

**FINAL ENVIRONMENTAL ASSESSMENT**

**Establishment of a Captive Breeding Pilot  
Program for the Endangered Mount Graham  
Red Squirrel**

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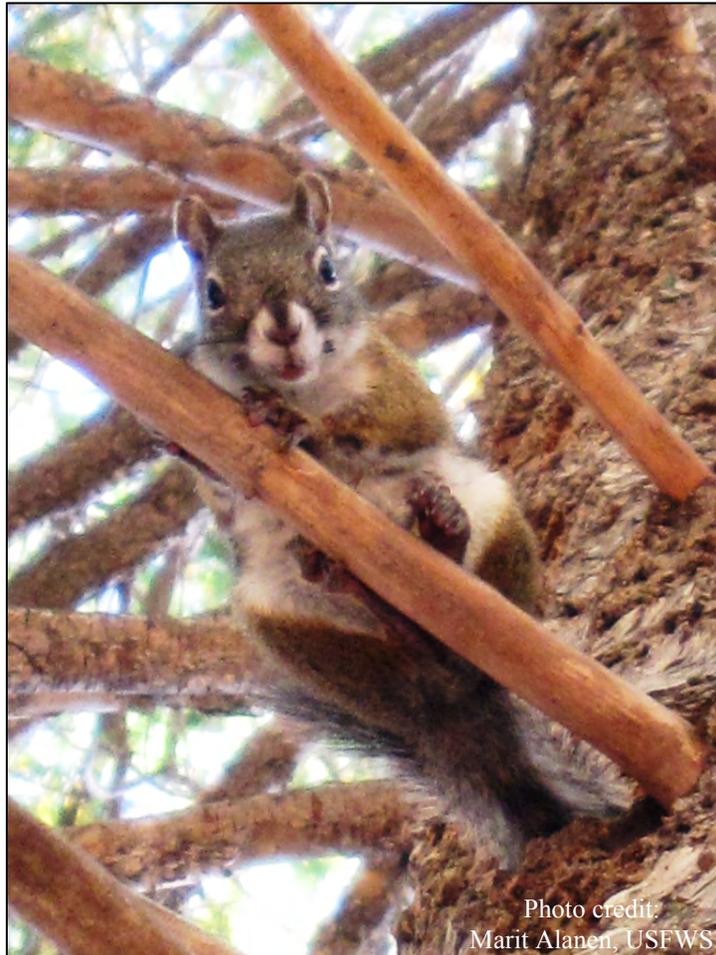


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## Section I: PURPOSE AND NEED FOR ACTION

### A. Introduction

The U.S. Fish and Wildlife Service (FWS) has prepared this final Environmental Assessment (FEA) to analyze potential effects to physical, biological, social, and cultural resources that may result from establishing a captive breeding pilot program for the endangered Mount (Mt.) Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*) (red squirrel or squirrel). The draft EA for this program was released for public review on September 10, 2010 and comments were received from one agency, six groups, and one individual. The proposal stems from a FWS Federal action: removal of up to 16 Mt. Graham red squirrels from the wild to establish a captive breeding pilot program. The DEA and the FEA were prepared in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality regulations (40 CFR 1500-1508), and FWS NEPA Reference Handbook (January 1997).

This document is organized into six sections:

- **Section 1 – Purpose and Need for Action:** Presents information on the background for the proposed action, the purpose of and need for the action and the FWS’s proposal for achieving that purpose and need.
- **Section 2 – Description of Alternatives, including the Preferred Alternative:** Provides a detailed description of the three alternatives evaluated in this FEA, including 1) the no action alternative, 2) the preferred alternative – establish a captive population(s) with up to 16 wild-caught Mt. Graham red squirrels, and 3) establish a captive population(s) with up to eight wild-caught Mt. Graham red squirrels.
- **Section 3 – Affected Environment:** Describes the environmental setting in which the proposed action would occur, including the site where the proposed action would be implemented.
- **Section 4 – Environmental Consequences:** Describes the environmental effects of implementing the three alternatives. The analysis is organized by resource topic (physical biological, social, and cultural environment). Effects are described for each of the three alternatives.
- **Section 5 – Public Involvement:** Describes the preparers, agencies and partners consulted during preparation of the DEA and FEA, as well as the public involvement period.
- **References:** Lists documents used in the preparation of this FEA.
- **Appendices:** The appendices provide more detailed information to support the analysis presented in this EA and contain the letters of comments received and our responses to comments.

## **B. Background for the Proposed Action**

### Species and Recovery Information

The Mt. Graham red squirrel is an endangered subspecies of the widespread red squirrel and is found only in the forests of the Pinaleno Mountains in Graham County, Arizona. All habitats for the subspecies are located on the U.S. Forest Service's Coronado National Forest (CNF). Threats to the red squirrel population are largely the result of loss of suitable habitat in the Petran and Madrean Montane Conifer Forest (Douglas fir/white fir and ponderosa pine subcategories), Petran Subalpine Conifer Forest (Engelmann spruce/corkbark fir) and the intergraded riparian zones. The amount and quality of the habitats has been affected by a number of factors including drought, insect, and disease effects to trees, clearing for human developments, wildfire, and introduction of the non-native Abert's squirrel (*Sciurus aberti aberti*) and Rocky Mountain elk (*Cervus canadensis nelsoni*) that compete with the red squirrel for food and habitat areas or have adverse effects on the growth of tree seedlings or saplings in red squirrel habitat (USFWS 2011a).

The Mt. Graham Red Squirrel Recovery Plan (Recovery Plan) was signed in 1993 and contained a suite of recovery actions that addressed habitat concerns, research needs contingency plans and public education components (USFWS 1993). The first revised draft Recovery Plan was released for public comment in 2011 (USFWS 2011a). It contained an updated suite of recovery actions addressing the same factors. Until the final revised plan is released, under FWS policy, the draft revision is the active plan for the purpose of planning and implementing recovery actions.

Recovery actions are designed to address specific issues relevant to a species. In this case, both the 1993 and 2011 Recovery Plans contain tasks related to captive breeding (Action 222 in 1993 and Actions 1.2.4, 3.11, 3.12, and 3.13 in 2011). In both Recovery Plans, these are Priority 1 actions. They are not the only Priority 1 actions in the plans; and all Priority 1 actions are considered "an action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

The implementation of Priority 1 actions is determined by several factors including new information on the needs of the species, availability of cooperators to implement the action, and funding. Numerous actions may be implemented at the same time while the opportunities to implement other actions may not exist at a particular point in time. As opportunities with cooperators arise, the FWS can choose to begin the implementation of the relevant recovery action while other recovery actions remain ongoing.

### Initiation of Efforts to Implement a Captive Breeding Program

The range of the red squirrel is limited to the forests of the Pinaleno Mountains. At the time of listing, approximately 5,365 hectares (ha) (13,257 acres [ac]) of habitat was present (Hatten 2009). Subsequently, the Clark Peak Fire in 1996, the Nuttall Complex Fire in 2004, and insect

outbreaks (spruce aphids, bark beetles, and spruce beetles) that affected conifers within the habitat at least between 1997 and 2003 eliminated 52 percent of the available habitat, leaving 2,601 ha (6,427 ac) remaining (Hatten, unpub. data). Most importantly, most of the spruce/fir community that is considered the most valuable habitat (and was included in the 1999 critical habitat determination (55 FR 427, January 5, 1990) has been lost. The critical habitat included 769 ha (1,900 ac) in three units, of which only 112 ha (277 ac) remains (USFWS 2011a). The presence of Abert's squirrels in a significant portion of the little lower vegetation community habitat that remains also reduces the effective available habitat for the red squirrel (summarized in USFWS 2011a).

