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In Reply Refer to:
AESO/SE
02EAAZ00-2012-F-0165

April 30, 2012

Memorandum

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

From: Field Supervisor

Subject: Biological Opinion on the Buenos Aires National Wildlife Refuge Multi-Unit Burn Plan for the 2012-2017 Burn Seasons

This biological opinion responds to your April 10, 2012, request for formal consultation with the U.S. Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request was received on April 13, 2012. At issue are impacts resulting from the proposed Multi-Unit Burn Plan for the Buenos Aires National Wildlife Refuge (Refuge) located in Pima County, Arizona, on the endangered Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*), the endangered masked bobwhite quail (*Colinus virginianus ridgwayi*), and threatened Chiricahua leopard frog (*Rana chiricahuensis* (leopard frog).

In your memorandum, you also requested our concurrence that the proposed action may affect, but is not likely to adversely affect the endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) and Chiricahua leopard frog critical habitat. Our concurrences are provided in Appendix A. You have determined that there will be no effect from the proposed action on any other listed species that occur or may occur on the Refuge.

This biological opinion (BO) is based on information provided in your April 10, 2012, correspondence, including your April 10, 2012 Biological Assessment (BA) of the proposed action and the proposed 2012 – 2017 Multi-Unit Burn Plan, as well as the 2002 Biological Opinion on the Buenos Aires National Wildlife Refuge Fire Management Plan (2-21-02-F-068) and the 2005 Biological Opinion on the Buenos Aires National Wildlife Refuge Fire Management Plan for the 2005-2008 Burn Seasons (02-21-05-F-0243), telephone and electronic mail conversations with Refuge staff, field investigations, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, effects of prescribed and wildland fire, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at Arizona Ecological Services Office (AESO) in Phoenix, Arizona.

Consultation history

- March 6, 2012, Refuge contacts AESO regarding new fire management planning process and need to conduct section 7 consultation on the Multi-Unit Burn Plan for 2012 – 2017.

- March 22, 2012, Refuge provides AESO with draft BA and draft Multi-Unit Burn Plan for review and comment.

- March 27, 2012, Refuge provides AESO with monitoring report data for 2009 and 2010.

- March 27, 2012, AESO provides Refuge with comments and recommendations on the draft BA.

- April 4, 2012, Refuge and AESO discuss the implications of the newly designated critical habitat for the leopard frog on the proposed Multi-Unit Burn Plan and section 7 consultation.

- April 13, 2012, Refuge requests formal consultation on the Multi-Unit Burn Plan and provides the final Multi-Unit Burn Plan and BA.

- April 30, 2012, AESO provides final BO to the Refuge

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is the implementation of prescribed burns on the Refuge from 2012 through 2017 as described by the Multi-Unit Burn Plan. Details regarding the implementation of the proposed prescribed burns are described in Refuge's Multi-Unit Burn Plan and BA; the appropriate portions of which are incorporated herein by reference. Annual burn units will be selected from within the entire grassland area of the Refuge based on the Refuge's Habitat Management Plan (HMP) goals and objectives, site specific conditions, and fuel conditions for each respective year of the burn plan. This approach represents a departure from previous fire management plans which required selection of specific burn units 4 or more years in advance of the burn irrespective of site specific conditions at the time of the burn implementation. The BA and this BO address effects of prescribed burns within the broader grassland region rather than the effects to specific burn units because ecological characteristics are reasonably uniform throughout the grassland region of the refuge. This approach provides a greater degree of habitat enhancement flexibility for on-the-ground resource management actions and is consistent with the adaptive management strategy described in the HMP.

Because specific burn units will be determined at the onset of each burn season, only the proposed burn units for 2012 have been identified in the BA (Map 1). However, all burn units on the Refuge have been identified (Map 2) and, for the purposes of this document, all designated burn units shown on Map 2 may be considered for prescribed fire treatments. For 2013 through 2017, specific burn units will be selected each year based on the goals and objectives of the Multi-Unit Burn Plan and the Refuge's HMP. Implementation of the prescribed burns in the selected units will follow the programmatic guidance outlined in the BA and Multi-Unit Burn Plan. Final site selections and burn prescriptions must be approved by the refuge manager prior to implementation of this action. Burn plans for individual burn units will also be approved prior to implementation during each fiscal year.

Early in each fiscal year planning cycle, the refuge will provide the AESO with burn unit maps, burn plans and prescriptions. This information can be used by AESO personnel to facilitate discussions with refuge staff to ensure all actions resulting from this consultation are met. Suggestions or recommendations from the AESO regarding the protection, conservation or preservation of relevant threatened and endangered species and/or critical habitat may be incorporated into final unit burns.

Criteria for burn unit selection include the vegetation structure and density, soil moisture, fuel loadings and landscape geography. Additionally, the presence or absence of threatened or endangered species will be evaluated during this site selection process. The presence of large numbers of masked bobwhite, detection of masked bobwhite nests, or other needs yet unanticipated would result in the removal of a burn unit from prescribed burn implementation for that given year.

Burn units proposed for the FY2012 burn season are shown on Map 1. The objectives for burn treatments in Middle and State Tank Burn Units are to improve habitat conditions for masked bobwhites. Refuge fire staff has developed a fire prescription designed to create a patchy mosaic of burn throughout smaller areas within these burn units in which no more than 50% of all vegetation present will be subjected to fire. This approach will have minimal negative impacts on desired leguminous shrubs, create micro-edge effects and promote a post-fire vegetation response beneficial to masked bobwhites. The unburned vegetation patches will also provide escape cover and ensure that insect and vegetation food sources remain available for bobwhites. The prescriptions for these burns require atmospheric humidity of 20% and wind speeds up to 5 mph which are necessary to achieve the desired fire effects. Prescribed fire

treatments in Middle and State Tank units are tentatively set for early May of 2012 to ensure that all weather conditions fall within the prescription parameters.

Burn unit selections will be staggered each year in a manner such that no two adjacent burn units will be burned during any given year. The action will help to ensure that unburned vegetation will always be available adjacent to areas subjected to prescribed fire. HMP guidelines also specify similar guidance in this regard.

Refuge personnel will conduct site visits to ascertain information regarding fuel loadings and habitat conditions in proposed candidate burn units. This information will be used to determine specific burn units for each year and help to ensure the best selections are met based on current site specific conditions.

One of the ignition methods described in the Multi-Unit Burn Plan calls for use of aerial ignition devices. It is important to note that, while aerial ignitions may take place under special conditions, this type of ignition method will be minimized due to cost limitations, safety issues and implementation logistics. Use of drip torches and other ground based ignition tools will be used in the vast majority of prescribed burns.

As is the case for all ignition methods described in the Multi-Unit Burn Plan, aerial ignition devices will only be used when they provide the best tool to achieve specific habitat enhancement objectives (i.e., reduce predator hiding cover in the pronghorn habitat management zone). Refuge personnel will implement additional planning and site preparation measures when needed to minimize the potential for collateral damage to non-targeted resources including drainages, saguaros or other valued resources. These actions may include increasing the spacing between incendiary devices dropped from helicopters (i.e., ping pong balls) and placed at safe distances from key drainages. In some cases, aerial ignition devices could be used in the masked bobwhite zone if this is determined to be the best ignition method to create low intensity, mosaic burn patterns and other desired habitat enhancement conditions there.

The BA and this BO have evaluated potential take and effects on listed species given the implementation of this programmatic guidance and associated conservation measures. As long as the Refuge implements the Multi-Unit Burn Plan in conformance with the guidelines and measures outlined in the BA and this BO, the Refuge is covered for the anticipated incidental take summarized in the Incidental Take Statement of this BO for prescribed burns conducted as described in the Multi-Unit Burn Plan from 2012 – 2017.

Burn Season

Based on HMP guidelines, prescribed burning may occur from April 1 to September 30 in any given year. As described in previous fire management plans, the majority of prescribed fire treatments will take place in May and June to emulate naturally occurring pre-monsoon fire events. In some cases, fall and winter burns may take place. This would allow for burning in situations where fuels were inadequate on some portions of the refuge, but abundant in others. It allows the fire staff to seize the opportunity to burn units when conditions are right.

Acreage

Based on HMP guidelines, a cap of 9,000 acres may be burned in the spring and summer of any given year to minimize potential short-term negative impacts to listed species. In some cases, fall and winter burns may take place as long as the total area of prescribed fire does not exceed 20,000 acres within a given year. In other words, an additional 11,000 acres may be burned in fall and winter burns, as long as

the objectives of such prescribed burns would meet the goals of the HMP and Multi-unit Burn Plan.

Resource and Prescribed Fire Objectives of the Multi-Unit Burn Plan

The resource and prescribed fire objectives of the Multi-Unit Burn Plan are as follows:

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

Restore and enhance native Sonoran semi-desert grasslands on the Buenos Aires National Wildlife Refuge.

Burn in a mosaic pattern, which helps to increase biodiversity.

Reduce and/or maintain mesquite canopy cover to <15%.
Reduce and/or maintain mesquite structure as shrub rather than tree.

Manage fire to reduce introduced lovegrass frequency to between zero and 10%, and favor native grasses over Lehman lovegrass.

Top kill 90% or more of Lehman's lovegrass.
Top kill 85% or more of all mesquite trees less than 10' tall not in protected drainages.

Complete necessary compliance work, including section 7 endangered species consultations and annual state smoke compliance documentation. Burn units will be selected within the entire grassland area of the refuge based on HMP goals, objectives and funding. The required NEPA compliance for this activity is tied to the approved 2003 Refuge Comprehensive Conservation Plan and 2008 Fire Management Plan.

As part of complying with recommendations from the AESO and previous section 7 endangered species consultations, implement special preparations for saguaro cacti and Pima pineapple cacti. These preparations involve the careful use of hand-tools to sufficiently reduce burnable vegetation in direct contact or near proximity to known cacti locations to ensure they are not harmed during burning.

Improve the efficiency of the AZ Fire District to assist in the management of masked bobwhite habitat and restoration of approximately 20,000 acres of native grassland annually, only a portion of which will be through the use of prescribed burning under the Multi-Unit Burn Plan.

Ensure public and firefighter safety throughout all operations. Keep prescribed fire within the defined boundaries of each individual burn unit. Ensure observed fire behavior and ambient conditions meet plan requirements and can reasonably be expected to achieve objectives.

Conservation Measures

The following measures are actions that the Refuge will take as part of the proposed action to reduce adverse impacts to and to conserve listed species:

Masked Bobwhite

In general, prescribed burns in the masked bobwhite zone will be reduced either in size or in intensity. Although large hot and aggressive fires may be beneficial to restore desired grassland conditions at a broader scale, this type of burning can be detrimental to bobwhites due to potential short term impacts to the breeding habitats for this species. Burns in the bobwhite zone will be implemented in a fashion to ensure that low intensity fire is allowed throughout a burn unit to create a mosaic in which 50% or more of the vegetation remains unburned. The unburned areas will provide essential escape cover and food resources for bobwhites that may be present at the time of ignition. Additionally, burning in a mosaic pattern will improve habitat conditions by creating more edge effects, provide additional mobility corridors and predator escape routes, and increase the level of vegetation structural complexity. If fuel conditions do not allow for this effect to take place, then prescribed fire will be restricted to small sub–unit areas less than 400 acres in size as specified in the HMP. If either of these conditions cannot take place within a given burn unit, then prescribed fire treatments in that burn unit may be suspended for a given year.

If nesting bobwhites or high density bobwhites are located within a unit, the portion of the unit containing the nest or the numerous birds will not be burned.

Adjacent units will not be burned during the same year in order to preserve habitat for birds to move into if the area they are using becomes undesirable due to lack of regeneration of habitat.

In the event that a cool season burn takes place in a unit and the habitat regenerates adequately, a burn in an adjacent unit might be considered for the normal May-June time frame if it is needed for a valid wildlife habitat restoration goal.

Pima Pineapple Cactus

Based on HMP guidance and the 2005 Fire Management Plan Biological Opinion, the following measures will take place in all planned prescribed burn units to reduce adverse impacts to and to conserve the Pima pineapple cactus:

Surveys for Pima pineapple cactus will be conducted in each burn unit scheduled for burning if the unit has not been completely surveyed within the past 5 years. The goal is to survey 100% of the habitat designated as having high or medium potential for Pima pineapple cactus based on the GIS habitat model.

Post burn surveys of up to 100% of the low potential habitat within each burn unit will be conducted, and data will be used to further validate the GIS habitat model. One hundred percent of all viable Pima pineapple cactus detected in pre-burn surveys will be re-visited to assess potential fire damage to individual cacti.

Data collected as part of each Pima pineapple cactus survey will include cactus measurements, number of pups present, percent vegetative cover, map of the area surveyed, hours surveyed, number of people surveying, number of Pima pineapple cactus located and map coordinates for each individual cactus. Pima pineapple cactus datasheets will be completed for each individual.

