highly desirable for the benefit of another species, then straw wattle, weed-free straw bales or straw logs (or other similar materials) will be used to intercept the debris and silt which might otherwise enter the tank. Each tank will be assessed individually and treated accordingly.

For tanks occurring within an area being treated with prescribed fire, debris-intercepting material, such as described above, will be installed prior to any rain event to intercept the flow of soot and ash into the pond.

Occasionally, disturbance within stock tanks and waters may be needed (cattail removal, etc.). In this case, a minimum tool strategy will be used (either manual digging or machinery), and work should be done during the active season (water temperature >14 deg. C) so that frogs, toads, snakes, and fish can escape the action to the best of their ability per FWS guidance.

Herbicides will not be applied to topminnow or leopard frog areas where they can wash into the tanks. If non-native invasive vegetation becomes established on the shoreline of one of these ponds, experts will be consulted prior to any treatment and consultation may need to be reinitiated at that point.

New stock tanks and other water sources may be developed to contribute to Chiricahua leopard frog and Gila topminnow conservation. In addition, bullfrog management will continue on BANWR. Chiricahua leopard frogs and Gila topminnow may also be reintroduced or established at appropriate locations on BANWR.

### Mexican Spotted Owl

Surveys for this species were conducted in 2008 and 2009. This species has not yet been found on the refuge, and no other specific conservation measures are planned at this time. Actions within the HMP should benefit the Mexican Spotted Owl through the establishment and maintenance of a healthy, functioning landscape.

### Northern Mexican Garter Snake

The Mexican gartersnake became a candidate species on November 25, 2008 and its consideration as a species of concern is relatively new on the BANWR. Its existence on the refuge at the Arivaca Cienega and elsewhere, may present an array of issues considering the high degree of public use, the maintenance of open water areas containing bullfrogs and fish, and the perceived inability or difficulty in controlling the non-natives which threaten the species. There are high numbers of bullfrogs at the Arivaca Cienega and in Arivaca Creek, and bullfrogs are likely predators on Mexican gartersnakes. The BANWR will implement bullfrog control in these areas. It will be impossible to achieve complete bullfrog control or removal, but regular management will occur. In the past, bullfrog gigging by the public was allowed. This action will be considered again as a tool to implement bullfrog control. Additionally, BANWR staff and volunteers, seasonal employees, and other partners may be used to reduce bullfrog numbers.

### Implementation and Monitoring Plan

BANWR has committed to developing and implementing an Inventory and Monitoring Plan related to the HMP. This plan will be developed in 2010 and will direct the monitoring of species and habitats affected by the implementation of the HMP. Results of the inventory and monitoring will be used to inform adaptive management to improve the effectiveness of the HMP.

## STATUS OF THE SPECIES

### Pima Pineapple Cactus

The pineapple cactus was listed as endangered on September 23, 1993 (58 FR 49875). The rule became effective on October 25, 1993, and critical habitat was not designated at that time. Factors that contributed to the listing include habitat loss and degradation, habitat modification and fragmentation, limited geographic distribution and species rareness, illegal collection, and difficulties in protecting areas large enough to maintain functioning populations.

Generally, the Pima pineapple cactus grows on gentle slopes of less than 10 percent and along the tops (upland areas) of alluvial bajadas nearest to the basins coming down from steep rocky slopes. The plant is found at elevations between 2,360 ft. and 4,700 ft. (Phillips *et al.* 1981, Benson 1982, Ecosphere 1992), in vegetation characterized as either or as combination of the Arizona upland of the Sonoran Desert scrub and semidesert grasslands

(Brown 1982).

Densities range between 0.05-3 plants per acre. Pima pineapple cactus is known to occur in 50 townships within its U.S. range. However, a considerable amount of land area within the range boundaries does not provide habitat for the species due to elevation, topography, hydrology, plant community type, and human impacts. To date, an estimated 56,730 acres, or 10 to 20 percent of the U.S. range, have been surveyed. Not all of this area has been intensively surveyed; some has only been partially surveyed using small land blocks to estimate densities rather than 100 percent ground surveys. A conservative estimate of total cacti located to date would be approximately 4,000 individuals. The majority of those were located after 1991.

It is important to clarify that the above number represents the total number of locations ever found and not the current population size. It would be impossible to estimate densities over the remaining unsurveyed area because of the clumped and widely dispersed pattern of distribution of this species. Of the approximately 4,000 individuals recorded to date, 2,212 (55 percent) of them have been removed. This number includes observed and authorized mortalities and individuals transplanted since the species was listed in 1993. A small portion of these mortalities was caused by natural factors (e.g., drought). Moreover, this figure does not take into account those cacti that are removed from private land or lost to other projects that have not undergone section 7 reviews.

Habitat fragmentation and isolation may be an important factor limiting future seed set of this cactus. Recent data show that the species cannot successfully self pollinate *in situ* and is reliant on invertebrate pollinators. One hypothesis is that the spatial distribution pattern of individual Pima pineapple cacti within a given area may regulate pollinator visitations, thus affecting successful cross-pollination and subsequent seed set over the population (Roller 1996). If the pollinators are small insects with limited ability to fly over large distances, habitat fragmentation may contribute to a decrease in pollinator effectiveness with a subsequent decrease in seed set and recruitment.

Extrapolations from 1992-1997 surveys of known Pima pineapple cactus locations suggest that the cactus may be more numerous than previously thought. Projections based only on known individuals may underestimate the total number of individuals. This estimate in no way indicates that the cactus is not rare or endangered. Pima pineapple cactus is widely dispersed in very small clusters across land areas well-suited for residential, commercial, or mining development. Field observations suggest that a great deal of land area within the range boundaries would not support Pima pineapple cactus today due to historical human impacts. Thus, populations are already considerably isolated from each other in many portions of the range, and population size and apparent recruitment varies significantly across the range. On a more local scale, population variability may relate to habitat development, modification, and/or other environmental factors such as slope, vegetation, pollinators, and dispersal mechanisms.

The transition zone between the two regions of vegetation described by Brown (1982) as semidesert grassland and Sonoran Desert scrub contains denser populations, better recruitment, and individuals exhibiting greater plant vigor. Vegetation within this transition zone is dominated by mid-sized mesquite trees, half shrubs (snakeweed, burroweed, and desert zinnia), and patches of native grass and scattered succulents. Because populations are healthier in this transition zone, conservation within these areas is very important (Roller and Halvorson 1997). However, this important habitat type is not uniformly distributed throughout the plant's range. Populations of Pima pineapple cacti are patchy, widely dispersed, and highly variable in density. The higher population densities have only been documented at three sites. Compared to other surveys, two of these sites are very small in scale and range from 1-3 plants per acre. Other densities across the majority of the plant's range vary between one plant per 4.6 acres and one plant per 21 acres (Mills 1991, Ecosphere 1992, Roller 1996).

The cactus has continued to experience declines throughout most of its range because of the loss of habitat and individuals due to residential and commercial development in the Santa Cruz River Valley, the lands south of Tucson and along the corridor north and south of State Route 86. The Altar Valley has not seen the development pressures that have been seen in the rest of this species' range, and the majority of the habitat in this valley remains intact. Surveys related to prescribed fire projects and research activities have continued to provide information on the status of this species in this part of its range. Most of the documented habitat loss has occurred south of Tucson through the Santa Cruz Valley to the town of Amado. This area is critical for the future recovery of the species. The expansion of urban centers, human population, and mining activities will continue to eliminate habitat and individuals, and result in habitat fragmentation.