Annual fall surveys are used to estimate red squirrel populations. At the time of listing (1987) there were approximately 280 red squirrels in the Pinaleño Mountains (52 FR 20994, June 3, 1987). Between 1987 and 2006, the population declined (1987-1990), generally increased to 300-520 from 1991 to 2001, and has fluctuated between 200 and 300 since then (USFWS 2011a).

After the 2004 Nuttall Fire, the potential for significant loss of suitable habitat due to wildfire was clearly documented, and with the continuing drought in the southwestern U.S., additional wildfires in the Pinaleños could be anticipated. While red squirrel numbers were not significantly reduced post-fire, another large fire in the remaining habitat would result in significant losses of both individuals and midden sites.

In response to this situation, on May 22, 2006, the Recovery Team sent a letter to then FWS Acting Southwest Regional Director Dr. Benjamin Tuggle referencing the Team's May 6, 2006 meeting where they had discussed the status of the red squirrel and its habitat. The Recovery Team letter focused on the current status of the red squirrel population and its habitat, concluding that existing conditions (particularly the risk of another wildfire) were an extraordinary threat to the persistence of red squirrels and represented a reasonable trigger for their request to initiate investigation of a captive breeding program. The Recovery Team requested that the FWS approve their action to plan, and if deemed appropriate, initiate emergency removal of a limited number of red squirrels from the wild for the following purposes:

- Establish at least one captive population;
- Begin a small-scale pilot program of maintenance and breeding of captive animals;
- Plan and initiate studies of the efficacy of release of captive-bred animals to augment the existing population in the wild; and
- Eventually develop and initiate a larger-scale captive breeding and supplemental release program for the species.

Mr. Larry Bell, acting for Dr. Tuggle, concurred with this proposal in a letter to the Recovery Team Leader dated June 14, 2006 (see Appendix 1 for copies of the two letters). The Recovery Team was to take the lead on initiating this program with the Arizona Ecological Services Office (AESO) as the FWS lead office.

In 2008, the AESO developed and published the 5-Year Review of the red squirrel (USFWS 2008). The Review updated the status of the subspecies through that time including new biological and survey information. The Review stressed the loss of habitat in the spruce/fir zone noting that of 417 middens known from that community, only 46 maintained the potential to support a red squirrel (an 89 percent reduction) (AGFD data presented in USFWS 2008) and losses were also documented in the Mount Graham International Observatory (MGIO) study area (Koprowski *et al.* 2005, 2006). In addition, in the mixed conifer and ecotone forests, 51 percent of the known middens had disappeared, leaving only 409. While the red squirrel populations have remained relatively stable, they are at lower numbers than in the recent past. The Review reiterated the need to develop a captive propagation plan and a pilot program with the objective of conserving the species in the short term in case of catastrophic population and habitat loss, and in the longer term as a means of producing offspring for augmenting the wild population.

In 2009, AESO was awarded a Preventing Extinction Grant of approximately \$15,000 to begin implementing recovery Action 222 from the 1993 Recovery Plan. This initial effort into developing a captive breeding program included the purchase of equipment to capture and transport red squirrels to a holding facility, a soft-release enclosure, and radio telemetry equipment to use in the capture and subsequent tracking of released red squirrels. AESO also initiated contacts with zoos to find cooperators to house the captured red squirrels and develop the husbandry techniques needed. The Phoenix Zoo in Phoenix, Arizona, expressed interest in partnering with the FWS in developing the captive program.

Although unfunded, the Phoenix Zoo initiated development of a husbandry manual and standards for maintaining an *ex situ* population. They also petitioned for, and were granted the addition of the red squirrel to the Regional Collection Plan (RCP) of the Rodent, Insectivore, and Lagomorph Taxon Advisory Group (RILTAG) in 2009. Having this addition enabled the Phoenix Zoo to look for other American Zoos and Aquariums (AZA) accredited facilities to partner in the program. The Reid Park Zoo in Tucson, Arizona and the Miller Park Zoo in Bloomington, Illinois expressed interest, and the Miller Park Zoo remains committed to assisting with the program.

Inclusion in the RCP also triggered development of a population management plan (now superseded by a species survival plan (SSP) and a studbook by the Phoenix Zoo which also required specialized training for Mr. Stuart Wells, the Phoenix Zoo Species Studbook Manager.

Development of the DEA for the project was also initiated, with the draft being published and sent out for public review in September, 2010. Comments were received but finalization of the DEA was delayed due to higher priority tasks in AESO.

A Memorandum of Understanding between the FWS and the Phoenix Zoo was also developed and signed on May 5, 2011 to guide the cooperative efforts for the red squirrel and other endangered species in Arizona. The Phoenix Zoo also obtained a section 10(a)(1)(A) permit from the FWS in 2012 allowing them to hold red squirrels but not breed them; their 2013 permit allows for captive breeding. The Miller Park Zoo obtained their section 10 permit in 2011. Both permits are conditioned on completion of environmental compliance under NEPA and ESA.

In June and July, 2011, in response to severe fire risk in the Pinaleño Mountains, the FWS trapped four red squirrels and transported them to the holding facility constructed at the Phoenix Zoo Native Species Conservation Center. The two female red squirrels died of unknown causes shortly after arriving at the facility (the necropsy showed no cause of death); however the two male red squirrels remain in captivity and are providing information for the development of the husbandry plans and other procedures. These two red squirrels will be included in the pilot program for the captive breeding project discussed in this FEA.

### **C. Purpose of the Proposed Action**

The purpose of the proposed action is to initiate the first steps in implementing the Priority 1 recovery actions related to a 10-year pilot project to develop captive husbandry and propagation techniques for red squirrels in captivity and implement and evaluate protocols for releasing the captive-born juveniles back into suitable habitat in the Pinaleño Mountains (Recovery Plan Actions 1.2.4, 3.11, 3.12, and 3.13, USFWS 2011a).

Initiating this action is in accordance with the decisions of the Recovery Team and FWS in 2006, is supported by the 5-Year Review (USFWS 2008), is supported by the draft revised Recovery Plan (USFWS 2011a) and ongoing FWS and the Phoenix Zoo efforts to conserve the red squirrel.

Developing captive husbandry and propagation techniques and release protocols for this subspecies under this 10-year pilot project would answer technical questions and provide data that can be used by the Recovery Team to inform the execution of a full captive breeding program and maintain *ex situ* population(s) in the future should the Recovery Team determine such a program is necessary to prevent extinction of or recover the red squirrel.

Implementation of the proposed action is compatible with the goal of recovery of the red squirrel as it moves forward four Priority 1 recovery actions included in the 2011 revised draft Recovery Plan. Taken as a whole, implementation of a Recovery Plan will result in recovery of the species if the actions are successful. Any individual recovery action addresses a portion of the needs of the species and is undertaken with the intent to complete that portion of the Recovery Plan. Implementation of the proposed pilot program does not eliminate or displace other recovery tasks in the Recovery Plan or change the priorities of other recovery tasks. Completion of NEPA compliance for this proposed action does not replace the Recovery Plan.