All Pima pineapple cacti will be marked and will be protected from fire by removal of fuels around each cactus. Measures will be taken to ensure that mortality of Pima pineapple cacti does not exceed 5% due

to the effects of fire. Vegetative cover surrounding each cactus will determine the level of clearing. The Refuge will save a circle of vegetation 2 feet in diameter centered on each cactus. Then a 10 foot zone will be cleared around the 2 foot diameter circle. The clearing could be done by blacklining, mowing (weedwhacking) and raking, foaming or whatever measure is appropriate to make the doughnut shaped area unlikely to burn.

The Refuge will survey all the high and medium probability areas predicted by the Pima pineapple cactus predictive model. Since the predictive model did not accurately predict presence of the cacti on narrow, gravelly ridges due to the coarseness of the digital elevation model (DEM) data it was agreed that the model would be refined using newly available data. The model is considered dynamic and may be refined whenever potential contributing information is identified. In addition to surveying the high and medium probability areas, areas seeming to be appropriate, but not predicted by the model will be surveyed.

Chiricahua Leopard Frog

The dirt tanks containing these species are typically surrounded by elevated berms which effectively protect the tanks from ash and sediment inflow. The inlets, however, are somewhat vulnerable. In the situation of Rock and State Tanks, both are double tanks where a smaller dugout area effectively functions as a silt trap. In order to protect tanks from any infiltration of harmful ash, either the trap will be cleaned at some interval following the burn, or a straw bale type sediment trap will be used at the inlet in order to prevent harmful ash from settling into the tanks. Protective measures at State Tank are not necessary for the planned burn in April 2012 since leopard frogs are currently absent due to dry conditions. Choffo, Carpenter, Banado, Triangle, Cactus Barrel and Garcia Tanks are not in burn units proposed in 2012, so no protection will be needed. However, in subsequent years, similar precautions will be implemented at these tanks should they fall within a burn unit selected for a given year under the Multi-Unit Burn Plan.

The headquarters holding pond is a cement structure and is adjacent to the headquarters building. No protective measures are needed at this pond, other than protecting the entire headquarters area from fire.

STATUS OF THE SPECIES

Pima Pineapple Cactus

The Pima 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. Biological information was summarized in the proposed and final listing rules.

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.

The area of habitat reviewed under section 7 of the ESA in approximately 26 consultations between 1987 and 2000 (i.e., habitat developed or significantly modified beyond the point where restoration would be a likely alternative) is approximately 24,429 acres, which represents 43 percent of the total area surveyed to date. In 1998, more than 1,100 acres of pineapple cactus habitat were lost, including 752 acres from the ASARCO, Inc. Mission complex project. In 2000, 586 acres of habitat were lost with the expansion of a state prison in Tucson. In 2001, 177 acres of habitat were lost through development, but 888 acres of occupied and suitable habitat were conserved through conservation easements. In 2002-2003, 76.5 acres of occupied habitat were destroyed, but 36 acre-credits were purchased in the pineapple cactus conservation bank, thus protecting 36 acres of pineapple cactus habitat, and an additional 58.5 acres of pineapple cactus habitat were conserved in a conservation easement. We are aware of housing developments along Valencia Road, Pima County, Arizona, in the vicinity of T15S, R12E, Section 15 and surrounding areas, which support pineapple cacti. In addition, residential development has continued, although at a slower rate than historically, in the Corona de Tucson area in the southeastern portion of the Tucson Basin. These developments affect several hundred acres of habitat and have not been evaluated through the section 7 process. The number of acres lost through private actions, not subject to Federal jurisdiction, is not known but, given the rate of urban development in Pima County, we believe it is significant.

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 (since 1993) at which much of the prime habitat is being developed, fragmented, or modified.

The Arizona Native Plant Law may delay vegetation clearing on private property for the salvage of specific plant species within a 30-day period. Although the Arizona State Native Plant Law prohibits the illegal taking of this species on State and private lands without a permit for educational or research purposes, it does not provide for protection of plants in situ through restrictions on development activities.

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. Although there has been a recent slowdown in the development of residential and commercial properties, 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.

Our information indicates that, rangewide, more than 45 consultations have been completed or are underway for actions affecting the pineapple cactus. The majority of these BOs 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 Quail

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); the Act. 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). A recovery team was formed in 2008 to provide guidance in preventing the extinction of this species and to develop and prioritize recovery actions.

Biological information on masked bobwhite is summarized in the recovery plan for this species (U.S. Fish and Wildlife Service 1995). Quantitative data on masked bobwhite in Mexico is lacking, although recent survey work has been funded in Mexico for both on-the-ground surveys and cultural and historical investigations of the occurrence of masked bobwhite in Sonora. The known populations of masked bobwhite have shown a significant decline in recent years. No masked bobwhites have been detected in

the wild in Mexico since 2008. The population of masked bobwhite in the United States is found primarily on the Refuge and ranchlands immediately adjacent to the Refuge. Several observations in the north end of the Altar Valley have been made along SR 286. Summer call-count survey data from the Refuge is summarized in Table 1.

The only formal Section 7 consultations on masked bobwhite quail have been related to fire isses on the Refuge and Refuge management. The quail has also been included in several informal consultations related to the Refuge's Comprehensive Conservation Plan and various quail related management actions on the Refuge.

Chiricahua Leopard Frog

The Chiricahua leopard frog (*Rana chiricahuensi*s) was listed as a threatened species without critical habitat in a Federal Register notice dated June 13, 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. The frog is distinguished from other members of the *Rana pipiens* complex by a combination of characters, including a distinctive pattern on the rear of the thigh consisting of small, raised, cream-colored spots or tubercles on a dark background; dorsolateral folds that are interrupted and deflected medially; stocky body proportions; relatively rough skin on the back and sides; and often green coloration on the head and back (Platz and Mecham 1979). The species also has a distinctive call consisting of a relatively long snore of 1 to 2 seconds in duration (Davidson 1996, Platz and Mecham 1979). Snout-vent lengths of adults range from approximately 2.1 to 5.4 inches (Stebbins 2003, Platz and Mecham 1979).

The Chiricahua leopard frog is an inhabitant of cienegas, pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations of 3,281 to 8,890 feet in central and southeastern Arizona; west-central and southwestern New Mexico; and in Mexico, northern Sonora, and the Sierra Madre Occidental of northern and central Chihuahua (Platz and Mecham 1984, Degenhardt *et al.* 1996, Sredl *et al.* 1997, Sredl and Jennings *in press*). Reports of the species from the State of Aguascalientes (Diaz and Diaz 1997) are questionable. The distribution of the species in Mexico is unclear due to limited survey work and the presence of closely related taxa (especially *Rana montezumae*) in the southern part of the range of the Chiricahua leopard frog. In New Mexico, of sites occupied by Chiricahua leopard frogs from 1994-1999, 67 percent were creeks or rivers, 17 percent were springs or spring runs, and 12 percent were stock tanks (Painter 2000). In Arizona, slightly more than half of all known historical localities are natural lotic systems, a little less than half are stock tanks, and the remainder are lakes and reservoirs (Sredl *et al.* 1997). Sixty-three percent of populations extant in Arizona from 1993-1996 were found in stock tanks (Sredl and Saylor 1998).

Northern populations of the Chiricahua leopard frog along the Mogollon Rim and in the mountains of west-central New Mexico are disjunct from those in southeastern Arizona, southwestern New Mexico, and Mexico. Genetic analyses, including a 50-loci starch gel survey, morphometrics, and analyses of nuclear DNA supports describing the northern populations as a distinct species (Platz and Grudzien 1999). In another study, frogs from these two regions showed a 2.4 percent average divergence in mitochondrial DNA sequences (Goldberg *et al.* 2004). Multiple haplotypes within *chiricahuensis* were also identified using mitochondrial DNA analysis (Benedict and Quinn 1999), providing further evidence of genetically distinct demes or groups of related populations. Based on morphological similarities, Hillis and Wilcox (2005) suggest the northern populations may be referable to *Rana fisheri* (Vegas Valley leopard frog), a taxon from the Las Vegas Valley, Nevada, considered by most to be extinct (Bradford 2002). However, *R. fisheri* in the Vegas Valley was disjunct from Mogollon Rim *chiricahuensis*

populations by about 230 miles, thus if the two are closely-related or conspecific, it begs some interesting biogeographical questions.

Die-offs of Chiricahua leopard frogs were first noted in former habitats of the Tarahumara frog (*Rana tarahumarae*) in Arizona at Sycamore Canyon in the Pajarito Mountains (1974) and Gardner Canyon in the Santa Rita Mountains (1977-78) (Hale and May 1983). From 1983-1987, Clarkson and Rorabaugh (1989) found Chiricahua leopard frogs at only two of 36 Arizona localities that had supported the species in the 1960s and 1970s. Two new populations were reported. During subsequent extensive surveys from 1994-2001, the Chiricahua leopard frog was found at 87 sites in Arizona, including 21 northern localities and 66 southern localities. (Sredl *et al.* 1997, Rosen *et al.* 1996, Service files). In New Mexico, the species was found at 41 sites from 1994 -1999; 31 of those were verified extant during 1998-1999 (Painter 2000). During May-August 2000, the Chiricahua leopard frog was found extant at only eight of 34 sites where the species occurred in New Mexico during 1994-1999 (C. Painter, pers. comm. 2000). The species has been extirpated from about 75 percent of its historical localities in Arizona and New Mexico. The status of the species in Mexico is unknown.

Based on Painter (2000) and the latest information for Arizona, the species is still extant in most major drainages in Arizona and New Mexico where it occurred historically; with the exception of the Little Colorado River drainage in Arizona and possibly the Yaqui drainage in New Mexico. It has also not been found recently in many rivers, valleys, and mountain ranges, including the following in Arizona: White River, West Clear Creek, Tonto Creek, Verde River mainstem, San Francisco River, San Carlos River, upper San Pedro River mainstem, Santa Cruz River mainstem, Aravaipa Creek, Babocomari River mainstem, and Sonoita Creek mainstem. In southeastern Arizona, no recent records (1995 to the present) exist for the following mountain ranges or valleys: Pinaleno Mountains, Peloncillo Mountains, Sulphur Springs Valley, and Huachuca Mountains. Moreover, the species is now absent from all but one of the southeastern Arizona valley bottom cienega complexes. In many of these regions, Chiricahua leopard frogs were not found for a decade or more despite repeated surveys. Recent surveys suggest the species may have recently disappeared from some major drainages in New Mexico (C. Painter and R. Jennings, pers. comm. 2004).

Threats to this species include predation by nonnative organisms, especially bullfrogs, fish, and crayfish; disease; drought; 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. Loss of Chiricahua leopard frog populations is part of a pattern of global amphibian decline, suggesting other regional or global causes of decline may be important as well (Carey *et al*. 2001). Numerous studies indicate that declines and extirpations of Chiricahua leopard frogs are at least in part caused by predation and possibly competition by nonnative organisms, including fish in the family Centrarchidae (*Micropterus* spp., *Lepomis* spp.), bullfrogs (*Rana catesbeiana*), tiger salamanders (*Ambystoma tigrinum mavortium*), crayfish (*Orconectes virilis* and possibly others), and several other species of fish (Fernandez and Rosen 1998, 1996; Rosen *et al.* 1996; 1994; Snyder *et al.* 1996; Fernandez and Bagnara 1995; Sredl and Howland 1994; Clarkson and Rorabaugh 1989). For instance, in the Chiricahua region of southeastern Arizona, Rosen *et al.* (1996) found that almost all perennial waters investigated that lacked introduced predatory vertebrates supported Chiricahua leopard frogs. All waters except three that supported introduced vertebrate predators lacked Chiricahua leopard frogs. Sredl and Howland (1994) noted that Chiricahua leopard frogs were nearly always absent from sites supporting bullfrogs and nonnative predatory fish. Rosen *et al.* (1996) suggested further study was needed to evaluate the effects of mosquitofish, trout, and catfish on frog presence.

Disruption of metapopulation dynamics is likely an important factor in regional loss of populations (Sredl *et al.* 1997, Sredl and Howland 1994). Chiricahua leopard frog populations are often small and habitats are dynamic, resulting in a relatively low probability of long-term population persistence. Historically, populations were more numerous and closer together. If populations winked out due to drought, disease, or other causes, extirpated sites could be recolonized via immigration from nearby populations. However, as numbers of populations declined, populations became more isolated and were less likely to be recolonized if extirpation occurred. Also, most of the larger source populations along major rivers and in cienega complexes have disappeared.