The protection of habitat and individuals is complicated by the varying land ownership within the range of this species. An estimated 10 percent of the potential habitat for pineapple cacti is held in Federal ownership. The remaining 90 percent is on Tribal, State, and private lands. Most of the federally owned land is either at the edge of the plant's range or in scattered parcels. The largest contiguous piece of federally owned land is the Buenos Aires National Wildlife Refuge, located at the southwestern edge of the plant's range at higher elevations and lower plant densities. Based on surveys and habitat analysis, areas south of Tucson through the Santa Cruz Valley to the town of Amado and surrounding developed parts of Green Valley and Sahuarita, and parts of the San Xavier District of the Tohono O'odham Nation, appear to support abundant populations and some recruitment, and units of extensive habitat still remain. However, the primary threat to the status of this species throughout its range is the accelerated rate (i.e., since 1993) at which much of the prime habitat is being developed, fragmented, or modified.

Based on current knowledge, urbanization, farm and crop development, and exotic species invasion alter the landscape in a manner that would be nearly irreversible in terms of supporting pineapple cactus populations. Prescribed fire can have a negative effect on pineapple cactus if not planned properly. Other specific threats that have been previously documented (58 FR 49875), such as overgrazing and mining, have not yet been analyzed to determine the extent of effects to this species. However, partial information exists. Mining

has resulted in the loss of hundreds, if not thousands, of acres of potential habitat throughout the range of the plant. Much of the mining activity has been occurring in the Green Valley area, which is the center of the plant's distribution and the area known to support the highest densities of pineapple cactus. Overgrazing by livestock, illegal plant collection, and fire-related interactions involving exotic Lehmann lovegrass (*Eragrostis lehmanniana*) may also negatively affect pineapple cactus populations (58 FR 49875).

Even with complete data on historical change related to pineapple cactus distribution and abundance, we cannot reliably predict population status due to compounding factors such as climate change, urbanization, and legal and political complexities (McPherson 1995). We do not know if the majority of populations of pineapple cacti can be sustainable under current reduced and fragmented conditions. Thus, there is a need to gather information on limits to the plant's distribution under current habitat conditions.

In summary, monitoring has shown that the range-wide status of the pineapple cactus appears to have been recently affected by threats that have completely altered or considerably modified more than a third of the species' surveyed habitat, and have caused the elimination of nearly 60 percent of documented locations. Dispersed, patchy clusters of individuals are becoming increasingly isolated as urban development, mining, and other commercial activities continue to detrimentally impact the habitat. The remaining habitat also is subject to degradation or modification from current land-management practices, increased recreational use on lands when adjacent to urban expansion (i.e., off-road vehicle use and illegal collection), and the continuing aggressive spread of nonnative grasses into pineapple cactus habitat. Habitat fragmentation and degradation will likely continue into the foreseeable future based on historical data and growth projections produced by the Pima County Association of Governments (1996). There is very little Federal oversight on conservation measures that would protect or recover the majority of the potential habitat. Even some areas where section 7 consultations have been completed have been modified and may not be able to support viable populations of the pineapple cactus over the long-term.

The current status of the species and biological information are documented in the Altar Valley Fire Management Plan BO (USFWS 2008a), is applicable to this consultation, and is included here by reference. Our records indicate that, range wide, 38 formal consultations have been completed for actions affecting Pima pineapple cactus. The majority of these opinions concerned the effects of development (approximately 38 percent), utility infrastructure (approximately 15 percent), prescribed fire plans (approximately 12 percent), and roads and bridges (approximately 8 percent). The remaining 42 percent of consultations dealt with grazing, mining, and agency planning issues.

### Masked Bobwhite

We listed the masked bobwhite as endangered with the original passage of the Endangered Species Conservation Act of 1969 (Public Law 91-135; 83 Stat.275). Shortly after specimens were first collected in 1884, masked bobwhites were essentially extirpated from

Arizona (and the United States) by 1900. In the U.S., the species was generally associated with the Santa Cruz and Altar valleys of southeastern Arizona (USFWS 1995). Critical habitat is not designated for this species. A recovery plan for the masked bobwhite exists and has been revised several times (USFWS 1995).

Biological information on masked bobwhite is summarized in the 2004 BO BANWR FMP (USFWS 2004) and in the recovery plan for this species (USFWS 1995) and is incorporated here by reference. The known populations of masked bobwhite have shown a significant decline in recent years. Survey efforts in Mexico have located a few individuals in recent years, but no coveys have been located. In the United States, masked bobwhite had been found primarily on the BANWR and ranchlands immediately adjacent to the BANWR. Several observations in the north end of the Altar Valley have been made along SR 286. Detections during summer call-count surveys have declined in recent years.

The only formal Section 7 consultations on masked bobwhite are on the BANWR Fire Management Plans. This species has been included in several informal consultations related to the BANWR's Comprehensive Conservation Plan, Altar Valley Fire Management Plan, and various masked bobwhite related management actions.

#### Northern Mexican Gartersnake

This species occurs up to about 8,500 feet in elevation, but is most frequently found between 3,000 and 5,000 ft. The Mexican gartersnake uses three general habitat types in Arizona: 1) source area ponds and cienegas; 2) lowland river riparian forests and woodlands; and 3) upland stream gallery forests. This species uses densely vegetated cienegas, cienega-streams, and stock tanks in the southern part of its distribution in Mexico and within its historical distribution in New Mexico.

An important component of suitable Mexican gartersnake habitat is a stable native prey base. The Mexican gartersnake is surface-active at ambient temperatures ranging from 71° F to 91° F and forages along the banks of waterbodies feeding primarily upon native fish (e.g. Gila topminnow, desert pupfish, etc.) and adult and larval native ranid frogs (e.g. lowland leopard frog, Chiricahua leopard frog, etc.). It may also supplement its diet with earthworms and vertebrates such as lizards, small rodents, salamanders, and hylid frogs (treefrogs). In some populations, adult Mexican gartersnakes will prey upon juvenile nonnative bullfrogs and/or bullfrog tadpoles where they co-occur.

The Mexican gartersnakes' historical distribution in the U.S. included the Santa Cruz, San Pedro, Colorado, Gila, Salt, Agua Fria, Rio Yaqui, and Verde river watersheds in Arizona, in addition to the upper Gila and San Francisco headwater streams in western Grant and Hidalgo counties in New Mexico. Within Mexico, Mexican gartersnakes historically occurred within the Sierra Madre Occidental and the Mexican Plateau in the Mexican states of Sonora, Chihuahua, Durango, Coahila, Zacatecas, Guanajuato, Nayarit, Hidalgo, Jalisco, San Luis Potosí, Aguascalientes, Tlaxacala, Puebla, México, Michoacán, Oaxaca, Veracruz, and Querétaro.

The Mexican gartersnake is likely extirpated from New Mexico. In Arizona, its distribution has been reduced to less than ten percent of its former range along large mainstem rivers. The species is considered likely extant in fragmented populations within the middle/upper Verde River drainage, middle/lower Tonto Creek, and the Cienega Creek drainage, as well as in a small number of isolated wetland habitats in southeastern Arizona. The species' current distribution in Mexico is uncertain.

Current threats to the Mexican gartersnake include: 1) destruction and modification of its habitat; 2) predation from nonnative bullfrogs; 3) significant reductions in its native prey base from predation/competition associations with nonnative species; and 4) genetic effects from fragmentation of populations caused by items 1-3 (Hendrickson and Minckley 1984, Rosen and Schwalbe 1988, Arizona Game and Fish Department 2001).