### **D. Need for Taking the Proposed Action**

In their May 22, 2006, letter, the Recovery Team identified the need for the proposed action based on the current status of the red squirrel and its habitat after the catastrophic Nuttall Fire in 2004. The red squirrel population had been relatively stable over the preceding 4 to 5 years; however numbers were low ( $276 \pm 12$  animals in fall 2005). They noted that the squirrel population is subject to high natural mortality and low productivity compared to other

subspecies, and is found at lower densities (in part due to larger sized home ranges (Koprowski 2005). Implementation of projects to design holding and captive rearing programs should be done before the need for such programs is extreme due to declines in red squirrel numbers. The current level of recruitment may be sufficient to sustain the existing population size; however, having options for augmentation through captive breeding and release may be important in the future.

Also of concern for any additional decline in population numbers is the recent genetic information which indicates that, while red squirrels randomly mate, on average, any two individuals are 90 percent related to each other (Fitak and Culver 2009). While the proposed action will not establish the optimum genetic mix of red squirrels for a captive population that would conserve the remaining genetic variability, understanding how to manage a captive population would be the first steps into this arena.

Additionally, the loss of suitable dense spruce-fir habitat to drought, insect infestations, and wildfires has significantly impacted the squirrel population. Habitable areas are fragmented, with patches sometimes located beyond normal dispersal distances for young squirrels to allow re-colonization. The FWS does not know if the carrying capacity of the remaining habitat has been reached with the current population of red squirrels; however, at least a portion of the available habitat is unoccupied and stochastic and demographic events within the occupied habitat patches may affect occupancy there over time.

Acquiring information on captive husbandry, breeding, rearing, and release techniques would provide individuals to augment numbers in existing habitat areas and for re-establishing squirrels in parts of their range where they are not now present due to distance from established midden areas. Release techniques may also play a role in designing translocation protocols of wild-born juvenile red squirrels to unoccupied portions of remaining habitat.

Any decision to move forward with a larger captive breeding program would be made based on the results of this pilot project as presented to the Recovery Team and the determination by FWS, and AGFD. The pilot project may, or may not, be fully successful in developing the needed protocols; however, answering these important questions contributes to the suite of actions available to support the squirrel population and thus is a benefit for recovery. Annual reviews of progress on implementation of the pilot project will be made by the Recovery Team, and they can recommend suspension or halting of the project at any point.

## **E. Decision to be made by the Responsible Official:**

The FWS Southwest Regional Director will decide whether or not to implement the proposed pilot project initiating a captive rearing, breeding and release program for the red squirrel using up to 16 wild red squirrels to establish the captive population for these research purposes. The proposed action would be undertaken by the AESO in collaboration with the AGFD, U.S. Forest Service (Coronado National Forest, Safford Ranger District) (USFS), Mt. Graham Red Squirrel Population Management Plan (PMP) coordinator, University of Arizona's Red Squirrel

Monitoring Program (RSMP), and participating facilities (e.g., zoos). Facilities that have expressed interest in participating in this project currently include the Phoenix Zoo (Phoenix, AZ) and Miller Park Zoo (Bloomington, IL).

## **F. Compliance with Laws, Regulations, and Plans**

This EA has been prepared in compliance with all applicable Federal statutes, regulations, and policies including, but not limited to, the following:

- National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [U.S.C.] 4321 et seq.)
- Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] 1500-1508);
- U.S. Fish and Wildlife Service Manual, Part 550, Chapter 1 (National Environmental Policy Act - Policy and Responsibilities) and Chapter 2 (National Environmental Policy Act Compliance Guidance).
- Administrative Procedures Act (APA) Public Law 79-404, 60 Stat. 237. June 11, 1946

In addition, all action alternatives will comply with the draft revised Mt. Graham Red Squirrel Recovery Plan (USFWS 2011a). The proposed action does not affect ongoing actions by the CNF to manage the Pinaleno Mountains under their land management plan (USFS 1986, as amended) or the Pinaleno Ecosystem Restoration Project (PERP) (USFS 2010).

## **G. Permitting Requirements and Authorizations Needed**

The following permits and authorizations are needed to implement any action alternative addressed in this FEA:

- Formal section 7 consultation under the ESA has been completed on the selected alternative. The biological opinion addresses impacts to the squirrel from the selected action and the conservation (mitigation) measures to be implemented. The biological opinion covers FWS personnel in implementing their actions (particularly capture and transport and release) in the proposed action. An incidental take statement is included with the biological opinion to address purposeful and non-purposeful take of individual squirrels during the implementation of the pilot project.
- The biological opinion also provides the basis for the section 10(a)(1)(A) recovery permit to the zoo cooperators for holding squirrels and any of their actions in capture, transport, and release. At this time, outside of the Phoenix Zoo in Phoenix, Arizona and the Miller Park Zoo in Bloomington Illinois as sites to house the captive squirrels and develop the husbandry plans, the specific entities to be involved in release activities has not been finalized. The FWS anticipates that existing cooperators within the Recovery Team and the RSMP would be involved in these actions and if needed, their section 10 permits would be modified to address their actions.

- The FWS has a memorandum of understanding (MOU) with the Phoenix Zoo for cooperative work in the conservation of sensitive, candidate, threatened or endangered species and their habitats (USFWS and Phoenix Zoo 2011). The red squirrel is included as a species under this MOU.
- Placement of the soft-release enclosure will require approval from the CNF under the Forest Management Plan and additional NEPA if necessary.
- Cultural resources consultation with the Arizona State Historic Preservation Office and interested Tribal entities would be completed prior to any ground-disturbing activities at the location selected for the enclosure.
- While no permit or authorization is needed, the proposed action will comply with the Policy Regarding Controlled Propagation of Species Listed Under the Endangered Species Act (65 FR 56916, September 20, 2000).

## **H. Scoping Summary and Responses to Comments**

The FWS did not have a public scoping period for this EA. Public scoping is not required for an EA, and since we were responding to a request from the Recovery Team (which has a broad representation of the interested parties on either the Technical or Implementation subgroups), we concluded that scoping would not identify any new issues of concern. Issues that were raised by commenters were in line with what was expected with no new issues identified.

The DEA was made available for a 30-day public review on September 10, 2010. Comments were received from the following persons or groups:

- Ms. Sandy Bahr, Grand Canyon Chapter, Sierra Club, Phoenix, AZ
- Mr. Michael D'Amico, Tucson, AZ
- Mr. Roger Featherstone, Mount Graham Coalition, Tucson, AZ (included comments from Center for Biological Diversity, Flagstaff, AZ)
- Mr. Eric Gardner, Nongame Branch Chief, Arizona Game and Fish Department, Phoenix, AZ
- Mr. Roger McManus, International Union for Conservation of Nature,
- Ms. Jenny Neeley, Conservation Policy Director, Sky Island Alliance, Tucson, AZ
- Dr. Peter Warshall, Scientists for the Preservation of Mt. Graham, Tucson, AZ (two comment letters sent)

In our review of the comments, we placed each comment in a specific category to allow us to respond to similar comments efficiently. Generally, comments fell into two major areas; process comments that addressed NEPA issues including purpose and need and the structure of the DEA, and technical comments relating to scientific information presented in the text. Each comment area contained several categories of related comments that were examined together.