Fire frequency and intensity in Southwestern forests are much altered from historical conditions (Dahms and Geils 1997). Before 1900, surface fires generally occurred at least once per decade in montane forests with a pine component. Beginning about 1870-1900, these frequent ground fires ceased to occur due to intensive livestock grazing that removed fine fuels, followed by effective fire suppression in the mid to late 20th century (Swetnam and Baisan 1996). Absence of ground fires allowed a buildup of woody fuels that precipitated infrequent but intense crown fires (Danzer *et al.* 1997, Swetnam and Baisan 1996). Absence of vegetation and forest litter following intense crown fires exposes soils to surface and rill erosion during storms, often causing high peak flows, sedimentation, and erosion in downstream drainages (DeBano and Neary 1996). Following the 1994 Rattlesnake fire in the Chiricahua Mountains, Arizona, a debris flow filled in Rucker Lake, a historical Chiricahua leopard frog locality. Leopard frogs (either Chiricahua or Ramsey Canyon leopard frogs) apparently disappeared from Miller Canyon in the Huachuca Mountains, Arizona, after a 1977 crown fire in the upper canyon and subsequent erosion and scouring of the canyon during storm events (Tom Beatty, Miller Canyon, pers. comm. 2000). Leopard frogs were historically known from many localities in the Huachuca Mountains; however, natural pool and pond habitat is largely absent now and the only breeding leopard frog populations occur in artificial tanks and ponds. Crown fires followed by scouring floods are a likely cause of this absence of natural leopard frog habitats. Bowers and McLaughlin (1994) list six riparian plant species they believed might have been eliminated from the Huachuca Mountains as a result of floods and debris flow following destructive fires.

Recent evidence suggests a chytridiomycete skin fungus, *Batrachochytrium dendrobatidis*, is responsible for global declines of frogs, toads, and salamanders (Speare and Berger 2000, Longcore *et al.* 1999, Berger *et al.* 1998, Hale 2001). Although the cause of death is uncertain, a thickening of the skin on the feet, hind legs and ventral pelvic region is thought to interfere with water and gas exchange, leading to death of the host (Nichols *et al.* 2001). The proximal cause of extinctions of two species of Australian gastric brooding frogs and the golden toad (*Bufo periglenes*) in Costa Rica was likely chytridiomycosis. Another species in Australia for which individuals were diagnosed with the disease may be extinct (Daszak 2000). In Arizona, chytrid infections have been reported from four populations of Chiricahua leopard frogs (M. Sredl, pers. comm. 2000), as well as populations of other several other frogs and toads (Bradley *et al.* 2002, Hale 2001, Davidson *et al.* 2000, Sredl and Caldwell 2000, Morell 1999). In New Mexico, chytridiomycosis was identified in a declining population near Hurley, and patterns of decline at 3 other populations are consistent with chytridiomycosis (R. Jennings, pers. comm. 2000). Die-offs occur during the cooler months from October-February. High temperatures during the summer may slow reproduction of chytrids to a point at which the organism cannot cause disease (Bradley *et al.* 2002). Rollins-Smith *et al.* (2002) also showed that chytrid spores are sensitive to antimicrobial peptides produced in ranid frog skin. The effectiveness of these peptides is temperature dependent and other environmental factors probably affect their production and release (Matutte *et al.* 2000).

The role of the fungi in the population dynamics of the Chiricahua leopard frog is as yet undefined;

however, there is increasing evidence for amphibian population declines correlated with chytrid infections (Carey *et al.* 2003). It is clear that Chiricahua leopard frog populations can exist with the disease for extended periods. The frog has coexisted with chytridiomycosis in Sycamore Canyon, Arizona since at least 1972. However, at a minimum, it is an additional stressor, resulting in periodic die-offs that increase the likelihood of extirpation and extinction. It may well prove to be an important contributing factor in observed population decline, and because of the interchange of individuals among subpopulations, metapopulations of frogs may be particularly susceptible. Rapid death of all or most frogs in stock tank populations in a metapopulation of Chiricahua leopard frogs in Grant County, New Mexico was attributed to post-metamorphic death syndrome (Declining Amphibian Populations Task Force 1993). Hale and May (1983) and Hale and Jarchow (1988) believed toxic airborne emissions from copper smelters killed Tarahumara frogs and Chiricahua leopard frogs in Arizona and Sonora. However, in both cases, symptoms of moribund frogs matched those of chytridiomycosis. The disease has now been documented to have been associated with Tarahumara frog die-offs since 1974 (Hale 2001). The earliest record for chytridiomycosis in Arizona (1972) roughly corresponds to the first observed mass die-offs of ranid frogs in Arizona.

Free-ranging healthy bullfrogs with low-level chytriodiomycosis infections have been found in southern Arizona (Bradley *et al.* 2002). Tiger salamanders and bullfrogs can carry the disease without exhibiting clinically significant or lethal infections. When these animals move, or are moved by people, among aquatic sites, chytridiomycosis may be carried with them (Collins *et al.* 2003). Other native or nonnative frogs may serve as disease vectors or reservoirs of infection, as well (Bradley *et al.* 2002). Chytrids could also be spread by tourists or fieldworkers sampling aquatic habitats (Halliday 1998). The fungus can exist in water or mud and thus could be spread by wet or muddy boots, vehicles, cattle, and other animals moving among aquatic sites, or during scientific sampling of fish, amphibians, or other aquatic organisms. The Service and Arizona Game and Fish Department are employing preventative measures to ensure the disease is not spread by aquatic sampling.

Additional information about the Chiricahua leopard frog can be found in Painter (2000), Sredl *et al.* (1997), Jennings (1995), Degenhardt *et al.* (1996), Rosen *et al.* (1996, 1994), Sredl and Howland (1994), Platz and Mecham (1984, 1979), and Sredl and Jennings (*in press*).

Our information indicates that, rangewide, more than 105 formal section 7 consultations have been completed or are underway for actions affecting Chiricahua leopard frogs. The majority of these opinions concerned the effects of grazing (approximately 62 percent), utility and water projects (approximately 8 percent), agency planning (approximately 8 percent), or recovery actions (approximately 8 percent). The remaining 14 percent of consultations dealt with fire, flooding, recreation, residential development, water development, border security, and water quality issues.

Chiricahua Leopard Frog Critical Habitat

On March 20, 2012, the Service designated approximately 10,346 acres (4,187 hectares) as critical habitat for the leopard frog in Apache, Cochise, Gila, Graham, Greenlee, Pima, Santa Cruz, and Yavapai Counties, Arizona; and Catron, Grant, Hidalgo, Sierra, and Socorro Counties, New Mexico. This included two critical habitat units within the Refuge boundaries, the Central Tanks Unit and the Garcia Tank Unit (see Maps 4 and 5). Issues related to the effects of the proposed action on leopard frog critical habitat are discussed in our concurrence in Appendix A.

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 Federal actions in the action area that have undergone formal or early section 7 consultation, and 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

The action area and general environmental baseline for the action area is described in the 2002 BO BANWR FMP (USFWS 2002). The Refuge habitat and activities on the Refuge have not changed substantially and the description in those previous documents is incorporated herein by reference. The fire program on the Refuge has been more focused on recent HMP objectives, with a subsequent reduction in the acres burned. In response to the an increase in illegal immigration and smuggling across the Refuge and in the Altar Valley at large, Border Patrol infrastructure (fences, barriers, towers, etc.) has increased. A general trend towards a decrease in illegal activity has been observed, but Border Patrol maintains a presence in the action area with the ongoing presence of agents, continued patrols, surveillance activity, and interdictions.

Pima Pineapple Cactus

A. Status of the Species within the Action Area

The status of Pima pineapple cactus through 2003 was described in the 2004 BO BANWR FMP and in the 2002 BO BANWR FMP. The Refuge implemented the prescribed burns that were proposed in the 2004 BO (USFWS 2004). In 2004, complete surveys of high and medium quality habitat in burn units were completed for the first time since cactus surveys began. A total of 85 cacti were found during 542 person hours of pre-burn surveys and 226 person-hours of 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 (2004) of 38 individuals in the burn units documented six pineapple cacti killed due to fire and four killed through non-fire related effects.

New data regarding the Pima pineapple cactus on BANWR was gathered in 2010. During the 2009-10 pre-burn Pima pineapple cactus surveys, a total of 114 new Pima pineapple cacti were discovered. Data records for each of these Pima pineapple cactus were included in the GIS database, resulting in a combined total of 597 Pima pineapple cactus records for the Refuge. Thirty-five new and previously discovered viable Pima pineapple cactus occurred within the FY2010 burn unit boundaries. All protective measures specified in the BO were applied to each of these cacti to protect them from potentially damaging fire effects. The 35 Pima pineapple cactus in the burn units were revisited within 5 weeks of the burns to evaluate impacts from fire.

Results of the post-burn surveys are as follows:

- 0 (0%) Pima pineapple cactus died from fire
- 0 (0%) Pima pineapple cactus were burned, had singed spines or showed any fire related heat stress
- All 35 (100%) viable cacti were protected from fire effects by removing fuel surrounding each plant.

- 7 (20%) Pima pineapple cactus showed signs of shriveling and desiccation due primarily to pre-monsoon drought conditions
- 3 (8%) had broken or crushed portion but remained healthy and viable. This was due to animal and/or human activity.

The 114 newly discovered Pima pineapple cactus were also used as additional validation points to assess the GIS Pima pineapple cactus predictive model accuracy. Newly assessed model accuracies results are as follows:

- 428 points were used to validate the model
- 209 (48.8%) occurred within predicted high probability habitat
- 162 (37.9%) occurred within predicted moderate probability habitat
- 371 (86.7%) occurred within predicted suitable habitat (high and moderate probability areas combined)
- 57 (13.3%) occurred within predicted non-habitat.

Overall model accuracy for suitable habitat had dropped slightly from 88% to 86.7% as compared to accuracy the assessment completed in 2008. This is due primarily to the discovery of several new Pima pineapple cactus which occurred in close proximity but outside mapped predicted areas in 2009 and 2010. The GIS model will be updated and improved prior to the implementation of future Pima pineapple cactus surveys.

Annual Pima pineapple cactus survey efforts on the Refuge have been ongoing and total individual cacti documented through 2012 are summarized in Table 2 and shown on Map 3.
A total of 607 Pima pineapple cactus locations are known on the Refuge, although the current status of each of these plants is unknown because each individual is not monitored each year.

B. Factors Affecting Species Environment within the Action Area

Pima pineapple cacti within the action area are protected from most of the threats faced by this species off the Refuge, such as urban development, mining, and recreational off-road vehicle use. However, ground disturbances from Arizona Department of Transportation maintenance activities, specifically the clearing of a 30-foot vehicle recovery zone in some areas along the sides of SR 286, may disturb individuals that may be growing near the road side. Past road improvement projects, such as a bridge replacement and road realignment, may have resulted in the loss of individuals. Several acres of habitat were converted to highway roadway. In addition, several roadside fires have impacted the habitat along the road side.

Human disturbance in the action area, while localized, could have a substantial effect on Pima pineapple cactus. The least impacting of these human activities is individuals exploring wildlife-related recreational opportunities on the Refuge. A more serious human disturbance is the large number of undocumented aliens and drug traffickers moving through the action area. New trails are created regularly and campfires left unattended pose a serious fire risk. In addition, the use of off-Highway Vehicles by Border Patrol while monitoring and apprehending these individuals could present a significant impact on this species. Recent construction and operation of the international border protection infrastructure has occurred on the Refuge. 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. However, all of these actions are still ongoing.

Prescribed fire has been used as a habitat management tool on the Refuge since it was established. However, based on ongoing monitoring as described above, preliminary indications are that impacts from prescribed fire on Pima pineapple cacti can be managed and reduced. Ongoing surveys, monitoring, and research will continue to improve fire management related to this species.

Masked Bobwhite Quail

A. Status of the Species within the Action Area

The reintroduced individuals on the Refuge make up the only known masked bobwhite quail population in the United States. The Refuge continued to breed and release more individuals through 2005, at which point releases were suspended until 2011 in an effort to better understand issues related to the captive flock and develop protocols to better prepare individual masked bobwhites for release. The population has been monitored continually using summer call counts. The population on the Refuge remained relatively stable at approximately 150-300 individuals through 2005, but has suffered significant decline since then (Table 1). Five nests have been observed on the Refuge (Simms 1989, Sally Gall pers. com.). One of these observations was in late April of 2004, several months prior to the typical nesting period of July. No nests have been observed since that time.

Masked bobwhite quail may occur refuge-wide in appropriate grassland habitat (approximately 80 percent of the refuge is suitable for bobwhite). They are most likely in the valley bottom, and least likely to be found in the foothills, Brown Canyon, and in the riparian areas. The species has spread to areas off-refuge, as well, with reports as far north as the Diamond Bell area near Three Points and on Rancho de la Osa west of Sasabe.

Surveys for masked bobwhite are done annually, during the summer breeding season. Since 2001, twenty-one standardized routes have been used. Call counts begin when the monsoon rains begin, and may continue until early September. Summer call counts do not detect all of the birds, and may only detect the unpaired males still seeking females. In addition, recent observations of two males calling side by side from a small tree indicate that even unpaired males may be under-counted due to our inability to differentiate the call of one male from that of another when the two exist in close proximity. The sporadic calling patterns of the males in summer also make it difficult to count birds. At best, the summer call counts are an index of abundance. Bobwhites detected on summer call count surveys are summarized in Table 1.