The FWS received a petition to list the Mexican gartersnake in December of 2003. A 90-day finding on the petition was published in the Federal Register on January 4, 2006. It found that adequate information was presented in the petition indicating that listing may be warranted and a 12-month status review was initiated. An initial 12-month finding was published on September 26, 2006, indicating that listing was not warranted due to a lack of information. Due to the issuance of an applicable Solicitor's opinion in 2007, the 2006 12-month finding was withdrawn by the FWS and a new status review initiated in December of 2007. On November 25, 2008, a new 12-month finding was published in the Federal Register indicating that listing of the Mexican gartersnake was warranted, but precluded by other higher-priority listing actions. The Mexican gartersnake was placed on the candidate species list, awaiting adequate resources to complete the listing rule.

## ENVIRONMENTAL BASELINE

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

### **Description of the Action Area**

BANWR is 117,345 acres located in the Altar Valley of Pima County, Arizona. Headquarters is approximately 8 miles northeast of Sasabe, Arizona and 18 miles southwest of Arivaca, Arizona. The project area encompasses the entire Buenos Aires National Wildlife Refuge. The zones are described in the HMP document and are shown on Maps 3-8 in the HMP, and are incorporated herein by reference.

The bulk of the refuge is comprised of Sonoran savannah grassland dominated by Lehmann's lovegrass (*Eragrostis lehmaniana*), velvet mesquite (*Prosopis velutina*), desert broom

(*Baccharis sarathroides*), catclaw acacia (*Acacia greggii*) and numerous native grass and forb species. This vegetation type is found in the valley floor (Altar Valley) and surrounding hills.

Brown Canyon is located in the northwest portion of the refuge. In the upper reaches of the canyon the vegetation falls within the Sierra Madrean Woodland vegetation community. Vegetation consists of oaks (*Quercus* spp), border pinyon (*Pinus discolor*), alligator juniper (*Juniperus deppeana*), velvet mesquite (*Prosopis velutina*), catclaw acacia (*Acacia greggii*), and *Mimosa* spp. Ocotillos (*Fouquieria splendens*) and saguaros (*Carnegiea gigantea*) dot the landscape as do Palmer agave (*Agave palmeri*) and shindagger (*Agave schottii*). A narrow riparian zone lies within the canyon bottom. The dominant trees here are Arizona sycamore (*Platanus wrightii*) and Arizona walnut (*Juglans major*). Hackberry (*Celtis* spp.) is also common here, as is *Baccharis salicifolia*. At the lower end of the canyon, where it flattens out within the foothills, the habitat become more like Sonoran savannah grassland with various species of native grasses interspersed with velvet mesquite in the uplands.

On the eastern side of the refuge lies Arivaca Creek and Arivaca Cienega. The creek is dominated by Fremont poplar (*Populus fremontii*), Gooding's willow (*Salix gooddingii*), and velvet ash (*Fraxinus velutina*). In the Cienega, the riparian opens up into marshland populated with cattails (*Typha* spp.), and sacaton (*Sporobolus wrightii*).

Current management activities on the project area include the normal range of refuge activities such as prescribed burning, road and trail maintenance, building maintenance, environmental education, captive breeding and reestablishment of endangered species and habitat restoration.

#### **A. Status of the species within the action area**

##### Pima Pineapple Cactus

The status of pineapple cactus through 2004 was described in the 2005 BO BANWR FMP (USFWS 2005c), in the 2004 BO BANWR FMP (USFWS 2004), and in the 2002 BO BANWR FMP (USFWS 2002). The BANWR implemented the prescribed burns from 2005 to 2008 as proposed in the 2005 BO (USFWS 2005c). Since 2004, complete surveys of high and medium quality habitat in BUs were completed prior to prescribe burning. A total of 248 new Pima pineapple cacti were found during 2,251 person hours of pre-burn and post-burn surveys. Several of these new locations were used to refine the GIS-based habitat model which is being used to identify habitat on or adjacent to the Refuge. Post-burn monitoring of 193 individuals in the BUs, documented four pineapple cactus killed due to fire and 46 killed through non-fire related effects. The construction of the border barriers have resulted in the loss of 52 acres of potential habitat, and the placement of seven observation towers will result in the loss of another 4.8 acres of potential Pima pineapple cactus habitat within the action area. A total of 485 Pima pineapple cactus locations are known on the Refuge (see Table 1 of BO).

Wildland fires generally occur in the Altar Valley as a result of natural ignition and human causes – primarily associated with the Highway 286 and fires started by illegal immigrants to either stay warm or signal for help. On the BANWR, these sources of ignition have resulted in approximately 215,600 acres burned in the past 10 years.

The full impact of drought and climate change on PPC has yet to be studied, but it is likely that, if recruitment occurs in punctuated events based on precipitation and temperature (Baker 2006), PPC will be negatively affected by these forces.

Pima pineapple cacti are fairly widespread across the refuge on relatively flat ground, especially on the alluvial outwash plains bordering the larger washes. A model was developed in 2002 which is 89% accurate in predicting occurrence. We use this model to guide our search effort which is done prior to our prescribed burns. Each year hundreds of person hours are spent surveying for this species. A total of 485 cacti have been found on the refuge, and 328 of those are currently alive.

### Masked Bobwhite

Masked bobwhites are native to southern Arizona and Sonora, Mexico. Extirpated from the United States by the early 1900s, BANWR was established for the purpose of re-establishment of the species. Since the BANWR was established, the reintroduced individuals on the BANWR made up the only known population of masked bobwhite in the United States. Since the refuge began in 1985, over 21,000 birds have been released. In 2004, due to a small but persistent population present on the refuge, releases were suspended to evaluate the sustainability of this small group of birds. Two years of prolonged drought ensued, and the population almost completely disappeared. The population has been monitored continually using summer call counts. The population on the BANWR appeared to be increasing through 2005, but then crashed shortly after the captive release program was suspended. Despite extensive surveys every year, few detections have been made recently, and it appears that the bird is nearly extirpated in the wild on the refuge. A captive population remains in a propagation facility housed in Arivaca, and releases are planned for the near future. Efforts are being made to establish a second captive population in Mexico.

The construction of the border barriers have resulted in the loss of 52 acres of potential habitat, and the placement of seven observation towers will result in the loss of another 4.8 acres of potential masked bobwhite habitat within the action area. Two unconfirmed observations have occurred in Triangle and Secundino BUs in the past 6 months. Table 2 of this BO summarizes the summer call count data on the BANWR and makes note of anecdotal observations.

### Northern Mexican Gartersnake

Little is known regarding the status of the Mexican gartersnake on BANWR. No survey or research efforts have specifically targeted this species. There is one incidental record of the northern Mexican garter snake from Arivaca Cienega (Rosen, pers.com.). Habitat for the

Mexican gartersnake does exist on BANWR in those areas where a permanent water source exists. These areas include Arivaca Cienega and Creek, as well as various stock tanks and frog ponds found on BANWR.

## **B. Factors affecting species environment within the action area**

### Pima Pineapple Cactus

Factors affecting pineapple cactus in the action area are documented in our 2009 BO BANWR FMP (USFWS 2009), 2005 BO BANWR FMP (USFWS 2005c), 2004 BO BANWR FMP (USFWS 2004), and the 2002 BO BANWR FMP (USFWS 2002); and are included here by reference. The only change has been the construction and operation of the international border protection infrastructure. This includes vehicle and pedestrian barriers along the south end of the Altar Valley and the installation and operation of electronic observation towers. These barriers have resulted in a relatively recent decrease in illegal immigration and drug smuggling activities moving north from the border through the BANWR. The actions of the U.S. Border Patrol have also decreased on the BANWR in response.