For process comments, some are answered specifically; others are reflected in changes to the organization and presentation of the alternatives and other sections in this FEA. Technical comments on information presented in the DEA were examined and corrections or additional

explanations are provided directly to the text of the FEA as appropriate.

Copies of the comment letters and our responses are in Appendix 3.

## **Section II: ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE**

### **1. Management Actions Common to All Alternatives**

All alternatives considered in this FEA are set against a common background of approved management actions taking place in the Pinaleño Mountains that affect one or more of the resources within the range of the red squirrel. These ongoing actions are part of the baseline conditions for all alternatives and include actions already covered by Endangered Species Act (ESA) section 7 compliance, issuance of section 10(a)(1)(A) recovery permits, and where needed, NEPA compliance. These management actions are briefly listed below and their effects are discussed in the Affected Environment section of this FEA.

The FWS and cooperators including the CNF, the University of Arizona (UA) through the RSMP, AGFD, and the Recovery Team will continue to implement other recovery actions in the revised recovery plan as funding and opportunities become available. Additional ESA and NEPA compliance may be needed to implement some recovery actions and that compliance would be completed by the lead Federal agency for the action.

Land management actions by the CNF under their existing and future land management plans (USFS 1986, as amended) and the Pinaleño Ecosystem Restoration Project (PERP) (USFS 2010) will continue to be implemented. These actions or programs include, but are not limited to:

- Maintenance and operation of CNF administrative sites and fire lookout towers
- Special use permits for the Columbine and Turkey Flat cabin areas, the Bible Camp, and the Boy Scout camp.
- Management of campgrounds and hiking trails and facilities at Riggs Flat Lake.
- Control/suppression actions for wildfires.
- Forest management actions taken under the PERP on 5,752 acres of the Pinaleño Mountains.

Under the Arizona-Idaho Conservation Act of 1988 (P.L. 100-696, November 18, 1988), the U.S. Forest Service was required to provide a special use permit to the UA for the Mt. Graham International Observatory (MGIO) on Emerald Peak. The Act also required development of a management plan for the squirrel which includes research and survey and monitoring programs. Operation of the MGIO and implementation of the management plan would continue as covered by permits from the CNF and the FWS (for section 10(a)(1)(A) recovery permits).

AGFD provides for recreational fishing at Riggs Lake and game management regulations for Abert's squirrels and elk in the project area. Sportfish stocking of Riggs Lake was included in

the 2011 section 7 consultation on use of Federal Sportfish Restoration funds to stock fish in Arizona (USFWS 2011b). Potential effects to squirrels from stocking trout into the lake were identified as coming from roadkill due to vehicles accessing the lake to fish, increased risk of human-mediated wildfire from humans driving up the road or using the area around the lake, and removal of dead and down wood for campfires. These effects were not considered significant and the biological opinion concluded these actions would not jeopardize the continued existence of the red squirrel.

In addition to management actions, the status of the red squirrel and its habitats is subject to natural factors (particularly drought, wildfire, insect pests, and other non-native species present in their habitats) as described in the Affected Environment section of this FEA.

## **2. Alternative A – No Action Alternative**

Under the no action alternative, the FWS would not, at this time, implement the pilot project to develop husbandry and release protocols for squirrels, thus not implementing recovery actions 1.2.4, 3.11, 3.12., and 3.13 of the revised recovery plan (USFWS 2011a).

It is expected that the programs and projects described under Item #1 above would continue to be implemented as at present.

### **2.1 Points of concern**

It is our expectation that the no action alternative would result in the following:

- The purpose and need for the proposed action relevant to creation of captive rearing, breeding, and release protocols would not be met.

## **3. Alternative B – Establish Captive Population(s) for Research Purposes with up to 16 Wild-caught Red Squirrels from the Pinaleño Mountains (Preferred Alternative)**

Under this alternative, the FWS would, in cooperation with others, undertake a pilot project consisting of a series of actions designed to develop husbandry, captive propagation, and release techniques to successfully hold in captivity, breed, rear, and release captive-born red squirrels to suitable habitats in the Pinaleño Mountains. Implementation of the proposed project would follow the FWS's Policy Regarding Controlled Propagation of Species Listed under the Endangered Species Act (65 FR 56916). (Available at: <http://frwebgate5.access.gpo.gov/cgi-bin/PDFgate.cgi?WAISdocID=592669416585+1+2+0&WAIAction=retrieve>)

This effort would span up to 10 years; however, the actual term may be shorter based on results obtained within the first five years. The desired result of the pilot project is to have workable husbandry plans, a species survival plan (SSP) and a studbook, and a release protocol for future use by the Recovery Team if they deem it necessary to support recovery of the red squirrel.

The proposed action has mitigation measures built in to minimize the potential effects to the wild

red squirrel population, maximize opportunities for successful capture and maintenance of the captive individuals and effective release strategies, and provide annual oversight by the Recovery Team.

Activities to implement the proposed action would include multiple visits to red squirrel territories to determine occupancy, sex, presence of young, and age of young; pre-baiting red squirrel territories to acclimatize squirrels to the taste of bait; trapping red squirrels; transporting red squirrels to participating facilities (e.g., zoos and museums); care within each facility (including genetic testing and individually marking animals); transporting individuals to Mt. Graham; and release of red squirrels to the wild.

The following discussion of the pilot project is organized by the actions that would take place during implementation.

### **Number and Age of Red Squirrels to be Removed from the Wild**

The pilot project allows for up to 16 wild-born red squirrels to be captured and held in captivity over the 10-year implementation period. Initially, up to six wild-born red squirrels (three males and three females) will be in *ex situ* holding facilities (four at the Phoenix Zoo and two at Miller Park Zoo) where they will be studied to develop the husbandry and propagation protocols. Additional housing space that may be created in the future would enable additional red squirrels to be held for these purposes and to produce young for release studies. It is anticipated that red squirrels captured in the initial years of the pilot project may not breed in subsequent years, thus requiring additional captures to replace them provided that in no case will more than 16 animals be removed from the wild over the 10-year implementation period. In addition to the wild-born red squirrels held at these facilities, some number of captive-born individuals may also be held for more than one year.

The red squirrel population is small but has been relatively stable (~200-300 individuals) over the last 10 years (USFWS 2011). Monitoring indicates that adult red squirrels have a 47% annual mortality rate (range 22-73%) (Rushton *et al.* 2006). Juvenile red squirrels have a high rate of mortality in their first year (50%, Kreighbaum and VanPelt 1996), with the distance they must travel to find an unoccupied territory a factor in this rate (Munroe *et al.* 2009). Removal for the pilot project of adults that have survived their initial dispersal event and subsequent mortality risks (particularly avian predation attempts) is thus less desirable than the removal of juvenile red squirrels as the juveniles have less chance of finding an unoccupied territory.

For this reason, we would first attempt to capture young-of-the-year squirrels (those weighing less than 200 grams [seven ounces]) around the time they emerge from the nests and begin to disperse from their natal area. Trapping could occur from April 15-November 15 in any year (this is the season that the road into the Pinaleños is open). The limitations on housing space mean that at most, six individuals could be removed in a given year and additional individuals might not be needed in the next year. Thus, no one cohort of red squirrels would be affected by the removals. However, depending on the success in trapping juveniles or because of low survival (less than 50 percent) in captivity of juveniles, up to eight adult squirrels (including no

more than four females) could be captured and brought into captivity for this pilot program. Again, no more than 16 total individuals would be brought into captivity regardless of age.