In October and November 2004, assembly call counts were done in order to locate coveys in the central portion of the refuge. This is the currently recommended technique for counting bobwhite. Taking into account certain weather variables, 75-79 percent of coveys are typically detected, based upon responses from northern bobwhite quail (Wellendorf el al. 2004, Seiler et al. 2002). However, in situations of low density birds, such as with the masked bobwhite, the techniques turned out to be labor intensive and a somewhat unreliable indicator of presence/absence of birds. Three coveys were detected in Middle Unit, and additional covey was found in Secundino Unit, two more coveys in Triangle Unit, and one covey just below the Headquarters buildings.

It is important to note that recent detections of bobwhites (since 2011) during call count surveys and incidental observations were likely due to the lifting of a ban on releasing of pen reared birds and likely do not indicate natural breeding activity. The refuge had re-started the bobwhite release program with a soft release of pen reared birds in October 2010 at Huacheta Springs near Rock Tank. This action

represents the first time bobwhites had been released on the refuge since the release program was suspended in the fall of 2005 and is based on recommendations from the Masked Bobwhite Quail Recovery Team.

Despite surveying every morning when conditions allowed in 2011, only one masked bobwhite was detected during the formal surveys. In addition, four reliable anecdotal detections took place within Refuge in 2009 and 2010. Descriptions of formal and anecdotal masked bobwhite detections are as follows:

- A single male MBQ seen by Law Enforcement Officer Scott Kozma and Ed Carr near Carpenter Tank on 11-Nov-09.
- Two or more masked bobwhites were seen with within a covey of ~ 8 Montezuma quail on 17-Nov-09 on the eastern edge of the Yellow Jacket Burn Unit by BANWR volunteers Dan and Laurie Mooney. These detections were confirmed by Refuge Biologists on 19-Nov-09.
- A single singing male MBQ was seen by SCA Intern Liz Payne during a formal survey near Huatcheta Springs/Rock Tank on 31-Jul-10.
- Law Enforcement Officer Jim Casey saw a single male MBQ fly over the hood of his vehicle on the Refuge Entrance road on 8-Aug-10.

Captive bred/pen reared MBQ were released on two sites within BANWR during 2010. Twenty-eight bobwhites were released near Huatcheta Springs on 25-Jul-10 and 46 bobwhites were released in the Montana Unit on 14-Jul-10. The MBQ's that Liz Payne and Jim Casey saw were likely dispersing birds from the Huatcheta Springs release site.

Even though all of these formal and anecdotal detections are considered confirmed and valid, we concluded that the population of free roaming masked bobwhites on the Refuge has declined significantly since 2004 when the last broad-scale programmatic releases of pen-reared birds took place.

B. Factors Affecting Species Environment within the Action Area

Drought, predation, and small population size seems 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 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. The factors affecting masked bobwhite on the Refuge were documented in the 2004 BO BANWR FMP. 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.

Chiricahua Leopard Frog

A. Status of the Species within the Action Area

Chiricahua leopard frogs were discovered in Garcia Tank in 1994. Since that time they have been found in Choffo, Carpenter, State and Rock Tanks and were found in the headquarters holding pond, which was originally constructed for Chiricahua leopard frog propagation. The species has also been found on adjacent Forest Service land in 2004 where over 300 individuals were noted. The locations on the Forest Service land are part of the metapopulation of Chiricahua leopard frogs on the southern portion of the Refuge.

Refuge-wide surveys implemented by USGS staff in August, 2010 confirm the presence of leopard frogs within several of the stock tanks previously identified as habitat for these species. No new habitat areas have been identified within BANWR for leopard frogs.

Leopard Frog Critical Habitat

On March 20, 2012, the Service designated approximately 10,346 acres (4,187 hectares) as critical habitat for the leopard frog in Apache, Cochise, Gila, Graham, Greenlee, Pima, Santa Cruz, and Yavapai Counties, Arizona; and Catron, Grant, Hidalgo, Sierra, and Socorro Counties, New Mexico. This included two critical habitat units within the Refuge boundaries, the Central Tanks Unit and the Garcia Tank Unit (see Maps 4 and 5), that cover approximately 1,721acres (697 hectares) of the Refuge. Issues related to the effects of the proposed action on leopard frog critical habitat are discussed in our concurrence in Appendix A.

B. Factors Affecting Species Environment within the Action Area

Threats to this species are from invasion of exotic predators, primarily bullfrogs, into these tanks and loss of aquatic habitats to drought. In order to conserve the metapopulation of leopard frogs, the Refuge has dug a well and installed a solar pump at Garcia Tank in order to provide reliable permanent water for the frog. Carpenter, State, Rock Tanks, and the headquarters holding pond (artificially filled) are permanent water sources. Status of the Choffo Tank population is unknown. The refuge is currently working with the University of Arizona to remove bullfrogs from several tanks in order to prepare them for leopard frog releases in the future. In addition, the restoration of earthen water tanks, once used for livestock, is being planned for wildlife use, including Chiricahua leopard frogs. Additionally, the placement of these tanks is being discussed to avoid providing a potential pathway for bullfrog dispersal.

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 effects of increased immigration and Border Patrol activities have little impact on Chiricahua leopard frogs. The occupied tanks are relatively large and the potential for impacts from immigrants (undocumented aliens) drinking or walking in the water are insignificant. The use of these tanks for bathing and personal hygiene may result in some decrease in water quality, but effects of this type have not been studied or documented.

EFFECTS OF THE ACTION

Pima Pineapple Cactus

The effects of the proposed action are similar to those described in the 2002 BO BANWR FMP. Due to the increased accuracy of the predictive habitat model for pineapple cactus and the experience with protective measures over the past fire seasons, we would expect that the effects of implementing the Multi-Unit Burn Plan should be slightly less that those described in the 2002 BO BANWR FMP.

The proposed action may result in direct loss of individual Pima pineapple cactus due to prescribed fire and fire related activities. The continued surveys of the burn units and protection of known individuals will mitigate losses, but in dense stands of grass or in areas that may not be covered in surveys, the potential exists that individual cacti will be killed by fire. The post-burn surveys that are part of this action will aid in 1) determining rates of detection, 2) determining fire related mortality, and 3) providing

additional information on cactus distribution. These data will further the accuracy of a predictive model that will assist the Refuge in focusing surveys in areas of highest potential habitat and in implementing conservation actions.

Indirect effects on this species include the potential increase of exotic Lehmann lovegrass within the grassland habitats on the Refuge. There is no evidence to support the hypothesis that frequent burning will reduce the density of Lehmann lovegrass (E. Gieger pers com). The potential exists that Lehmann lovegrass could become the dominant grass species across the Refuge, as fire can provide an opportunity for Lehmann lovegrass to become established. The largest factor that is correlated with the spread of Lehmann lovegrass seems to be high precipitation (E. Gieger pers com). The effects of rainfall patterns and long-term climate change are issues that are beyond the control of the Refuge, but will also contribute to changes in vegetation and fire ecology of this area. As discussed above, the increase of Lehmann lovegrass could result in increased fire intensity and frequency, which would be detrimental to Pima pineapple cactus.

Masked bobwhite quail

The effects of the proposed action are similar to those described in the 2004 BO BANWR FMP. The reduction in the number of acres burned per year, with a maximum of 9,000 acres to be burned during the spring and summer seasons, will result in reducing the potential direct and indirect adverse effects on masked bobwhite from those described in the 2004 BO BANWR FMP. However, the cool season burns in the sacaton bottoms and other grass dominated bottomlands and terraces could result in moving the coveys from the protection of these bottomland grass habitats, removing foraging resources (seeds), and increasing the potential for masked bobwhite to be trapped within the fire and killed. In addition, the status of the masked bobwhite on the Refuge has declined to a level that it is not reasonably certain that masked bobwhite even occur in any given burn unit. Therefore, the potential for effects to individual masked bobwhite are reduced. In general, effects to the masked bobwhite from the proposed action are expected to decrease because the primary focus of the planned burns is for resource enhancement in accordance with the Refuge's HMP. In other words, burns are planned to enhance the long-term quality of masked bobwhite habitat. These benefits outweigh any potential short-term effects to individuals.

Chiricahua leopard frog

The proposed action is not anticipated to have direct effects on Chiricahua leopard frogs. The season when burn units would be ignited is prior to the typical dispersal period during the monsoon season, July-September. In addition, the frogs are inactive during the period of the cool season burns and are not anticipated to be directly impacted by the burns.

Indirect effects of the prescribed fire are anticipated through increased sediment and ash flow into occupied waters from project related activities that occur upstream from occupied sites. Fire removes vegetation and consumes organic components of ground cover, thus changing the physical and chemical properties of watersheds and the streams, wetlands, and aquatic habitats to which they contribute. The removal of vegetation can trigger an increase in water yield and storm-flow discharge (Swanston 1991). Elevated peak flow volumes and velocities are associated with increased transport of ash and nutrients (Ffolliott et al. 2004). Heavy ash and soot content in water clogs tadpole and fish gills and leads to acute and chronic chemical effects. The runoff of ash contributes phosphoric nutrients to aquatic ecosystems, and the presence of charcoal in water is associated with reduced dissolved oxygen concentrations. Both ammonia and phosphorus levels have been documented to be above lethal limits to fish during fires (Spencer and Hauer 1991). Similar effects are anticipated for leopard frog tadpoles and eggs. In addition,

inflow of ash and sediment into a water body is capable of smothering eggs and tadpoles, resulting in the loss of individuals and reproductive potential. Sediment and ash flow can also inhibit respiration in macroinvertebrates, resulting in reduced density and composition of macroinvertebrates (a primary food resource for the frogs). A reduction in the amount of prey can ultimately affect leopard frog numbers and reproduction. This could have an effect on population persistence and alter the metapopulation dynamics in this portion of the Altar Valley. The conservation measures that are included in this action will minimize these potential indirect effects. The effects of ash and sediment flows are temporary. The aquatic habitats should be habitable after the ash and sediment settles and the aquatic community of invertebrates and plants become reestablished. The Chiricahua leopard frog has a very high reproductive potential and can repopulate a tank fairly quickly once the aquatic habitat becomes hospitable. Tanks outside of the units selected for burning in any given year can act as sources of metapopulation support should effects from the proposed action occur at tanks within the units being burned that year.

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.

The Altar Valley Conservation Alliance (Alliance), whose members include the majority of the land owners and state lease holders in the Altar Valley, are currently working to implement a prescribed fire plan. The Alliance's burn plan generally covers the remaining portions of the Altar Valley Drainage outside of the Refuge. This would include the only portion of Pima pineapple cactus' known distribution that is not currently impacted by development. If adequate conservation measures are not put into place and implemented, and associated monitoring completed, Pima pineapple cactus populations in the northern portion of the Altar Valley could be impacted.

In addition, the corridor along SR 86 from Tucson, AZ to Three-points, AZ is being developed at an increased rate, in particular the north end of the Altar Valley. We are currently aware of development plans for approximately 640 acres, south of Three-points. This area is likely to be under increased pressure for urban developments in the near future. Developments in this area could effectively isolate the southern portion of the Altar Valley from the rest of the range of Pima pineapple cactus.

Other activities in the Altar Valley include illegal cross-border traffic, on-going grazing, outdoor recreational activities and those activities of Arizona Department of Transportation as mentioned above.

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 proposed Multi-Unit Burn Plan, and the cumulative effects, it is our biological opinion that the Multi-Unit Burn Plan 2012 - 2017, as proposed, is not likely to jeopardize the continued existence of the 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 reduction in the number of acres burned annually, when compared to historical levels of burning on the Refuge, reduces overall effects of the action.

- The conservation measures for Pima pineapple cactus have been effective in limiting effects to this species in past years and will continue to be implemented during the proposed action.
- Because the Multi-Unit Burn Plan is intended to meet the goals and objectives of the Refuge's HMP, no long-term adverse affects are anticipated to the habitat for this species.
- The habitat model developed for the Refuge focuses survey efforts and minimization efforts, resulting in more efficient protection of individual Pima pineapple cactus from the proposed burning.

Masked bobwhite quail

After reviewing the current status of masked bobwhite, the environmental baseline for the action area, the effects of the proposed Multi-Unit Burn Plan 2012 – 2017, and the cumulative effects, it is our biological opinion that the Multi-Unit Burn Plan 2012-2017, as proposed, is not likely to jeopardize the continued existence of the 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 to the point that masked bobwhite are not reasonably certain to occur in the action area.
- Any burn units which are determined to have nesting masked bobwhite or high densities of masked bobwhite will be removed from the proposed action.
- Masked bobwhite captive breeding stock will not be impacted by the proposed action.
- The reduction of proposed acreage to be burned has reduced the potential effects to the species.
- The current distribution of the burns within the action area provides adequate habitat on the Refuge for masked bobwhite likely to be released this year or if any are existing on the Refuge.
- The prescribed burns will be implemented to improve quail habitat, so the short-term negative effects will be offset by long-term positive effects.