### Masked Bobwhite

The factors affecting masked bobwhite on the BANWR were documented in the 2009 BO BANWR FMP (USFWS 2009), 2004 BO BANWR FMP (USFWS 2004) and are incorporated here by reference. Drought and small population size seem to be the largest factors effecting masked bobwhite on the BANWR. Detections of individuals and coveys on the BANWR were increasing through 2005, and apparently the population crashed in response to the poor precipitation during the period of 2006-2007. The population has not rebounded, probably due to the existing population not being large enough to rebound and the reduced quality of habitat found on the BANWR. The only change in factors affecting the species' environment has been a relatively recent decrease in illegal immigration and drug smuggling activities moving north from the border through the BANWR. The actions of the U.S. Border Patrol have also decreased on the BANWR in response. A Masked Bobwhite Recovery Team was formed, and they are providing input on the conservation and management of the masked bobwhite on the BANWR.

### Northern Mexican Gartersnake

Threats to this species are from invasion of exotic predators, primarily bullfrogs, into tanks and waterways within the BANWR. Loss of aquatic habitats due to drought is also a significant factor affecting this species within the action area. Actions implemented by BANWR for other species have also likely benefitted the Mexican gartersnake. In order to conserve the metapopulation of leopard frogs, the BANWR has dug a well and installed a solar pump at Garcia Tank in order to provide reliable permanent water. Arivaca Cienega, as well as Carpenter, State, Rock Tanks, and the headquarters holding pond (artificially filled) are permanent water sources that potentially benefit the Mexican gartersnake, but are affected to varying degrees by bullfrogs and drought. BANWR has worked with a number of

partners, including the University of Arizona, to remove bullfrogs from several tanks, potentially benefitting the Mexican gartersnake. The effects of increased immigration and Border Patrol activities have probably had little impact on Mexican gartersnakes because suitable habitats are relatively large and the potential for impacts from immigrants (undocumented aliens) drinking or walking in the water are insignificant. The use of Mexican gartersnake habitat for bathing and personal hygiene may result in some decrease in water quality, but effects of this type have not been studied or documented. Management of Arivaca Cienega to provide a diversity of open-water and emergent cover may promote the persistence or expansion of bullfrog numbers at this site, potentially affecting Mexican gartersnakes. However, BANWR and their partners continue to implement bullfrog management and control in the action area.

## EFFECTS OF THE ACTION

Effects of the action means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

### Pima Pineapple Cactus

Fire will be used as a tool to implement the HMP. Wildfire and prescribed burning can have significant negative effects on Pima pineapple cacti, despite the benefits of fire in establishing a functioning grassland ecosystem. Implementation of fire-related actions in the HMP will be consistent with actions outlined in the existing BANWR FMP and any future revisions. Therefore, the effects of fire on the Pima pineapple cactus from implementing the HMP have been and will be evaluated and addressed in the current version of BANWR's Fire Management Plan and they do not need to be discussed in any further detail in this document.

A number of the actions in the HMP would result in ground and vegetation disturbance, as well as the use of trucks, other vehicles, and various types of mobile equipment. Many of these actions would take place primarily in low-lying areas so that the chance of encountering a PPC would be unlikely, as predicted by the refuge PPC model. In areas of suitable PPC habitat, BANWR will continue to conduct surveys and implement conservation actions to reduce the impacts of the proposed HMP actions. If PPC are present in the areas where HMP activities of this type will occur, direct effects could consist of destruction of cacti by equipment, running over individual cacti with support vehicles, uprooting of undetected seedling cacti, or crushing/burying individual cacti with vegetation, dirt, or other materials. Inadvertent trampling by those implementing the HMP actions may also occur. However, BANWR will continue to do surveys for PPCs prior to these actions, and any cacti found will be protected. However, seedlings will likely go undetected and may be harmed or destroyed.

Indirect effects may include soil compaction; introduction or promotion of growth of non-native, invasive species resulting in increased competition for existing PPCs and seed germination; restoration of an area through seeding or planting native vegetation resulting in competition with existing PPCs and reproduction; and degradation of appropriate microclimatic conditions for seed establishment and reproductive events. These effects could also occur in areas along roadsides where unpalatable species are planted to reduce wildlife road mortality.

Some HMP actions will incorporate the use of herbicides. If cacti come in contact with the herbicide, undoubtedly they would be killed or damaged. However, all work areas would be surveyed for Pima pineapple cacti prior to any herbicide work. Extreme care will be taken in any herbicide application so as to target only the mesquites or other densely growing trees or brush targeted for removal. However, extremely young PPCs may be missed during a survey and could be affected, though the likelihood would be extremely small.

### Masked bobwhite quail

Generally, implementation of HMP actions will have long-term beneficial effects on the masked bobwhite. The primary goals and objectives of the HMP are to restore a healthy, functioning grassland ecosystem that will contribute to the conservation and survival of native wildlife, with a focus on masked bobwhite. For example, beneficial effects would likely include an increase of forbs, retention of soil and plant moisture, and possibly increased insect biomass. However, HMP implementation may have some short-term negative impacts.

Short-term direct effects of ground-disturbing activities, including the use of heavy equipment, are likely reduced during the non-breeding season because adults and young-of-the-year are mobile and would move out of the way of approaching equipment and people. However, such activities during the breeding season (July-September), may result in nest destruction, mortality of sitting hens, or loss of extremely young, less mobile chicks. Regardless of the season, the response of bobwhites to potential harm is either that of flushing or squatting and hiding. If the squat and hide choice is made, individuals may not be able to escape contact with the equipment and mortality could result. Effects of noise would be short-lived. Noise effects are expected to be only one to a few days in duration in any given location. Indirect effects include temporary removal of cover or possible stimulation of growth of non-native or invasive species. Temporary disturbance and disruption in feeding may occur from human activity and equipment noise.

The use of pesticide spray or pellets applied to the ground may affect non-target species. Very careful usage of these chemicals would be implemented on a limited basis due to expense. With the prudent usage anticipated, very few of the bobwhite food or cover plants would be affected.

Water and food supplementation may attract other small birds and mammals and, ultimately, the predators that feed upon them. This may result in increased predation on masked bobwhites. The use of pygmy-owl nest boxes may also potentially increase predation if

numbers of screech owls and pygmy-owls increase. In addition, water, especially if allowed to drizzle on the ground or overflow existing steel tanks, may allow for the growth of invasive or non-native species. Benefits, however, may outweigh the negative effects during the months of May and June when water availability and moisture from green plants and insects is not generally available on BANWR.

Many of the HMP activities would be implemented over relatively small areas (disking, aeration, seeding, irrigation, woodcutting, etc.) and, thus, the total proportion of a typical bobwhite home range (40 acres) would be small and insignificant. The overall effect will be beneficial following the initial season of treatment.

#### Northern Mexican Gartersnake

The maintenance of open water at Arivaca Cienega may have negative impacts on the northern Mexican garter snake because the open water will undoubtedly provide habitat for non-native bullfrogs, which are predators on the snake. In addition, the operation of heavy equipment and the act of scooping up cattails could potentially injure or displace any garter snakes which may be in the area. Cattail removal, if attempted, will be done on a limited basis during the time of year when it will be least likely to affect Mexican gartersnakes, i.e. when snakes are active and can move out of the way of the equipment being used.

Use of pesticides to control non-native vegetation species could potentially affect water quality in areas of potential occupancy by Mexican gartersnakes. Though virtually all the herbicide used will be applied to the target stumps and will be almost entirely absorbed, as a precautionary measure, herbicides will not routinely be applied on the edges of tanks, unless absolutely essential (salt cedar becomes established, for example) and only cut-stump methodology would be used. When applied to trees bordering tanks, the herbicide used will be one approved for use around water, and care will be taken to minimize the usage in this area so no potentially harmful chemicals will be entering the water where they could be absorbed by snakes, fish or frogs.