Trapping protocols to be used (see next section) cannot discriminate between adult and juvenile red squirrels so capture events may result in the handling of both adult and juvenile individuals.. No more than 10 percent of the population (based on the most recent mountain-wide census data) would be subject to trapping in any one calendar year to populate this pilot program. Once a maximum of 10 percent of the population had been subject to trapping in that year, all trapping efforts for this project would cease until the next calendar year even if the desired numbers had not been obtained. The 10 percent includes individuals trapped incidentally and released immediately (e.g., during an attempt to capture a female, a male is incidentally caught or adults are captured instead of juveniles), as well as any captured red squirrels that will be brought into captivity that year.

Should wild-caught red squirrels die in captivity due to human-related causes (e.g., negligence during trapping, transport, or while in captivity), or from natural causes, additional wild-born red squirrels (up to the total of 16 that can be removed from the wild) may be brought into captivity to replace them. If 16 red squirrels have already been brought into captivity, no additional removal from the wild is allowed unless Mt. Graham red squirrels bred in captivity have been released back into the wild and have demonstrated they survive and reproduce at a level that meets or exceeds their natural level of survival and fecundity. Should all wild-caught red squirrels die in captivity, the pilot project would be halted and the causes of death fully evaluated before any additional captures (up to the 16) could be authorized. Captive-born squirrels that die in captivity due to either human-related or natural causes would not reduce the total number of wild-caught squirrels that may be held in captivity.

### **Trapping Protocol**

Trapping and handling of Mt. Graham red squirrels would be conducted by AESO staff and/or individuals holding Federal and State permits (including trapping as a permitted activity) for this subspecies. Trapping and handling techniques would follow those outlined in Koprowski *et al.* (2008) and Koprowski (2002). Briefly, collapsible, single door live traps (Tomahawk Live Trap, Tomahawk WI: Model # 201) would be used, and bait would consist of peanuts and/or peanut butter or an acceptable substitute (e.g., almonds and/or almond butter). Prior to trapping, pre-baiting the area would be done to habituate the red squirrels to the food. Traps would be checked every two hours and closed to capture each night. Handling of red squirrels would be kept to a minimum; however, if handling is required (e.g., to determine the weight of the squirrel), a cloth handling cone (Koprowski 2002) would be used. Additionally, while traps are open, pieces of wood and bark would be laid across and against the sides of the traps to provide shade within the trap, and if the weather becomes inclement, the traps would be checked immediately and closed to capture until the weather event has passed.

Trapping would be initiated in the late spring-early summer and would continue as long as juvenile red squirrels are at their maternal midden site which could be until September or October. As stated above, trapping would cease for the year once the limit on trapping only up

to 10 percent of the red squirrel population in any year was reached. In years when the estimated red squirrel population is less than 200 individuals, no trapping would occur even if the desired 16 red squirrels had not been captured.

### **Transport to Captive Holding Facility**

Mt. Graham red squirrels would be transported to a participating facility or suitable holding location within 24 hours of capture by FWS personnel or others with appropriate permits.. Transportation would follow International Air Transport Association (IATA) airport code regulations for flight and AZA standards for overland transport. They would be transported in species-appropriate enclosures (e.g. Sky Kennel, small size), and provided adequate water and food. External temperatures would be controlled through heating or air conditioning within the vehicle (car, truck, and/or cargo plane) during transportation so that the red squirrels do not experience heat or cold related stress during transport.

### **Captive Population Management and Research**

#### Preparations by Holding Facilities

Facilities that participate in this program would be members of the AZA or would be able to demonstrate they can meet or exceed the accepted standards developed by the AZA. (Available at: <http://www.aza.org/uploadedFiles/Accreditation/Microsoft%20Word%20-%202010%20Accred%20Standards.pdf>.)

As described in Section 1B, the Phoenix Zoo has already initiated efforts to comply with AZA species management requirements to hold the captive population of red squirrels. Training courses are identified and there is a species studbook (The Phoenix Zoo 2012a) and captive management protocol (the Phoenix Zoo 2012b). The Phoenix Zoo has also updated its section 10(a)(1)(A) recovery permit to include actions needed for implementation of the pilot project. The Miller Park Zoo is also implementing these actions, as will any additional partners that join the project later.

#### Quarantine

All red squirrels brought into captivity would undergo a 30-day quarantine period (in accordance with AZA guidelines and standards) (AZA 2013). There are two levels of quarantine to consider; on-site (meaning quarantining the animals in the structures built to house them) and off-site (in a separate quarantine facility away from the holding area). At this time, on-site quarantine is the preferred method as no disease issues have been raised by zoo veterinarians. If concerns about : a) prevention of the introduction of disease and parasites into the breeding facility or the wild populations, and/or b) or to have better control over climatic conditions (such as lighting and temperature) while in captivity to ensure the breeding cycle is not disrupted develop over time, more restrictive quarantine protocols would be implemented.

#### Holding Facilities

The Phoenix Zoo has developed enclosures for individual red squirrels that provide space for climbing and perching, dens, feeding areas, and other structural features. These enclosures are indoors and are made with a wood frame with welded wire attached. Enclosures are 2.6 meters (m) (eight feet [ft]) long by one m (three ft) wide and two m (six ft) tall with a two-compartment nest box of 50.8 centimeters (9cm) (20 inches [in]) long by 30.5 cm (12 in) wide by 40.6 (16 in) tall. The number of red squirrels captured will not exceed the available holding space even if that is less than 16 individuals.

Mt. Graham red squirrels could be kept either on- or off-exhibit at participating facilities. In either case, public information would be developed about the recovery program at zoological institutions, which may include (but not be limited to) informational kiosks, as well as providing photos and video of captive-rearing efforts to the press and management agencies for educational use.

### Development of Husbandry and Propagation Protocols

Development of these protocols will be in line with established AZA or other suitable standards. The natural history of the species is the foundation for determining the physical and biological needs of the species for:

- Nutrient requirements (wild foods and commercial diets)
- Housing and sociality requirements and how to meet those needs in the *ex situ* setting
- Environmental parameters (sunlight, day cycle, temperature etc.)
- Reproductive parameters (age at first reproduction, behavioral clues, reproductive seasonality, parturition, neonatal care, whelping etc.)

Successful breeding techniques for this subspecies are currently unknown. Therefore, once pairs of squirrels are in captivity, different techniques would be attempted based upon the best available information regarding their natural breeding behaviors, as well as similar species' breeding behaviors in captivity. Successful husbandry and propagation results in individuals that are not compromised in their ability to survive and breed in the wild once released.

Concurrent with establishing the captive breeding pilot program, a Population Management Plan (PMP) and studbook would be developed for the Mt. Graham red squirrel. Information gathered during the pilot program would be incorporated into the PMP and studbook for this subspecies, which would serve as sources of reference on the biology, maintenance, housing, health, genetics, behavior, diet, breeding, restraint, transportation, and release of animals held in captivity.

### **Pre-release Conditioning and Release Protocols**

Prior to release, an assessment of survival abilities of the captive born red squirrels will be made. Predator response, foraging ability, ability to seek refugia, appropriate behavior to conspecifics,

and other metrics will be used to evaluate individuals for release suitability.

In the DEA, we included both hard and soft-release options. We have elected to only pursue soft release options due to the limited number of captive-born red squirrels that would be available in any one year. We believe that soft-release has a greater chance for success (defined as a released red squirrel that survives to successfully breed in the wild).