Chiricahua leopard frog

After reviewing the current status of Chiricahua leopard frog, the environmental baseline for the action area, the effects of the proposed Multi-Unit Burn Plan 2012-2017, and the cumulative effects, it is our biological opinion that the Multi-Unit Burn Plan 2012-2017, as proposed, is not likely to jeopardize the continued existence of the Chiricahua leopard frog. Effects to critical habitat are discussed in our concurrence in Appendix A. In making this determination, we considered the following:

- Burn units selected in any given year will not contain all of the known, occupied tanks on the Refuge. Therefore, tanks in unburned units will be available to provide habitat and population support.
- The tanks on the Refuge are part of a functioning metapopulation that includes several water tanks on the Refuge and on the adjacent Coronado National Forest lands. Tanks that may occur within proposed burn units that may be affected by the proposed action do not represent the entire metapopulation.
- The design of these tanks and the conservation measures included as part of the action reduce the potential for anticipated impacts.
- Any impact from sediment and ash flow will be short-term.
- Chiricahua leopard frog reproductive potential will make up for any reduction in existing population size due to the action.

INCIDENTAL TAKE STATEMENT

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

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

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species, therefore, no discussion of incidental take of the Pima pineapple cactus will occur in this Incidental Take Statement. 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 Quail

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

- The presence of masked bobwhite has only been confirmed once through formal surveys on the BANWR in the past five years. Anecdotal sightings occurred in 2009, 2010, and 2011, but masked bobwhites have not been able to be consistently relocated during any of these years.
- Masked bobwhites are not reasonably certain to be in the burn units proposed in any given year for prescribed burns.
- If masked bobwhites are detected in any of the burn units proposed for any given year under the proposed action, that unit will not be burned.
- The prescribed burn program may result in short-term adverse effects, but is implemented to improve masked bobwhite habitat. Therefore, this action is anticipated to provide a long-term benefit to masked bobwhite through habitat maintenance and improvements.

Chiricahua Leopard Frog

We anticipate take of Chiricahua leopard frogs to occur in the form of harm, harass, or indirect mortality resulting from the increased flow of sediment and ash into Rock and State tanks. Individuals will be harmed through changes in the water chemistry; heavy sediment and ash deposits covering eggs, tadpoles, and clogging gills; and by temporary habitat loss through increased run off after the prescribed burn. Harm would also occur through the loss of habitat resulting in the movement of leopard frogs within and between stock tanks because of altered habitats. This may increase intra-species competition for food and available territories.

Incidental take of Chiricahua leopard frogs will be difficult to detect for the following reasons: early life stages of this species have a small body size, losses may be masked by seasonal fluctuations in numbers or other causes (e.g., oxygen depletions for aquatic species, disease), dead tadpoles and frogs are easily scavenged, and the species occurs in habitat that makes detection difficult; therefore, finding a dead or impaired specimen is unlikely. Consequently, incidental take will be quantified based upon habitat disturbance and surrogate species.

However, take of this species can be anticipated if more than 50 percent of the bottom of an occupied stock tank is covered by fresh silt or ash deposits following a precipitation event. Such deposits are directly related to habitat modifications and, if exceeded, will constitute an unacceptable impact to occupied habitat and individual Chiricahua leopard frogs. Take will also be exceeded if more than 10 dead or dying Chiricahua leopard frogs or 20 fish, tadpoles, or other aquatic vertebrates of any species are observed near or within an occupied stock tank during or within three days of a runoff event. This represents a much larger potential die off of Chiricahua leopard frogs due to a significant change in water and habitat quality.

Effects of the Take

In the accompanying biological opinion, we have determined that this level of anticipated take is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

We believe the following reasonable and prudent measure is necessary and appropriate to minimize take of Chiricahua leopard frogs. In order to be exempt from the prohibitions of section 9 of the Act, you must comply with the accompanying terms and conditions with regard to the proposed action. The terms and conditions are nondiscretionary and implement the reasonable and prudent measure as described.

Chiricahua Leopard Frog

The following reasonable and prudent measure and terms and conditions are necessary and appropriate to minimize take of Chiricahua leopard frogs:

1. You shall attempt to reduce the extent of take in occupied stock tanks when burn units containing occupied stock tanks are burned. This will be accomplished by monitoring fire effects and run-off, and monitoring these tanks to determine if take has occurred.

A. Report to us by January 15 of each year or incorporate this information into the Annual Refuge Work Plan, the extent of the burns, results of all surveys for Chiricahua leopard frog, and the effectiveness of conservation measures.

B. When prescribed burns occur in units containing occupied stock tanks, evaluate the impact of the burn on vegetation and soils to determine if excessive sediment is likely to flow into the drainages of those tanks.

1) On-the-ground evaluation shall be made post burn to determine if the fire severity was enough to remove vegetation and ground cover in or immediately adjacent to drainages or if it led to the formation of hydrophobic soils which would reduce water infiltration and increase run off.
2) The upper tank of the double tank system, or sediment traps, shall be inspected prior to the summer rains and after any large precipitation event to determine if silt removal is needed to allow for the capture of the increased influx of sediment and ash from post-burn run-off.
3) Occupied stock tanks within annual burn units shall be inspected after precipitation events to determine the amount of sediment and ash that may have entered the tank. If Chiricahua leopard frogs or any other aquatic vertebrate species are observed to be stressed or dying, collection and relocation of Chiricahua leopard frogs shall be performed, in coordination with Arizona Game and Fish Department.

Review requirement: The reasonable and prudent measure, with its implementing terms and conditions, is designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measure provided. The Refuge must immediately provide an explanation of the causes of the taking and review with the AESO the need for possible modification of the reasonable and prudent measure.

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. We recommend that the Refuge plan for and document all survey efforts and data on Pima pineapple cactus in the Annual Work Plan.

2. We recommend that the Refuge continue to evaluate the existing Refuge prescribed fire program and its long-term effects on recovery of masked bobwhite. Specifically, evaluate whether the use of prescribed fire is achieving the goals and objectives of the Refuge's HMP and the guidelines of the Recovery Team.

3. We recommend that the Refuge support or encourage research into fire effects on masked bobwhite habitat regeneration and invertebrate food availability.

4. We recommend that the Refuge experiment with the use of mechanical and chemical mesquite control in burn units where high numbers of masked bobwhite are known to occur and where high or moderate value habitat for Pima pineapple cactus is not present.

5. We recommend that the Refuge develop a management plan for stock tanks and other waters that support or could support Chiracahua leopard frogs, northern Mexican gartersnakes, and/or Gila topminnow in cooperation with Arizona Game and Fish Department and our office.

6. Continue active bullfrog control within the BANWR to promote the conservation of Chiricahua leopard frogs and other native aquatic species.

In order for us to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action(s) outlined in the 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.

Our office appreciates the Refuge's efforts to identify and minimize effects to listed species from this project. For further information please contact Scott Richardson (520) 670-6150 (x242) or Jean Calhoun (520) 670-6150 (x223). Please refer to the consultation number 02EAAZ00-2012-F-0165 in future correspondence concerning this project.

/ s / Jean Calhoun for
Steven L. Spangle

cc (hard copy):

Field Supervisor, Fish and Wildlife Service, Phoenix, AZ (2)
Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ

cc (electronic copy):
Regional Chief, National Wildlife Refuge System, Fish and Wildlife Service,
Albuquerque, NM

Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ (Attn: Joan Scott)

LITERATURE CITED

Arizona Game and Fish Department (AGFD). 2002. Heritage management data system. Nongame Branch, Arizona Game and Fish Department, Phoenix.

Benedict, N., and T.W. Quinn. 1999. Identification of Rio Grande leopard frogs by mitochondrial DNA analysis: a tool for monitoring the spread of a non-native species. Department of Biological Sciences, University of Denver, CO.

Berger L., R. Speare, P. Daszak, D.E. Green, A.A. Cunningham, C.L. Goggins, R. Slocombe, M.A. Ragan, A.D. Hyatt, K.R. McDonald, H.B. Hines, K.R. Lips, G. Marantelli, and H. Parkes. 1998. Chytridiomycosis causes amphibian mortality associated with population declines in the rain forests of Australia and Central America. Proceedings of the National Academy of Science, USA 95:9031-9036.

Bowers, J.E., and S.P. McLaughlin. 1994. Flora of the Huachuca Mountains. Pages 135-143 *in* L.F. DeBano *et al.* (Tech. Coord.), Biodiversity and management of the Madrean Archipelago: the sky islands of the Southwestern United States and Northwestern Mexico. USDA Forest Service General Technical Report RM-GTR-264.

Bradford, D.F. 2002. Amphibian declines and environmental change in the Eastern Mojave Desert. *In* Conference proceedings: Spring-fed wetlands: Important scientific and cultural resources of the intermountain region. Http://www.wetlands.dri.edu.

Bradley, G.A., P.C. Rosen, M.J. Sredl, T.R. Jones, and J.E. Longcore. 2002. Chytridomycosis in native Arizona frogs. Journal of Wildlife Diseases 38(1):206-212.

Campbell, J.A. 1998. Amphibians and Reptiles of northern Guatemala, the Yucatan, and Belize. University of Oklahoma Press, Norman, Oklahoma.

Carey, C., D.F. Bradford, J.L. Brunner, J.P. Collins, E.W. Davidson, J.E. Longcore, M. Ouellet, A.P. Pessier, and D.M. Schock. 2003. Biotic factors in amphibian population declines. *In* G. Linder, D.W. Sparling, and S.K. Krest (eds.), Multiple stressors and declining amphibian populations: evaluating cause and effect. Society of Environmental Toxicology and Chemistry (SETAC). Pensacola, Florida.

Carey, C., W.R. Heyer, J. Wilkinson, R.A. Alford, J.W. Arntzen, T. Halliday, L. Hungerford, K.R. Lips, E.M. Middleton, S.A. Orchard, and A.S. Rand. 2001. Amphibian declines and environmental change: use of remote sensing data to identify environmental correlates. Conservation Biology 15(4):903-913.

Carlson, C. A., and R. Muth. 1989. The Colorado River: lifeline of the American southwest. Pages 220-239 In Dodge, D.P. (eds). Proceedings of the International Large River Symposium, Canadian Special Publication of Fisheries and Aquatic Sciences 106.

Clarkson, R.W., and J.C. Rorabaugh. 1989. Status of leopard frogs (*Rana pipiens* Complex) in Arizona and southeastern California. Southwestern Naturalist 34(4):531-538.

Collins, J.P., J.L. Brunner, V. Miera, M.J. Parris, D.M. Schock, and A. Storfer. 2003. Ecology and

evolution of infectious disease. Pages 137-151 *in* R.D. Semlitsch, Amphibian Conservation. Smithsonian Books, Washington D.C.

Dahms, C.W., and B.W. Geils (tech. eds). 1997. An assessment of forest ecosystem health in the Southwest. General Technical Report RM-GTR-295. Fort Collins, CO, US Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Danzer, S.R., C.H. Baisan, and T.W. Swetnam. 1997. The influence of fire and land-use history on stand dynamics in the Huachuca Mountains of southeastern Arizona. Appendix D in Robinett, D., R.A. Abolt, and R. Anderson, Fort Huachuca Fire Management Plan. Report to Fort Huachuca, AZ.

Daszak, P. 2000. Frog decline and epidemic disease. International Society for Infectious Diseases. Http://www.promedmail.org.

Davidson, C. 1996. Frog and toad calls of the Rocky Mountains. Library of Natural Sounds, Cornell Laboratory of Ornithology, Ithaca, NY.

Davidson, D., Pessier, A.P., J.E. Longcore, M. Parris, J. Jancovich, J. Brunner, D. Schock, and J.P. Collins. 2000. Chytridiomycosis in Arizona (USA) tiger salamanders. Page 23 *in* Conference and Workshop Compendium: Getting the Jump! On amphibian diseas. Cairns, Australia, August 2000.

DeBano, L.F., and D.G. Neary. 1996. Effects of fire on riparian systems. Pages 69-76 *in* P.F. Ffolliott, L.F. DeBano, M.B. Baker, G.J. Gottfried, G. Solis-Garza, C.B. Edminster, D.G Neary, L.S. Allen, and R.H Hamre (tech. coords.). Effects of fire on Madrean province ecosystems, a symposium proceedings. USDA Forest Service, General Technical Report RM-GTR-289.

Declining Amphibian Populations Task Force. 1993. Post-metamorphic death syndrome. Froglog 7:1-2.

Degenhardt, W.G., C.W. Painter, and A.H. Price. 1996. Amphibians and reptiles of New Mexico. University of New Mexico Press, Albuquerque.

Diaz, J.V., and G.E.Q. Diaz. 1997. Anfibios y reptiles de Aguascalientes. Grupo Impressor Mexico, Aguascalientes, Aguascalientes, MX.

Dole, J.W. 1972. Evidence of celestial orientation in newly-metamorphosed *Rana pipiens*. Herpetologica 28:273-276.

Dole, J.W. 1971. Dispersal of recently metamorphosed leopard frogs, *Rana pipiens*. Copeia 1971:221-228.