The provision of water in tanks which hold leopard frogs or topminnows is critical to their survival, so anything that can be done to maintain the water conditions in those tanks will ultimately also be beneficial to the Mexican gartersnake. This will be accomplished through the repair of tanks, in most cases, but the tanks will be dried prior to work, and it is likely that any Mexican gartersnakes will have moved to alternative water sources. All equipment used will be sanitized to reduce the risk of chytridomycosis fungal infection. Thus, no direct mortality is anticipated from tank repairs. In some emergency situations, water may need to be hauled in from other sources in order to provide adequate water during times of drought. With the addition of water to a tank from another source, care will be taken to assure that the source is from a well, rather than another tank, in order to reduce the spread of disease or predatory species.

Demolition of buildings along Arivaca Creek could potentially harm the Mexican garter snake. If buildings are demolished which may have snakes living within or underneath (as is

common in the area), the snakes could be harmed, or at the least, displaced. Replanting to native vegetation could disrupt snake dens or displace individual garter snakes.

## CUMULATIVE EFFECTS

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

Illegal border activity in the action area has been reduced in the valley due to the construction of the pedestrian barrier along the international border, but activities in the mountains has continued and possibly increased as more traffic is pushed around the pedestrian barrier. These border protection activities have led to a reduction in the use of the illegal trail system through the valley, and natural revegetation has begun on these trails. The reduction in illegal border activity will likely also result in a reduction in human-caused fires in the valley bottom from unattended warming and signal fires.

However, the impacts of illegal immigration are likely to be shifted into the mountain ranges surrounding the action area. Impacts of Department of Homeland Security will also shift into the mountains. This shift in activity could increase effects to species such as the Kearney's bluestar, jaguar, Mexican spotted owl, and lesser long-nosed bat.

In addition, the corridor along SR 86 from Tucson, AZ to Three-points, AZ is being developed at an increased rate, in particular at the north end of the Altar Valley. This area is likely to be under increased pressure for urban developments in the near future. Pima County has been purchasing private lands and conservation leases in this area to preserve open space and wildlife corridors as part of the Sonoran Desert Conservation Plan.

Other activities in the Altar Valley include on-going grazing, outdoor recreational activities, and Arizona Department of Transportation maintenance activities along SR 286.

## CONCLUSION

### Pima pineapple cactus

After reviewing the current status of the Pima pineapple cactus, the environmental baseline for the action area, the effects of the implementation of the HMP, and the cumulative effects, it is our biological opinion that the implementation of the BANWR HMP, as proposed, is not likely to jeopardize the existence of the endangered Pima pineapple cactus. No critical habitat has been designated for this species; therefore, none will be affected. We present this conclusion for the following reasons:

- The habitat model developed for the BANWR focuses survey efforts and minimization efforts.
- Ongoing surveys by the BANWR will identify PPC's within the action area, and protection of known PPC individuals will reduce impacts to PPC populations.

- The conservation measures for PPC have been effective in limiting effects to this species in past years.
- An area of maximum PPC protection has been designated within the PPC Zone.
- BANWR will develop and implement an Inventory and Monitoring Plan related to the implementation of the HMP to inform adaptive management related to the HMP.
- Implementation of the HMP will contribute to the restoration of a healthy, functioning grassland ecosystem that will benefit PPC populations. Short-term negative effects may occur, but no long-term adverse effects are anticipated to the habitat for this species.

### Masked bobwhite

After reviewing the current status of masked bobwhite, the environmental baseline for the action area, the effects of the implementation of the HMP, and the cumulative effects, it is our biological opinion that the implementation of the BANWR HMP, as proposed, is not likely to jeopardize the continued existence of the endangered masked bobwhite. No critical habitat has been designated for this species; therefore, none will be affected. In making our determination, we considered the following:

- The status of masked bobwhite has declined within the action area to the point that implementation of the HMP is unlikely to affect the few wild individuals that may remain on the BANWR.
- Ongoing survey efforts by BANWR staff will allow implementation to avoid or reduce direct impacts to any occupied sites within the action area.
- Other conservation measures will reduce the likelihood of effects to the masked bobwhite.
- Masked bobwhite captive breeding stock will not be impacted by the proposed action, and will be available for release at appropriate times to supplement the masked bobwhite population on BANWR.
- The HMP will be implemented to improve masked bobwhite habitat, so the short-term negative effects will be offset by long-term positive effects.
- BANWR will develop and implement an Inventory and Monitoring Plan related to the implementation of the HMP to inform adaptive management related to the HMP.

### Northern Mexican Gartersnake

After reviewing the current status of the northern Mexican gartersnake, the environmental baseline for the action area, the effects of the implementation of the HMP, and the cumulative effects, it is our biological opinion that the implementation of the BANWR HMP, as proposed, is not likely to jeopardize the existence of the candidate northern Mexican gartersnake. Because this is a candidate species, no critical habitat has been designated for this species; therefore, none will be affected. In making our determination, we considered the following:

- Only a single individual of this species has been documented on the BANWR. Considering the northern Mexican gartersnake's rangewide status, it is unlikely that

implementation of the HMP will result in impacts significant enough to result in a change in rangewide population status.

- Conservation measures proposed as part of the implementation of the HMP will reduce the likelihood of any negative effects on northern Mexican gartersnakes in the action area.
- The impacts from implementation of the HMP will have a primarily beneficial effect on any northern Mexican gartersnakes found on BANWR.
- BANWR will develop and implement an Inventory and Monitoring Plan related to the implementation of the HMP to inform adaptive management related to the HMP.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any Conservation Measures that were incorporated into the project design.

### INCIDENTAL TAKE STATEMENT

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

#### Pima pineapple cactus

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally listed endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy any such species on any other area in knowing violation of any regulation of any State or in the course of any violation of a State criminal trespass law.

#### AMOUNT OR EXTENT OF TAKE

#### Masked bobwhite

The FWS does not anticipate the proposed action will incidentally take any masked bobwhite quail for the following reasons:

- The status of masked bobwhite has declined within the action area to the point that implementation of the HMP is unlikely to affect the few wild individuals that may remain on the BANWR.
- Ongoing survey efforts by BANWR staff will ensure implementation of the HMP actions will avoid or reduce direct impacts to any occupied sites within the action area.
- Other conservation measures will reduce the likelihood of effects to the masked bobwhite.
- Implementation of the HMP may result in short-term adverse effects, but, in the long-term, implementation will improve masked bobwhite habitat. Therefore, this action is anticipated to provide a long-term benefit to masked bobwhite through habitat maintenance and improvements.

#### Northern Mexican Gartersnake

The FWS does not anticipate the proposed action will incidentally take any northern Mexican gartersnakes for the following reasons:

- Only a single individual of this species has been documented on the BANWR. The implementation of the HMP is unlikely to affect the few individuals that may occur on the BANWR.
- Conservation measures proposed as part of the implementation of the HMP will reduce the likelihood of any negative effects on northern Mexican gartersnakes in the action area.
- The impacts from implementation of the HMP will have a primarily beneficial effect on any northern Mexican gartersnakes found on BANWR.

#### EFFECT OF THE TAKE

The FWS does not anticipate any take of affected species as a result of the proposed actions.