Prior to release into the wild, all captive-born red squirrels would undergo a 30-day quarantine period (per AZA guidelines and standards), which requires a complete physical examination, infectious disease testing, and all relevant vaccinations, making it unlikely that captive animals released into the wild would transmit diseases or parasites to the wild population.

A soft-release enclosure measuring 4.6 meter (m) (14-feet[ft]) wide by 4.0 m (12-ft) deep by 2.3 m (seven-ft) high (Figure 1) would be installed within the USFS's Columbine administrative site on Mt. Graham. Installing the enclosure at this location would minimize conflicts with human activities and impacts to the wild squirrel population, while also providing captive squirrels the opportunity to experience the natural weather and elevational conditions within their habitat prior to release. Locating the enclosure at Columbine also provides the convenience of running water and electricity (should it be needed) so that captive squirrels can easily be cared for while housed in the soft-release enclosure. From this enclosure, squirrels would be recaptured and transported to release sites.

The soft-release enclosure has been designed in paneled sections so that it can be assembled, disassembled, and moved if it is determined it should be relocated in the future as the captive breeding pilot program develops. It can be constructed using hand tools and small power tools (e.g. screwdrivers and drills) and would be attached to a floor made out of concrete blocks. Its exact location would be selected within the Columbine administrative site to avoid any new ground-disturbing activities. Should it become necessary to move the enclosure to a different location during the 10-year life of this pilot project, all necessary environmental compliance would be completed prior to relocating it.

In the soft-release, individuals would spend approximately seven to 10 days in the soft-release enclosure described above to acclimate to local conditions prior to release. A person familiar with caring for captive squirrels (e.g., zoo personnel) would stay at the Columbine administrative site the entire time squirrels are in the enclosure to monitor their behavior and condition, as well as ensure they receive proper care. Candidates for release would be assessed as to whether they exhibit essential behavioral skills, including food recognition and acquisition, caching behavior, avian predator avoidance, and finding refugia.

Squirrels would only be released into the wild in May through August when the snow has melted, food resources are available, and sufficient time is available for the released squirrels to cache cones and fungi for the winter. To the greatest extent possible within this timeframe, release events would be timed to coincide with natural juvenile dispersal during that year.

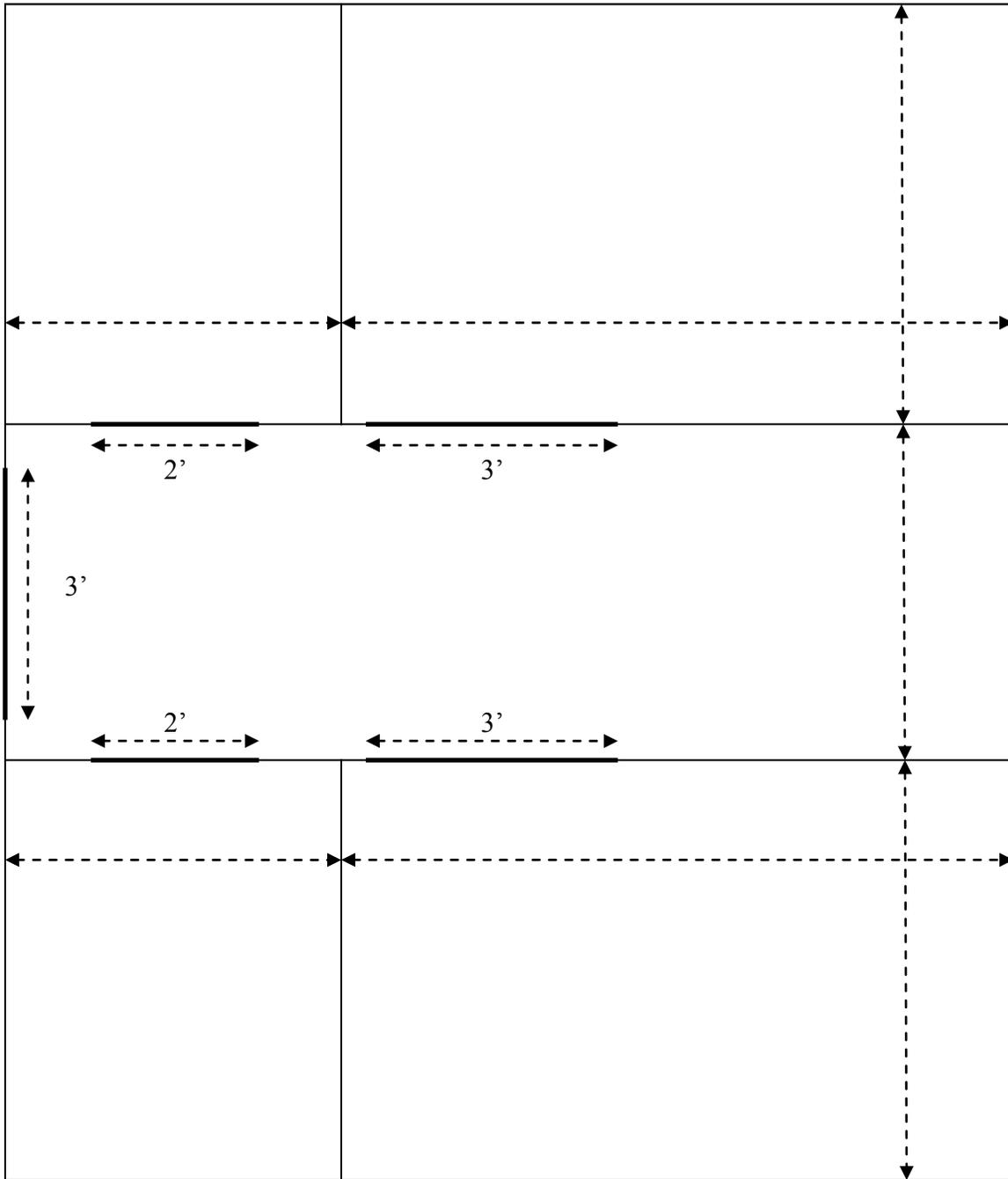
Ear tagging and radio-telemetry equipment and techniques would follow the materials and methods outlined in Koprowski *et al.* (2008). Briefly, released Mt. Graham red squirrels would be fitted with uniquely numbered ear tags (Monel 1005-1, National Band and Tag) with colored ear disks (1 cm Model 1842, National Band and Tag) for individual identification. Radiocollars (SOM 2190, Wildlife Materials International) weighing <5 percent of body mass would be fitted and replaced as needed (approximate life = 1 yr).

Areas of release would be coordinated with the contacts listed in Appendix 2. Release areas would be selected to avoid conflicts with human activities and to minimize impacts to the wild squirrel population. To avoid potential conflicts with human activities, sites would only be selected within the Mt. Graham red squirrel's range (Figure 2) and would not be located within 1,300 m (4,000 ft) of existing structures, campgrounds, special use areas (e.g., summer homes, Bible and Boy Scout Camps), and the 60.7 ha (150ac) Mount Graham International Observatory research area (for a description of these areas, see Environmental Setting below). This distance was chosen because it is greater than twice the mean dispersal distance recorded for this subspecies (670 m [1,916 ft]); Kreighbaum and Van Pelt 1996, as reported in Munroe *et al.* 2009), and is also greater than the maximum distance a red squirrel has been found from its midden (1,009 m [3,028 ft]) once it has an established territory (Koprowski *et al.* 2008). This should minimize the potential for released squirrels to disperse into and establish territories within areas that may impact human activities. In addition, sites would be selected so as to minimize impacts to the wild Mt. Graham red squirrel population.