Dole, J.W. 1968. Homing in leopard frogs, *Rana pipiens*. Ecology 49:386-399.

Fernandez, P.J., and J.T. Bagnara. 1995. Recent changes in leopard frog distribution in the White Mountains of east central Arizona. Page 4 in abstracts of the First Annual Meeting of the Southwestern Working Group of the Declining Amphibian Populations Task Force, Phoenix, AZ.

Fernandez, P.J. and P.C. Rosen. 1998. Effects of introduced crayfish on the Chiricahua leopard frog and its stream habitat in the White Mountains, Arizona. Page 5 *in* abstracts of the Fourth Annual Meeting of the Declining Amphibian Populations Task Force, Phoenix, AZ.

Fernandez, P.J., and P.C. Rosen. 1996. Effects of the introduced crayfish *Oronectes virilis* on the native aquatic herpetofauna in Arizona. Report to the Arizona Game and Fish Department, Heritage Program, IIPAM Project No. I94054.

Ffolliott, P.F., L.F. DBano, M.B. Baker, Jr., D.G. Neary, and K.N. Brooks. 2004. Hydrology and Impacts of Disturbance on Hydrologic Function. Pp. 51-76 in Baker, MB., P.F. Ffolliott, L.F. DBano, and M.B. Baker, Jr., D.G. Neary, and K.N. Brooks, eds. 2004. Riparian Areas of the Southwestern United States, Hydrology, Ecology, and Management. CRC Press LLC. Boca Raton, Florida.

Frost, J.S., and J.T. Bagnara. 1977. Sympatry between *Rana blairi* and the southern form of leopard frog in southeastern Arizona (Anura: Ranidae). The Southwestern Naturalist 22(4):443-453.

Goldberg, C.S., K.J. Field, and M.J. Sredl. 2004. Mitochondrial DNA sequences do not support species status of the Ramsey Canyon leopard frog (*Rana subaquavocalis*). Journal of Herpetology 38(3):313-319.

Hale, S.F. 2001. The status of the Tarahumara frog in Sonora, Mexico based on a re-survey of selected localities, and search for additional populations. Report to the U.S. Fish and Wildlife Service, Phoenix, Arizona.

Hale, S.F., and J.L. Jarchow. 1988. The status of the Tarahumara frog (*Rana tarahumarae*) in the United States and Mexico: part II. Report to the Arizona Game and Fish Department, Phoenix, Arizona, and the Office of Endangered Species, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Hale, S.F., and C.J. May. 1983. Status report for *Rana tarahumarae* Boulenger. Arizona Natural Heritage Program, Tucson. Report to Office of Endangered Species, US Fish and Wildlife Service, Albuquerque, NM.

Halliday, T.R. 1998. A declining amphibian conundrum. Nature 394:418-419.

Hillis, D.M., and T.P. Wilcox. 2005. Phylogeny of New World true frogs (*Rana*). Molecular Phylogenetics and Evolution 34:299-314.

Jennings, R.D. 1995. Investigations of recently viable leopard frog populations in New Mexico: *Rana chiricahuensis* and *Rana yavapaiensis*. New Mexico Game and Fish Department, Santa Fe.

Jennings, R.D. 1987. The status of *Rana berlandieri*, the Rio Grande leopard frog, and *Rana yavapaiensis*, the lowland leopard frog, in New Mexico. Report to New Mexico Department of Game and Fish, Santa Fe, New Mexico.

Johnson, J.E. and C. Hubbs. 1989. Status and conservation of poeciliid fishes. Pages 301-331, *In*: G.K. Meffe and F.F. Snelson, eds., Ecology and evolution of livebearing fishes (Poeciliidae). Prentice Hall, Englewood Cliffs, New Jersey. 453 pp.

Matutte, B., K.B. Storey, F.C. Knoop, and J.M. Conlon. 2000. Induction of synthesis of an anti-microbial peptide in the skin of the freeze-tolerant frog, *Rana sylvatica*, in response to environmental stimuli. FEBS Lett. 483:135-138.

McPherson, G.R. 1995. The role of fire in desert grasslands. Pages 130-151 in M.P. McClaran and T.R. Van Devender (editors), The Desert Grassland. University of Arizona Press, Tucson, Arizona.

Morell, V. 1999. Are pathogens felling frogs? Science 284:728-731.

Nichols, D.K., E.W. Lamirande, A.P. Pessier, and J.E. Longcore. 2001. Experimental transmission of cutaneous chytridiomycosis in dendrobatid frogs. Journal of Wildlife Diseases 37:1-11.

Painter, C.W. 2000. Status of listed and category herpetofauna. Report to US Fish and Wildlife Service, Albuquerque, NM. Completion report for E-31/1-5.

Pima County Association Of Governments, 1996. Population handbook 1995.

Platz, J.E. 1993. *Rana subaquavocalis*, a remarkable new species of leopard frog (*Rana pipiens* Complex) from southeastern Arizona that calls under water. Journal of Herpetology 27(2):154-162.

Platz, J.E., and T. Grudzien. 1999. The taxonomic status of leopard frogs from the Mogollon Rim country of central Arizona: evidence for recognition of a new species. Proceedings of Nebraska Academy of Sciences 109:51.

Platz, J.E., and J.S. Mecham. 1984. *Rana chiricahuensis*. Catalogue of American Amphibians and Reptiles 347.1.

Platz, J.E., and J.S. Mecham. 1979. *Rana chiricahuensis*, a new species of leopard frog (*Rana pipiens* Complex) from Arizona. Copeia 1979(3):383-390.

Rollins-Smith, L.A., C. Carey, J.E. Longcore, J.K. Doersam, A. Boutte, J.E. Bruzgal, and J.M. Conlon. 2002. Activity of antimicrobial skin peptides from ranid frogs against *Batracytrium dendrobatidis*, the chytrid fungus associated with global amphibian declines. Devel. Comp. Immunol. 26:471-479.

Rorabaugh, J.C. In press. *Rana berlandieri* Baird, 1854, Rio Grande Leopard Frog. *In* Lannoo, M.J. (Ed.), Status and Conservation of U.S. Amphibians. Volume 2: Species Accounts. University of California Press, Berekely, CA.

Rosen, P.C., and C.R. Schwalbe. 1998. Using managed waters for conservation of threatened frogs. Pages 180-202 *in* Proceedings of Symposium on Environmental, Economic, and Legal Issues Related to Rangeland Water Developments. November 13-15, 1997, Tempe, AZ.

Rosen, P.C., C.R. Schwalbe, D.A. Parizek, P.A. Holm, and C.H. Lowe. 1994. Introduced aquatic vertebrates in the Chiricahua region: effects on declining native ranid frogs. Pages 251-261 *in* L.F. DeBano, G.J. Gottfried, R.H. Hamre, C.B. Edminster, P.F. Ffolliott, and A. Ortega-Rubio (tech. coords.), Biodiversity and management of the Madrean Archipelago. USDA Forest Service, General Technical Report RM-GTR-264.

Rosen, P.C., C.R. Schwalbe, and S.S. Sartorius. 1996. Decline of the Chiricahua leopard frog in Arizona

mediated by introduced species. Report to Heritage program, Arizona Game and Fish Department, Phoenix, AZ. IIPAM Project No. I92052.

Swanston, D.N. 1991. Natural Processess. American Fisheries Society Special Publication 19:139-179.

Seburn, C.N.L., D.C. Seburn, and C.A. Paszkowski. 1997. Northern leopard frog (*Rana pipiens*) dispersal in relation to habitat. Herpetological Conservation 1:64-72.

Seiler, T.P., R.D. Drobney, and T.V. Dailey. 2002. Use of weather variables for predicting fall covey calling rates of northern bobwhites. Proceedings of the National Quail Symposium 5: 91-98.

Simms, K. 1989. Home range, habitat use, and movements of reintroduced masked bobwhite. M.S. thesis. University of Arizona, Tucson. 120pp.

Sinsch, U. 1991. Mini-review: the orientation behaviour of amphibians. Herpetological Journal 1:541-544.

Snyder, J., T. Maret, and J.P. Collins. 1996. Exotic species and the distribution of native amphibians in the San Rafael Valley, AZ. Page 6 *in* abstracts of the Second Annual Meeting of the Southwestern United States Working Group of the Declining Amphibian Populations Task Force, Tucson, AZ.

Speare, R., and L. Berger. 2000. Global distribution of chytridiomycosis in amphibians. Http://www.jcu.edu.au/school/phtm/PHTM/frogs/chyglob.htm.11 November 2000.

Spencer, C.N., and F.R. Hauer. 1991. Phosphorus and nitrogen dynamics in streams during a wildfire. Journal of the North American Benthological Society 10(1):24-30.

Sredl, M.J., and D. Caldwell. 2000. Wintertime populations surveys - call for volunteers. Sonoran Herpetologist 13:1.

Sredl, M.J., and J.M. Howland. 1994. Conservation and management of madrean populations of the Chiricahua leopard frog, *Rana chiricahuensis*. Arizona Game and Fish Department, Nongame Branch, Phoenix, AZ.

Sredl, M.J., J.M. Howland, J.E. Wallace, and L.S. Saylor. 1997. Status and distribution of Arizona's native ranid frogs. Pages 45-101 *in* M.J. Sredl (ed). Ranid frog conservation and management. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Technical Report 121.

Sredl, M.J., and R.D. Jennings. In press. *Rana chiricahuensis*: Platz and Mecham, 1979, Chiricahua leopard frogs. *In* M.J. Lanoo (ed), Status and Conservation of U.S. Amphibians. University of California Press, Berkeley.

Sredl, M.J., and L.S. Saylor. 1998. Conservation and management zones and the role of earthern cattle tanks in conserving Arizona leopard frogs on large landscapes. Pages 211-225 *in* Proceedings of Symposium on Environmental, Economic, and Legal Issues Related to Rangeland Water Developments. November 13-15, 1997, Tempe, AZ.

Stebbins, R.C. 2003. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Company, Boston, MA.

Swetnam, T.W., and C.H. Baisan. 1996. Fire histories of montane forests in the Madrean Borderlands. Pages 15-36 *in* P.F. Ffolliott *et al.* (Tech. Coord.), Effects of fire on Madrean Province ecosystems. USDA Forest Service, General Technical Report, RM-GTR-289.

USFWS. 2005a. Intra-Service Section 7 Biological Evaluation for Buenos Aires National Wildlife Refuge Fire Management Plan – 2005-2008 prescribed burns. January 26, 2005. Buenos Aires National Wildlife Refuge. Sasabe, Arizona.

_____. 2005b. Supplemental information for Intra-Service Section 7 Biological Evaluation for Buenos Aires National Wildlife Refuge Fire Management Plan – 2005-2008 prescribed burns. March 10, 2005. Buenos Aires National Wildlife Refuge. Sasabe, Arizona.

_____. 2004. Amended to the 2003 Biological Assessment for the Reinitiation of the Intra-Service Section 7 Consultation for the Buenos Aires National Wildlife Refuge Fire Management Plan. February 18, 2004. Buenos Aires National Wildlife Refuge, Sasabe, AZ.

_____. 2003a. Cactus Ferruginous Pygmy-owl Draft Recovery Plan. Region 2, U. S. Fish and Wildlife Service. Albuquerque, NM. 174 pp.

_____. 2003b. Biological Assessment for the Reinitiation of the Intra-Service Section 7 Consultation for the Buenos Aires National Wildlife Refuge Fire Management Plan. April 25, 2003. Buenos Aires National Wildlife Refuge, Sasabe, AZ.

_____. 2002. Biological Opinion for the Intra-Service Section 7 Consultation for the Buenos Aires National Wildlife Refuge Fire Mangement Plan. April 30, 2002. 34 pp.

_____. 2001. Fire Management Plan - Buenos Aires National Wildlife Refuge. Buenos Aires National Wildlife Refuge, Sasabe, AZ. 59 pp.

_____. 1995. Masked bobwhite (*Colinus virginianus ridgway*) recovery plan. Albuquerque, NM. 82pp.

_____. 1984. Sonoran topminnow recovery plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 56 pp.

_____. 1967. Native fish and wildlife. Endangered Species. Federal Register 32(48):4001.

Wellendorf, S.D., W.E. Palmer, and P.T. Bromley. 2004. Estimating calling rates of northern bobwhite coveys and measuring abundance. Journal of Wildlife Management 69: 672-682.