#### **Disposition of Dead or Injured Listed Species**

Upon locating a dead, injured, or sick listed species initial notification must be made to the FWS's Law Enforcement Office, 2450 W. Broadway Rd, Suite 113, Mesa, Arizona, 85202, telephone: 480/967-7900) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

#### **CONSERVATION RECOMMENDATIONS**

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to

minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

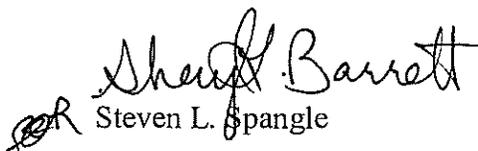
1. Provide the Arizona Ecological Services Office of the FWS with an annual report of all HMP activities implemented. This includes acres treated, facilities constructed, and the results of all inventories and monitoring conducted.
2. Implement species-specific surveys for the northern Mexican gartersnake.
3. Through the implementation of the Inventory and Monitoring Plan, evaluate the effectiveness of the HMP actions to achieve the HMP goals and objectives. Include this evaluation in the annual report requested in #1 above.
4. Support or encourage research related to focal species and the effects of the implementation of the HMP. Make the results of such research available to appropriate institutions and cooperators.

In order for the FWS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.

#### **REINITIATION NOTICE**

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

The FWS appreciates the BANWR efforts to identify and minimize effects to listed species from the implementation of the HMP. For further information please contact Scott Richardson at (520) 670-6150 ext. 242. Please refer to the consultation number, 22410-2009-F-0368 in future correspondence concerning the HMP.

  
Steven L. Spangle

cc (hard copy):

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## TABLES AND FIGURES

Table 1. Number of new Pima pineapple cactus locations by prescribed BU since the 2005 BO.

UNIT #	UNIT NAME	ACRES	< 2003	2004	2005	2006	2007	2008	Total (known mortalities)
1	Espinosa	1507	3						3
2	Pozo	1744							
3	City Hall	5312		2					2
4	Dry	821	2						2
5	Pajonal	2854							
6	Blanco	3968	1	33			1		35(-19)
7	Mosca	3478	10						10
8	Buena	1120	11						11
9	Road Camp	1024	1			12			13(-3)
10	Hippy	1734	10		11				21(-2)
11	Indios	682	13			1			14
12	Guijas Tank	467	2					2	4
13	Secundino	1624	23					1	24(-10)
14	Middle	1871	6	35		1		1	43(-28)
15	Linberg Ridge	886	7		2				9
16	Punta North	740							
18	Round Hill 3	1176	2	3	4			1	10(-2)
19	Linberg Tank	1402	2						2
20	Punta South	1361				13			13
21	Mesquite	928							
22	Round Hill 2	1747	2					2	4(-1)
23	High Gates	4905	2	3		1			6(-3)
24	Round Hill 1	2321			4	1			5
25	Mckay	459				4			4(-1)
26	Bailey	520	2						2
27	Airport	764	2					2	4
28	Aguirre	287							
29	Rock	1956				1		2	3
30	Bertha North	1053							
31	Triangle	593	3			1		1	5
32	Bertha South	1169						4	4(-1)
33	Horse North	344	2						2
34	Headquarters	504	1		1				2
35	Borrego North	461			4	1		1	6(-3)
36	Horse South	902	1						1
37	Mormon	206	11						11
38	Borrego South	1187	3			1			4
39	State	1624				8			8
40	Carrizo	1179							
41	Compartidero 2	1194	4	8					12
42	Compartidero 1	935	3	1					4(-1)
43	Snake	1664		2				12	14(-1)

Table 1 Continued

UNIT #	UNIT NAME	ACRES	≤ 2003	2004	2005	2006	2007	2008	Total (known mortalities)
44	Compartidero 3	708	6		2				8
45	LOPEZ/Control	2164			1				1
46	North Border	1700							
47	Yellowjacket	584							
48	East Gate	808							
49	South Border	915							
50	Garcia	2440							
51	Brown North	1482	1						1
52	Brown South	977							
53	Mormon West	337						1	1
54	West Bailey	1038							
55	West Bertha	1923							
56	Canoa	1706							
57	Ted	2627	1						1
58	King	1989				2			2(-1)
59	Las Delicias	1151			104	3			107(-34)
	Non Burn Unit		13		33	1			47
	Total Locations		150	87	166	51	1	30	485(-157)

**Table 2. Number of Male Masked Bobwhite Detected on Summer Call Count Surveys 1999-2004.**

UNIT #	UNIT NAME	ACRES	Maximum Occupancy 1999-2004 <sup>1</sup>	2005 <sup>3</sup>	2006	2007 <sup>4</sup>	2008 <sup>5</sup>
1	Espinosa	1507					
2	Pozo	1744	1 <sup>2</sup>				
3	City Hall	5312	1 <sup>2</sup>				
4	Dry	821	1				
5	Pajonal	2854					
6	Blanco	3968		1			
7	Mosca	3478	4				
8	Buena	1120					
9	Road Camp	1024	6	.5 covey			
10	Hippy	1734	2	1			
11	Indios	682					
12	Guijas Tank	467					
13	Secundino	1624	15 <sup>2</sup>				
14	Middle	1871	9 <sup>2</sup>	9			
15	Linberg Ridge	886	2	1			
16	Punta North	740	1				
18	Round Hill 3	1176	5				
19	Linberg Tank	1402	1				
20	Punta South	1361					
21	Mesquite	928					
22	Round Hill 2	1747	1				
23	High Gates	4905					
24	Round Hill 1	2321					
25	Mckay	459					
26	Bailey	520	1				
27	Airport	764	1		2		
28	Aguirre	287					
29	Rock	1956	2				
30	Bertha North	1053	1	3			
31	Triangle	593	2	1,1 covey	3		
32	Bertha South	1169	1				
33	Horse North	344			1		
34	Headquarters	504	1				
35	Borrego North	461	2	1			
36	Horse South	902	2				
37	Mormon	206					
38	Borrego South	1187	1				
39	State	1624	3				
40	Carrizo	1179					
41	Compartidero 2	1194	2				
42	Compartidero 1	935	1				

Table 2. Continued.

UNIT #	UNIT NAME	ACRES	Maximum Occupancy 1999-2004 <sup>1</sup>	2005 <sup>3</sup>	2006	2007 <sup>4</sup>	2008 <sup>5</sup>
43	Snake	1664	1				
44	Compartidero 3	708	1				
45	LOPEZ/Control	2164	1				
46	North Border	1700	1				
47	Yellowjacket	584	1				
48	East Gate	808					
49	South Border	915	2				
50	Garcia	2440	1				
51	Brown North	1482					
52	Brown South	977					
53	Mormon West	337					
54	West Bailey	1038					
55	West Bertha	1923					
56	Canoa	1706					
57	Ted	2627					
	Non Burn Unit		7				

<sup>1</sup>Minimal effort was expended on call counts in 2000.

<sup>2</sup>Prior to 2001, birds were not recorded by burn management unit. Fractions of birds were recorded for birds being sighted in the middle of the road between units or uncertainty in the recording of burn management unit birds occurred in. These numbers were rounded up in from the 1999 numbers reported in Table 3 of the 2005 BO.

<sup>3</sup>Surveys in 2005 may have missed peak calling period. Wet spring induced early breeding

<sup>4</sup>2007 had anecdotal observation of a covey south of Outpost and assembly call near headquarters.

<sup>5</sup>2008 had anecdotal observation of pair on Service Rd. near headquarters (one in Horse North, one pair in Aguirre BU).

## APPENDIX A.

This Appendix contains all concurrences with “may affect, not likely to adversely affect” determinations.

### Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuena*)

#### **Environmental Baseline**

This species is known from grasslands, arid scrublands, and oak woodlands below 5500 ft in elevation. In Arizona, they arrive in mid- April, roosting in caves, abandoned mine shafts and tunnels. Young are typically born in maternity colonies in mid-May. Females and young remain in maternity roosts and forage on primarily saguaros below about 3500 ft until approximately mid-July. At this time the range expands and bats are found up to about 5500 ft in areas of semi-desert grassland and lower oak woodland, foraging primarily on agaves. These bats typically leave southern Arizona by late September to early October. While there are small caves and some mine shafts on or near the BANWR, no roost sites or maternity colonies are known to be on the BANWR.

Lesser long-nosed bats are known to forage on the BANWR, using species of agave and columnar cacti, as well as hummingbird feeders. *Agave parryi* and *Agave palmeri* on the BANWR typically occurs in relatively small numbers in the foothills portion of the BANWR. Where this agave is found within the action area, it is typically in gravelly soils which are sparsely vegetated and are not likely to be suitable for implementation of HMP actions other than fire. These areas have little ability to carry a fire. Saguaro cacti, which are not numerous within the action area, will be protected from prescribed fire and other HMP actions as described above.

#### **Conclusion**

The Service concurs with the BANWR determination that the action may affect, but is not likely to adversely affect lesser long-nosed bat, based upon the following:

- There are no known roost sites within the action area.
- The majority of the foraging resources for this species will not be significantly affected by the proposed HMP actions.
- The occurrence of lesser long-nosed bats within the action area is limited primarily to the foothills areas, which make up a limited proportion of the action area.
- Implementation of conservation actions outlined in the Project Description will reduce effects of implementing the HMP to insignificant levels.

## **Chiricahua Leopard Frog**

### **Environmental Baseline**

The Chiricahua leopard frog was listed as a threatened species without critical habitat in 2002 (67 FR 40790). Included was a special rule to exempt operation and maintenance of livestock tanks on non-Federal lands from the section 9 take prohibitions of the Act. No critical habitat has been designated for the Chiricahua leopard frog. The Chiricahua leopard frog recovery plan was completed in 2007 (USFWS 2007).

Threats to this species include predation by nonindigenous organisms, especially bullfrogs, fish, and crayfish; disease; drought and climate change; floods; degradation and loss of habitat as a result of water diversions and groundwater pumping, poor livestock management, altered fire regimes due to fire suppression and livestock grazing, mining, development, and other human activities; disruption of metapopulation dynamics; increased chance of extirpation or extinction resulting from small numbers of populations and individuals; and environmental contamination. Numerous studies indicate that declines and extirpations of Chiricahua leopard frogs are at least in part caused by predation and possibly competition by nonindigenous organisms, including fish in the family Centrarchidae (*Micropterus* spp., *Lepomis* spp.), bullfrogs, tiger salamanders (*Ambystoma* spp.), crayfish (*Orconectes virilis* and possibly others), and several other species of fish (Clarkson and Rorabaugh 1989; Sredl and Howland 1994; Fernandez and Bagnara 1995; Rosen et al. 1995; Snyder et al. 1996; Fernandez and Rosen 1996a and b, 1998).

In 2004, Chiricahua leopard frogs were known from Carpenter, Choffo, Rock, and State tanks. A large population site was also known on the Coronado National Forest that was probably part of the same metapopulation. Since this time the Chiricahua leopard frog status in the action area has gone through normal metapopulation fluctuations. Choffo Tank is no longer occupied and is not considered to be a perennial tank. Triangle Tank, near the main entrance road, has been renovated and is occupied by Chiricahua leopard frogs. Precipitation during the 2008 monsoon season provided additional opportunity for Chiricahua leopard frogs to expand into several additional locations on the BANWR. In fall of 2008, a total of eight sites were occupied including Aguire Lake, Bailey Gravel Pit 2, Carpenter Tank, Hito Tank, Rock Tank, State Tank, Sulfido Tank and Triangle Tank. Due to seasonal drying, only the four perennial Chiricahua leopard frog sites (Carpenter, Rock, State, and Triangle tanks) are reasonably certain to be occupied during the 2009 fire season. The construction of the border barriers and the placement of seven observation towers are not likely to affect Chiricahua leopard frogs directly, but the road and barrier along the international border may reduce cross border dispersal and gene flow.

The factors affecting Chiricahua leopard frogs in the action area include drought, the occurrence of chytrid fungus, and non-native predators and competitors. Bullfrogs, from six source population sites on the west side of the valley, dispersing on to the BANWR are a perennial threat. Active monitoring and management of bullfrogs on the BANWR will need

to continue to safe guard this metapopulation. The threats from illegal immigration and Border Patrol activities have probably diminished with the movement of these activities out of the valley bottom and into the mountains.

## **Conclusion**

The Service concurs with the BANWR determination that the action may affect, but is not likely to adversely affect Chiricahua leopard frog, based upon the following:

- Bullfrog management and control will continue to be implemented in those areas where HMP activities could result in the enhancement or persistence of bullfrogs.
- HMP activities related to tank repair and maintenance have the highest likelihood of effects to the Chiricahua leopard frog. To avoid these effects, tank repair or maintenance will only occur in tanks that are dry and where frogs are absent as a result of natural movements to alternative water sources or through salvage.
- Implementation of conservation actions outlined in the Project Description will reduce effects of implementing the HMP to insignificant levels.
- BANWR will continue to participate in the reintroduction or establishment of Chiricahua leopard frogs on BANWR to promote the recovery and survival of this species.

## **Gila Topminnow**

### **Environmental Baseline**

Gila topminnow was listed as endangered in 1967 without critical habitat (32 FR 4001). Only Gila topminnow populations in the United States, not those in Mexico, are listed under the Act. No critical habitat has been designated for this species. The reasons for decline of this fish include past dewatering of rivers, springs and marshlands, impoundment, channelization, diversion, regulation of flow, land management practices that promote erosion and arroyo formation, and the introduction of predacious and competing nonindigenous fishes (Miller 1961, Minckley 1985). Other listed fish suffer from the same impacts (Moyle and Williams 1990). Life history information can be found in the 1984 recovery plan (USFWS 1984), the draft revised Gila topminnow recovery plan (Weedman 1999), and references cited in the plans.

No formal surveys or trapping efforts have occurred on the BANWR since 2004. Informal observations in Rock and State tanks have not resulted in any individuals being detected during the intervening period. The species is still presumed to be present due to the availability of the habitat and lack of predators and non-native competitors. Gila topminnows on the BANWR are not part of a functioning metapopulation, with a series of dispersal and colonization events that provide for local extirpation and recolonization of sites. If a population is lost due to implementation of the HMP, reestablishment will have to occur through a direct management decision to place topminnow back into the tanks. Therefore, the conservation measures included in this action are important to reduce effects

to occupied tanks, namely the use of straw wattles to stabilize and trap sediment above the tanks should implementation of the HMP result in potential for sedimentation. The construction of the border barriers and the placement of seven observation towers are not likely to affect Gila topminnow. The threats from illegal immigration and Border Patrol activities have probably diminished with the movement of these activities out of the valley bottom and into the mountains.

### **Conclusion**

The Service concurs with the BANWR determination that the action may affect, but is not likely to adversely affect Gila topminnow, based upon the following:

- Gila topminnows are very restricted in their distribution within the action area. BANWR is aware of these sites and will implement conservation measures to avoid or reduce potential effects to an insignificant level from the implementation of HMP actions.
- HMP activities related to tank repair and maintenance have the highest likelihood of effects to the Gila topminnow. To avoid these effects, tank repair or maintenance will only occur in tanks that are dry or where Gila topminnow are absent as a result of salvaging any fish occupying the tank.
- Implementation of conservation actions outlined in the Project Description will reduce effects of implementing the HMP to insignificant levels.