These could include gaps within the current distribution of red squirrels, currently unoccupied areas that appear to contain habitat, such as West Peak, and/or silviculturally treated areas (such as those that would be treated through the Pinaleño Ecosystem Restoration Project). We believe that there are sufficient habitat areas to use in this pilot project for release experiments that are not near human use areas. Any future releases under a larger program would determine if these restrictions are appropriate.

Implementation of the field activities is expected to commence during the summer of 2013. The pilot program would continue for a period of up to 10 years. As more information is gained from the captive research, release protocols, and post-release monitoring, the results would be reviewed and changes made as necessary to improve implementation of the pilot project. The ultimate success metric for this project is the survival and subsequent breeding in the wild of captive-bred red squirrels, with each stage (capture, holding, breeding, release of animals) having to show success before the next is initiated. The decision to be made on the success of the pilot project will hinge on how many of the released red squirrels survived and bred in the wild. The specific percentage of surviving and breeding animals that would constitute "success" has not been established at this point.

Figure 1. Mount Graham red squirrel soft-release enclosure design



Panel Form Construction

- 4 Total Units
- 1 Hallway connecting them 4' wide
- 2 Units 4' w x 5' d x 7' high
- 2 Units 8' w x 5' d x 7' high
- Overall dimensions: 14' wide x 12' deep x 7' high

Roof panels: Thermoclear solid roofing

- 1" sq. Anodized Aluminum Tubing
- ½" x 1" 16 gauge GAW wire mesh
- Stainless Steel Hardware
- 2 doors - 24" x 72"
- 3 doors - 36" x 72"

The Technical Subgroup of the Mt. Graham Red Squirrel Recovery Team would review the pilot program annually to ensure that the program is meeting its objectives. Based on their review, they could recommend that FWS: a) develop a full captive-breeding program, which may involve holding more than 16 wild-caught squirrels in captivity at one time, or b) discontinue the pilot program because it is clearly not benefitting the subspecies. Expansion of the program to more than 16 wild-caught squirrels would undergo additional review under NEPA and the ESA.

### **3.1 *Continued Coordination***

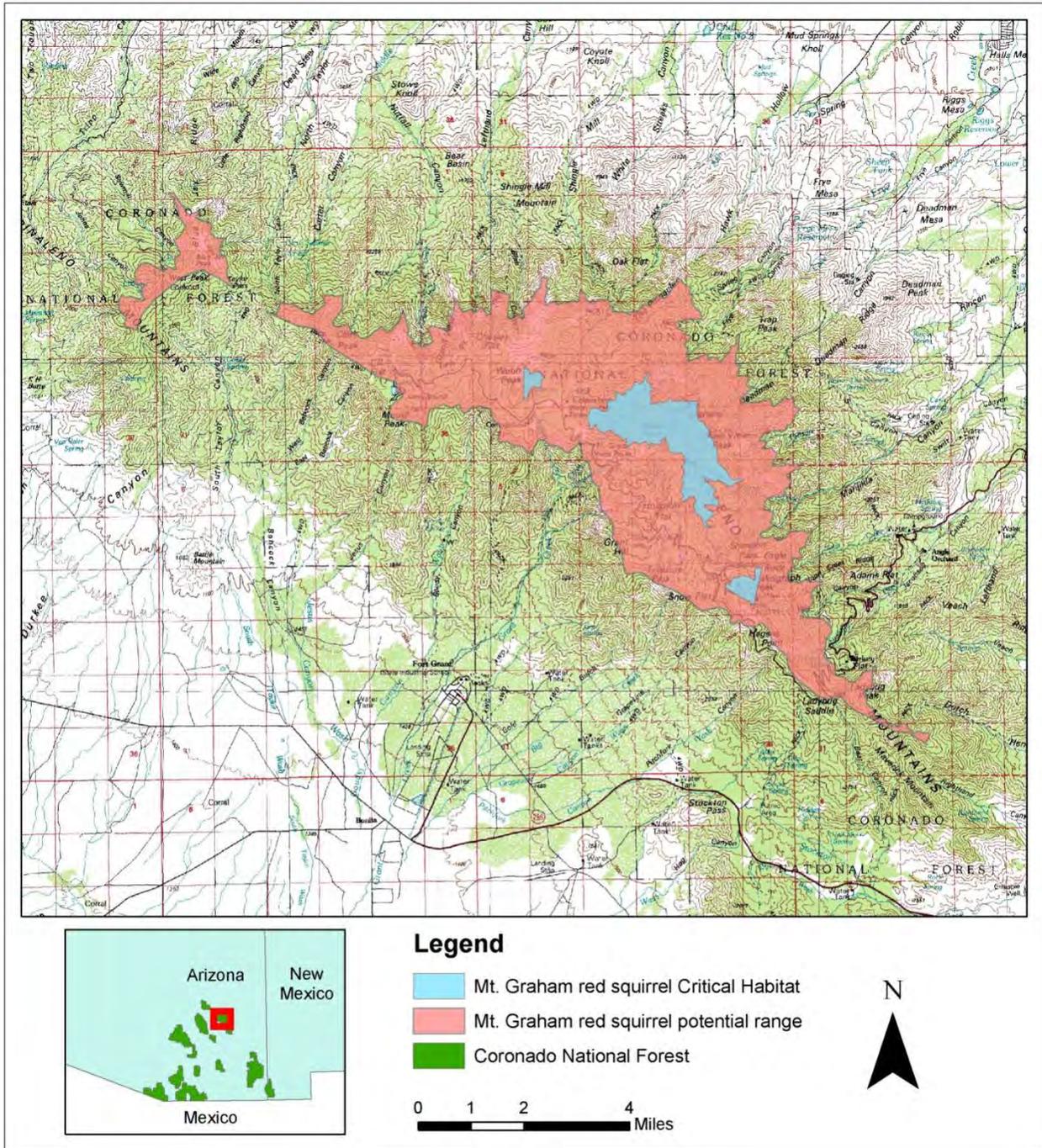
All aspects of the captive breeding pilot program would be coordinated among AESO, AGFD, USFS, the Mt. Graham Red Squirrel PMP coordinator, RSMP, and participating facilities; these entities would provide input during key decision-making times throughout the life of the project (e.g., where to capture squirrels, where to release squirrels, etc.). Additionally, the Technical Subgroup of the Mt. Graham Red Squirrel Recovery Team would review the pilot program annually to ensure the program is meeting its objectives. Especially important would be input from these cooperators regarding the success of breeding efforts and release techniques, including recommendations for adaptive management. Adaptive management would be employed within the constraints of the project described herein to improve the likelihood of success of the project and to reduce any potential adverse effects on resources or affected parties. Should the Technical Subgroup feel that a full captive-breeding program is necessary to recover the Mt. Graham red squirrel (possibly involving more than 16 captive squirrels), a meeting of both the Technical and Stakeholder Subgroups of the Recovery Team would be convened to discuss this option. Coordination efforts will be documented for Annual Reports.