TABLES AND MAPS

Table 1

NUMBER OF MALE MASKED BOBWHITE DETECTED ON SUMMER CALL COUNT SURVEYS FOR 13 YEARS

Unit #	UNIT NAME	ACRES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	ESPINOSA	1507													
2	POZO	1744	.5												
3	CITY HALL	5312	.5												
4	DRY	821	1												
5	PAJONAL	3298													
6	BLANCO	3968							1						
7	MOSCA	3478				4									
8	BUENA	1120													
9	ROAD CAMP	1024	6		4				1c						
10	HIPPY	1734	1		2				1						
11	INDIOS	682													
12	GUIJAS TANK	467													
13	SECUNDINO	1624	14.5	.5	3	2		1		1i					
14	MIDDLE	1871	7.5	.5	3	5	9	7	9						
15	LINBERG RIDGE	886		1			1	2	1						
16	PUNTA NORTH	740						1							
18	ROUND HILL 3	1176	5			1									
19	LINBERG TANK	1402	1												
20	PUNTA SOUTH	1361								1i					
21	MESQUITE	928													
22	ROUND HILL 2	1747	1					1							
23	HIGH GATES	4905												1i	
24	ROUND HILL 1	2321													
25	MCKAY	459													
26	BAILEY	520			1										
27	AIRPORT	764			1		1			2				1i	
28	AGUIRRE	287													1i
29	ROCK	1956	2							1i					
30	BERTHA NORTH	1053						1	3						
31	TRIANGLE	593			1		1	2	1, 1c	3, 1i					1i
32	BERTHA SOUTH	1169						1							
33	HORSE NORTH	344								1				2i	

Table 1, cont'd.

UNIT #	UNIT NAME	ACRES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
34	HEADQUARTERS	504			1			1							
35	BORREGO NORTH	461			2			1	1						
36	HORSE SOUTH	902						2							
37	MORMON	206													
38	BORREGO SOUTH	1187						1							
39	STATE	1624						3							
40	CARRIZO	1179													1
41	COMPARTIDERO 2	1194	1		2	2									
42	COMPARTIDERO 1	935				1		1							
43	SNAKE	1664			1			1							
44	COMPARTIDERO 3	708	1												
45	LOPEZ/control	2164	1												
46	NORTH BORDER	1700			1	1									
47	YELLOWJACKET	584				1									1i
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													
58	KING	1989													
59	LAS DELICIAS	559													
	Non Burn Unit		3		7	2			3, 1c	1i		1i	3i		
	Total Calling Males		48	2	30	19	12	28	20	6, 5i		1i	3i	4i	1, 3i

Minimal effort was expended on call counts in 2000
Fractions of birds are due to birds being sighted in the middle of the road between units or uncertainty in the recording of burn units birds occurred in. Prior to 2001, birds were not recorded by burn unit.
Covey detections are denoted with 'c'. Three coveys were detected in 2005.
Incidental detections of bobwhites were observed outside formal survey periods are depicted with 'i'.

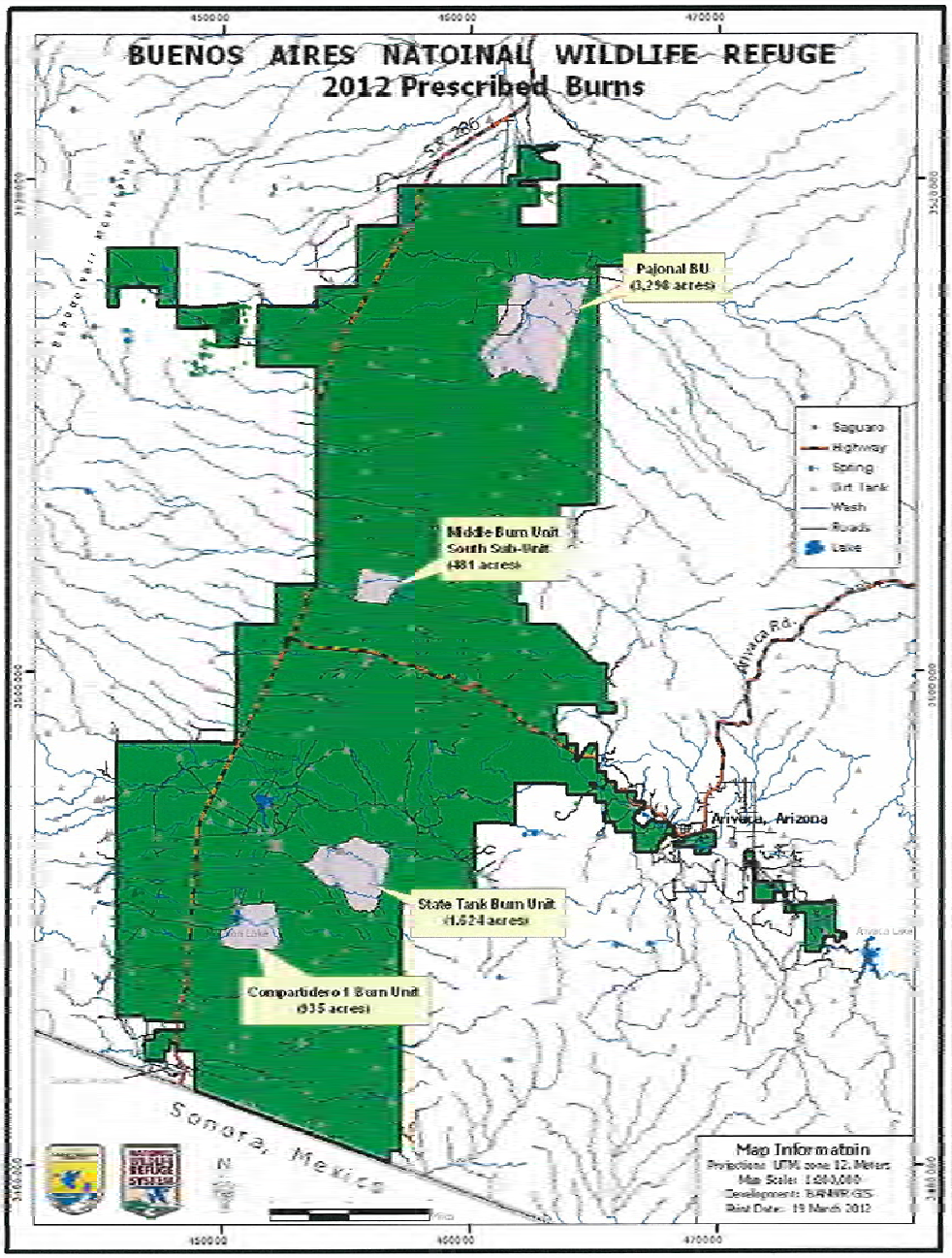
Table 2

Pima Pineapple Cactus Discoveries on Buenos Aires NWR from 1992 – 2012.

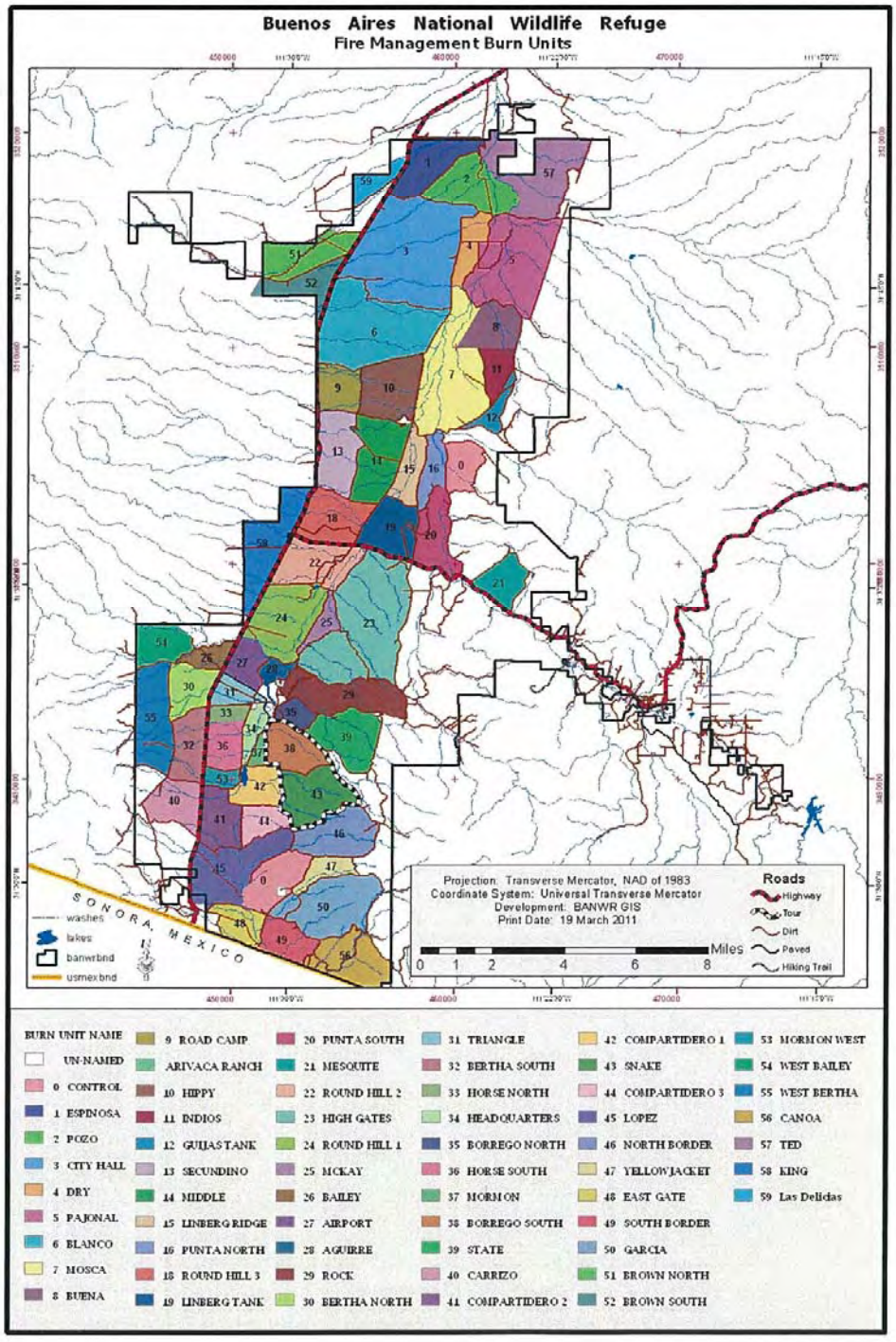
Survey Year	# PPCs Discovered
1992 -2000	52
2001	30
2002	27
2003	42
2004	86
2005	166
2006	51
2007	1
2008	30
2009	72
2010	40
2011	7
2012	3
Total	**607**
Ave/yr	**30.4**

Note: The 2012 Pima pineapple cactus surveys were in progress at the time of this writing. Additional Pima pineapple cactus may be discovered in 2012 prior to completion of these surveys.

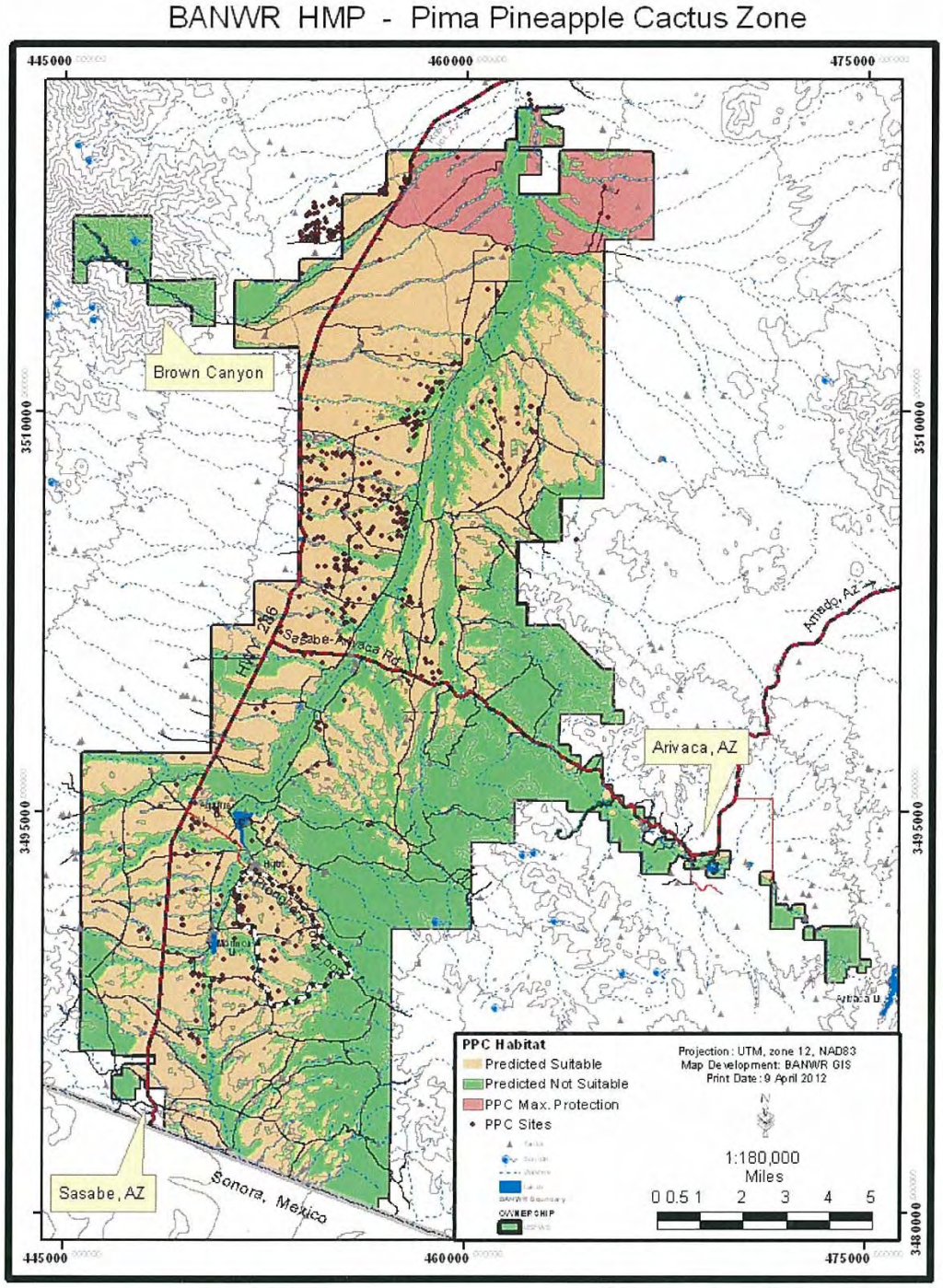
Map 1. FY2012 Planned Burn Units at Buenos Aries NWR.