### **Jaguar (*Panthera onca*)**

#### **Environmental Baseline**

The non-U.S. population was listed as endangered in March 1972 (37 FR 6476). The geographic extent of the listing was expanded to include jaguars in the U.S. on July 22, 1997 (62 FR 39147). It is the largest species of cat native to the Western Hemisphere. Individuals in Arizona have been found in Sonoran desertscrub up through subalpine conifer forest. The loss and modification of habitat, shooting, and predator control have contributed to its decline.

Within the action area, jaguars are most likely to occur in the more topographically diverse areas of the hills and mountains surrounding the Altar Valley. Jaguars have been documented in Brown Canyon and elsewhere in the Baboquivari Mountains. Remote camera research has documented that jaguars will move across valley bottoms as they travel among mountain ranges in southern Arizona.

### **Conclusion**

We concur that the proposed action may affect, but is not likely to adversely affect the jaguar, based upon the following:

- Many of the HMP actions will be implemented on a small scale. Impacts to jaguar habitat from HMP actions are expected to be insignificant relative to the home range of a jaguar given its mobility and its ability to cover large areas during normal activities.
- The proposed action avoids effects within riparian areas, which likely serve as movement corridors for the jaguar. The canopy cover will not be removed through the proposed action, and HMP actions will have a discountable effect on the use of these areas by jaguars due to the jaguar's extremely limited occurrence in the action area.
- The proposed action does not involve habitat type conversion or the fragmentation or blocking of movement corridors that jaguars may use between Mexico and the United States.
- The prey base for the jaguar (white-tail and mule deer) may be enhanced due to the long-term goals of the HMP to restore a healthy, functioning landscape within the action area. Long-term

### **Kearney's Blue Star (*Amsonia kearneyana*)**

#### **Environmental Baseline**

Kearney's bluestar was listed as endangered in January 1989 without critical habitat. An herbaceous perennial in the Dogbane family (Apocynaceae), it is a sub-shrub with a thickened woody root and many pubescent (hairy) stems that rarely branch. Plants grow in stable, partially shaded, coarse alluvium along dry washes at 1,097 - 1,158 m (3,600-3,800 ft) elevation. It is known on the Refuge from a west-facing drainage in the Baboquivari Mountains, Pima County and potentially could be in other west-facing drainages in the Baboquivari Mountains.

#### **Conclusion**

After reviewing the status of the Kearney's bluestar, the environmental baseline for the action area, and the effects of the proposed action, the FWS concurs that the proposed action may affect, but is not likely to adversely affect Kearney's bluestar, based upon the following:

- The known location of these plants is easily avoided.
- Conservation measures will be implemented to avoid adverse effects.
- No critical habitat has been designated for this species.

### **Mexican Spotted Owl (*Strix occidentalis lucida*)**

#### **Environmental Baseline**

The Mexican spotted owl was listed as threatened in 1993 (58 FR 14248) and critical habitat was designated in 2004 (69 FR 53182). We appointed the Mexican Spotted Owl Recovery Team in 1993, which produced the Recovery Plan for the Mexican Spotted Owl (Recovery Plan) in 1995 (U.S. Fish and Wildlife Service 1995b). The Recovery Plan summarizes the effects of livestock grazing on Mexican spotted owls in four broad categories: 1) altered prey

availability, 2) altered susceptibility to fire, 3) degeneration of riparian plant communities, and 4) impaired ability of plant communities to develop into spotted owl habitat. The only potential habitat for the Mexican spotted owl within the action area is around Brown Canyon and nearby drainages in the Baboquivari Mountains. Surveys for this species in the Brown Canyon area were conducted in 2008 and 2009 with negative results.

## **Conclusion**

After reviewing the status of the Mexican spotted owl, the environmental baseline for the action area, and the effects of the proposed action, we concur that the proposed action may affect, but is not likely to adversely affect, the Mexican spotted owl and designated critical habitat, based upon the following:

- The Mexican spotted owl habitat is only located in the higher elevations of the action area.
- Only a few locations in the action area are known from Baboquivari Mountains.
- The majority of HMP actions will be implemented at lower elevations, outside of Mexican spotted owl habitat.
- If occupancy is confirmed within the action area, conservation measures will be implemented to avoid adverse affects to Mexican spotted owl and its habitat.
- No designated critical habitat is within the action area.

## **Southwestern Willow Flycatcher (*Empidonax traillii extimus*)**

### **Environmental Baseline**

The southwestern willow flycatcher was listed as endangered, without critical habitat on February 27, 1995 (60 FR 10694). On October 19, 2005, we designated critical habitat for the southwestern willow flycatcher (70 FR 60886). A total of 737 river miles across southern California, Arizona, New Mexico, southern Nevada, and southern Utah were included in the final designation.

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

Critical habitat for southwestern willow flycatcher in Arizona includes portions of the Virgin River Gorge, Verde River, Gila River, Salt River, Tonto Creek, San Pedro River, Little Colorado River, and Big Sandy River.

### **Conclusion**

We concur with the determination that the action may affect, but is not likely to adversely

affect the southwest willow flycatcher and designated critical habitat, based upon the following:

- No critical habitat is designated within or adjacent to the action area.
- No southwestern willow flycatcher breeding sites or suitable breeding habitat are currently known from within the action area.
- The only known sightings of southwestern willow flycatchers in the action area are of migrating individuals, which are not likely to be affected by the proposed action.
- Beneficial effects to the southwestern willow flycatcher area anticipated as a result of implementing HMP actions in the Arivaca Creek and Riparian HMP Zones.

### **Yellow-billed Cuckoo (*Coccyzus americanus*)**

#### **Environmental Baseline**

The yellow-billed cuckoo is a medium-sized bird of about 30 cm (12 in ) in length, and weighing about 60 g (2 oz). The species has a slender, long-tailed profile, with a fairly stout and slightly down-curved bill, which is blue-black with yellow on the basal half of the lower mandible (bill). Plumage is grayish-brown above and white below, with rufous primary flight feathers. The tail feathers are boldly patterned with black and white below.

Arriving in June and leaving by mid-September, this species prefers dense cottonwood/willow stands (Rosenberg et al. 1991, Halterman 1991), though it is known to nest also in salt cedar and in mesquite (Hunter et al. 1988). Nests are often placed in willows, but they use cottonwoods for foraging. In Brown Canyon they nest in the riparian zone in Arizona sycamores, oaks and netleaf hackberry (*Celtis reticulata*) (Powell 1999).

The loss, degradation, and fragmentation of riparian habitat have been identified as the primary factors causing yellow-billed cuckoo declines in the western United States. Ongoing drought, the effects of climate change, and increasing urban water demands are likely to continue to affect the availability of suitable habitat in the action area.

This candidate species is a summer resident and breeder which has been regularly documented breeding at Arivaca Creek, Arivaca Cienega and Brown Canyon. Sporadically, in good years, cuckoos are detected in the grassland portion of the refuge on breeding bird surveys. Nests have been occasionally found in mesquites and have also been observed in landscape shrubbery at refuge headquarters.

#### **Conclusion**

We concur with the determination that the action may affect, but is not likely to adversely affect the yellow-billed cuckoo, based upon the following:

- The distribution of the yellow-billed cuckoo is relatively restricted within the action area. Implementation of most HMP actions will have a discountable effect on this species.

- HMP actions that do occur within yellow-billed cuckoo habitat will have insignificant effects due to the implementation of the conservation measures outlined in the Project Description.
- Beneficial effects to the yellow-billed cuckoo are anticipated as a result of implementing HMP actions in the Arivaca Creek and Riparian HMP Zones.