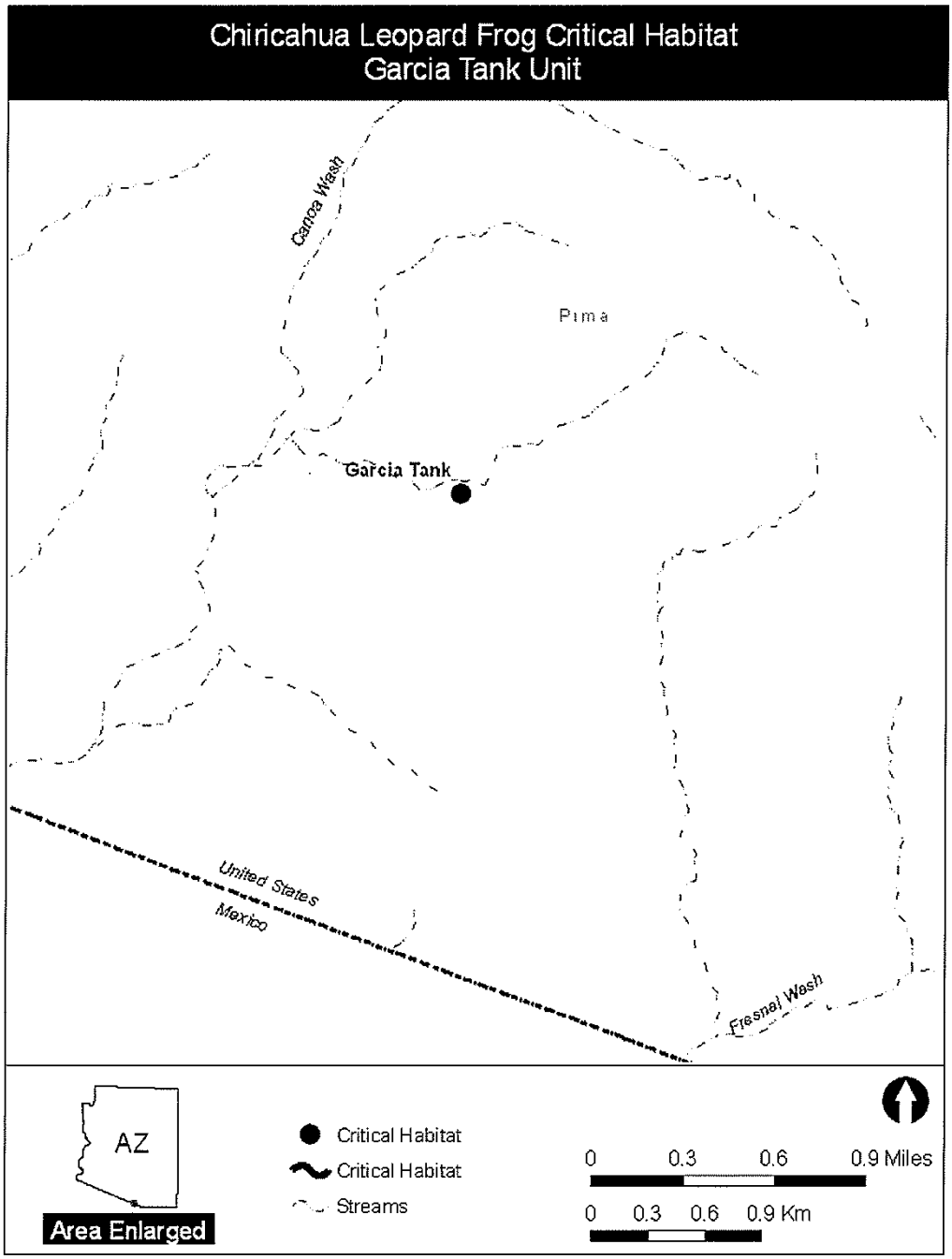
Map 2. Fire Management Burn Units at Buenos Aires NWR.



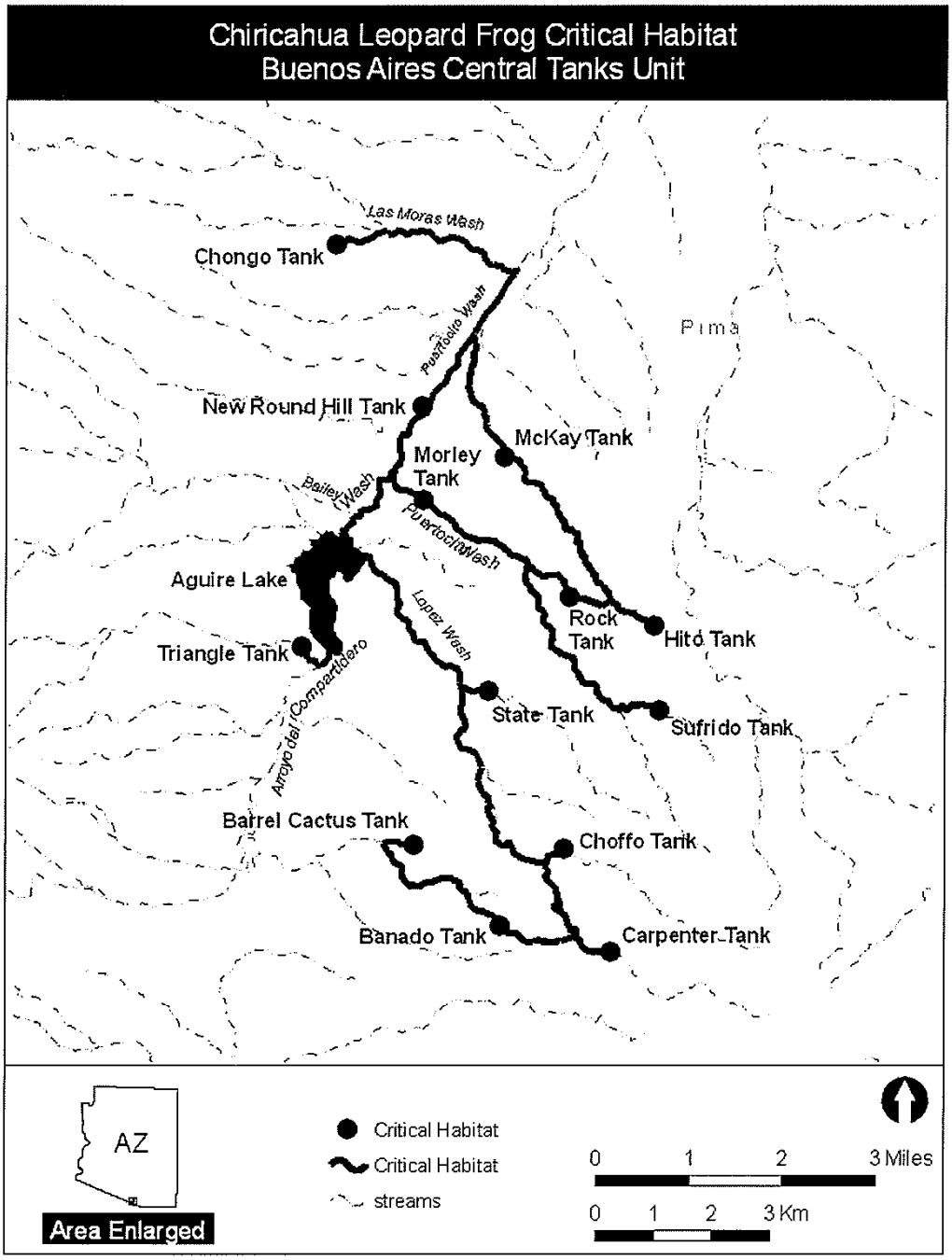
Map 3. Buenos Aires NWR Predicted Suitable Pima Pineapple Cactus Habitat and PPC locations.



Map 4. Chiricahua Leopard Frog Critical Habitat: BANWR Garcia Tank.



Map 5. Chiricahua Leopard Frog Critical Habitat: BANWR Central Tanks.



APPENDIX A.

Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuenae*)

Environmental Baseline

This species is known from grasslands, arid scrublands, and oak woodlands below 5500 ft in elevation. In Arizona, these bats 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* on the BANWR typically occurs in relatively small numbers in the foothills portion of the BANWR. These areas are not part of a burn unit. When this agave is found within a burn unit, it is typically in gravelly soils which are sparsely vegetated and have little ability to carry a fire. Saguaro cacti, which are not numerous within the burn units, will be protected from prescribed fire as described above for Pima pineapple cacti.

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 burn units.
- The majority of the foraging resources for this species are outside the burn units.
- Saguaro cactus within the burn units will be protected from prescribed fire.

Chiricahua Leopard Frog (*Rana chiracahuensis*) Critical Habitat

Environmental Baseline

The recent critical habitat (CH) designation for the leopard frog include the Garcia Tank Unit (the place where leopard frogs were originally sighted on the Refuge), and a network of 13 tanks, drainages and Aguirre Lake in the central portion of the refuge (Central Tanks Unit) (Maps 4 and 5). The Primary Constituent Elements of leopard frog CH are 1) presence of suitable aquatic breeding habitats and 2) dispersal and non-breeding habitat, including permanent and ephemeral water sources not suitable for breeding but which provide barrier-free dispersal corridors of appropriate length. These sites provide essential PCEs including breeding habitat in tanks which

typically hold water over extended periods of time as well as dispersal and non-breeding habitats within and adjacent to drainages which are intermittently flooded and hold water over short periods of time. Leopard frogs can occur within any of these habitat areas, but have been documented in only a few of the tanks in recent years.

Since Garcia Tank Unit is geographically separated from established dispersal corridors for leopard frogs, only PCE 1 is applicable for this CH designation. The Central Tanks Unit of CH includes both PCE 1 and PCE 2 since dispersal corridors have been established in the area of the refuge.

Several tanks and dispersal corridors included in the CLF CH designation occur within semi-desert grassland burn units described in the Multi-Unit Burn Plan. Implementation of prescribed fire will have little if any effects on the PCEs 1 and 2 since none of the proposed actions should lead to an increase in bullfrogs, chytrids or crayfish. Additionally, fire personnel actively work to reduce or prohibit fire from key drainages. Impacts to PCE 2 from proposed burn actions therefore will be minimized or non-existent since fire will be managed in a manner to prevent or greatly minimize burning in critical dispersal drainages. Vegetation cover present in these drainages will likely not be affected by proposed actions since fire will be minimized in these areas. Conservation measures designed to protect leopard frogs would also protect CH including the installation of straw wattles to reduce or stop sediment ash flows into tanks which provide breeding habitat for the CLF. In addition to the CH designation, the HMP guidelines and resource management policies at the Refuge restrict the use of heavy equipment and off road vehicles within or adjacent to all key drainages and tanks. Direct physical impacts to PCEs 1 or 2 would not take place as a result of implementation of the Multi-Unit Burn Plan.

Threats to CLF CH include a lack of permanent water sources in breeding habitats, the presence of chytridiomycosis (chytrid) fungus and the presence of non-native predators including bull frogs *(Rana catesbeiana)* and crayfish (unknown species).

Conclusion

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

- PCE 1, the presence of suitable breeding habitat, will not be affected by the proposed action. Such areas will be avoided during prescribed burns or will have adequate buffers to prevent or reduce potential effects from fire. The proposed action will not increase the occurrence of non-native predators or competitors or chytrid fungus.
- As a result of the conservation measures and guidelines that will be implemented during the proposed action, riparian areas and drainages will be protected and buffered such that effects to PCE 2 will be insignificant.
- Prescribe burning to meet the objectives of the Refuge's HMP will result in improved ecosystem health and a more consistent presence of the PCEs found within the designated critical habitat on the Refuge.