### **3.2 *Points of concern***

It is our expectation that the proposed action alternative would result in the following:

- An unknown number of individuals would be harassed during reconnaissance and pre-baiting activities, however these activities as presently implemented have not resulted in injury or death and the same techniques would be used for this project.
- The non-lethal removal of up to 16 Mt. Graham red squirrels over 10 years from the wild potentially could affect the overall population.
- Squirrels potentially could be injured or harmed during trapping, transport, and/or release activities, or while in captivity.
- Release of captive-bred squirrels could detrimentally affect wild squirrels.

Figure 2. Mount Graham red squirrel potential range and critical habitat (potential range boundary determined by Hatten 2009).



#### **4. Alternative C – Establish Captive Population(s) for Research Purposes with up to Eight Wild-caught Red Squirrels from the Pinaleño Mountains**

This alternative is identical to Alternative B, above, except rather than removing 16 Mt. Graham red squirrels from the Pinaleño Mountains, this alternative would remove eight. The reduction in the number of Mt. Graham red squirrels to eight was done to further reduce the potential for effects to the wild population over time. Like Alternative B, we would attempt to capture young-of-the-year squirrels around the time they begin to disperse from their natal area, but may capture up to eight adult squirrels (including no more than four adult females) if trapping this cohort proves unsuccessful. No more than eight squirrels would be removed from the wild under this alternative, unless Mt. Graham red squirrels bred in captivity have been released back into the wild and have demonstrated they survive and reproduce at a level that meets or exceeds the natural level of survivorship and fecundity for this subspecies. The mitigation measures and continued coordination as described under Alternative B would be identical for this alternative, with the exception that no more than eight Mt. Graham red squirrels would be removed from the wild.

##### **4.1 Points of concern**

It is our expectation that this alternative would result in the following:

- An unknown number of individuals would be harassed during reconnaissance and pre-baiting activities, however these activities as presently implemented have not resulted in injury or death and the same techniques would be used for this project.
- The non-lethal removal of up to eight Mt. Graham red squirrels from the wild potentially could affect the overall population.
- Squirrels potentially could be injured or harmed during trapping, transport, and/or release activities, or while in captivity.
- Release of captive-bred squirrels could detrimentally affect wild squirrels.
- A total of eight wild squirrels may limit our ability to meet the purpose and need of the captive breeding pilot program.

#### **5. Other Alternatives Considered**

Two other alternatives, Alternatives D and E, were considered but ultimately rejected because they did not meet the proposed action's purpose and need.

Alternative D involved establishing a captive breeding pilot program using up to 16 Mogollon red squirrels from the White Mountains, Arizona, instead of Mt. Graham red squirrels. The White Mountains support the nearest population of red squirrels to the Pinaleño Mountains. These squirrels share similar life-history traits with the Mt. Graham red squirrel, and therefore could act as a surrogate for the Mt. Graham subspecies in developing captive husbandry, rearing, breeding, and release techniques. However, there may be differences in behaviors between the two subspecies that could affect outcomes of husbandry, propagation, and release protocols. For example, Mogollon red squirrels have smaller home ranges and thus may be more used to closer neighbors than Mt. Graham red squirrels that have larger home ranges. That could affect how

they respond to the individual red squirrel in the next cage in terms of stress levels that can affect health and breeding ability. Unfortunately, we would not know if there were differences that affected the protocols until such time as the Recovery Team determined to implement the larger-scale breeding program with the Mt. Graham subspecies. Since one of the triggers to implement that program could be a catastrophic decline in the Mt. Graham population, the loss of time to re-evaluate the protocols before they could be implemented could have adverse effects.

Alternative E involved translocating up to 16 Mt. Graham red squirrels to appropriate habitat in another mountain range in Arizona. This alternative was focused on the purpose and need to establish a group of Mt. Graham red squirrels outside of Pinaleño Mountains that could serve as a buffer against catastrophes. Since this FEA is focused on the purpose and need to develop captive husbandry, rearing, breeding, and release techniques; this alternative was eliminated from further consideration.

The No Action Alternative (Alternative A) also fails to satisfy the purpose and need of the proposed action, but is retained as the baseline for comparing environmental effects.

### **Section III: AFFECTED ENVIRONMENT**

#### **Environmental Setting**

The Pinaleño Mountains are located in southeastern Arizona and are within the Safford Ranger District of the Coronado National Forest, which means all ongoing and future actions are either led by or coordinated with the USFS. Mt. Graham red squirrels inhabit an approximately 7,907 ha (19,768-ac) area in the high-elevation forests of this mountain range (Figure 2). Their habitat supports primarily Engelmann spruce (*Picea engelmannii*) and corkbark fir (*Abies lasiocarpa* var. *arizonica*) at the highest elevations, and is dominated by Douglas fir (*Pseudotsuga menziesii*) in the lower, mixed-conifer association, with white fir (*Abies concolor*) and Mexican white pine (*Pinus strobiformis*) as sub-dominants.

Catastrophic wildfire currently poses the greatest threat to the human and biological environment in the Pinaleño Mountains, including all remaining habitat for the red squirrel. The cumulative effects due to past practices of fire suppression, livestock grazing, and logging have resulted in a shift in the fire regime from short-interval, low-intensity fires to infrequent but larger, high-intensity fires (USFS 2000a). Two such fires have occurred in the recent past, the Clark Peak Fire in 1996 and the Nuttall Complex Fire in 2004, which together affected approximately 35,000 acres of forested area. Fire size is currently limited by wildfire-suppression activities and fuel-reduction projects (such as the Pinaleño Ecosystem Management demonstration project and Pinaleño Ecosystem Restoration Project, described below). Engelmann spruce and corkbark fir, both fire-intolerant species, now grow in much greater density and probably at lower elevations than in the past, as evidenced by the number of these trees less than 110 years old in areas where the dominant, older trees are almost exclusively fire-resistant Douglas-fir, ponderosa pine, and southwestern white pine. In addition to accumulation of fire-intolerant species, the mixed conifer forest has become dense with continuous horizontal (canopy cover) and vertical (ladder)

fuels, meaning these forests no longer provide a fire buffer to the spruce-fir forest, resulting in increased fire intensity (hotter fires) and an increased risk of crown fire (severity), both of which are more likely to alter and destroy resources on the mountain.

One silvicultural project designed to address the heavy fuel loads in the Pinaleño Mountains has been completed in the mixed-conifer area, the Pinaleño Ecosystem Management (PEM) demonstration project, which was implemented from 2000 through 2008. The PEM project involved thinning, piling, burning, and sometimes broadcast burning in an area occupied by the red squirrel, northern goshawk, Mexican spotted owl, and other USFS Sensitive species. Another, larger, fuel reduction and forest restoration project proposed by the Coronado National Forest is the PERP. This project is designed to help reduce the threat of catastrophic wildfire (described above) in much of the remaining mixed conifer zone, and will begin to set the forest on a trajectory towards conditions that will allow a return to low-intensity fire cycles without risk of catastrophic fire damage. The mixed conifer forest currently has the largest block of remaining red squirrel habitat, and monitoring of impacts to the red squirrel and its habitat are incorporated into the project's design. This larger project will take a decade or more to complete.

Compounding the threat of wildfire are the added pressures of insect and disease outbreaks and climate change. At the highest elevations, Engelmann spruce and corkbark fir populations in the Pinaleño Mountains were severely depleted by recent catastrophic outbreaks of *Nepytia janetae*, spruce beetle, western balsam bark beetle (USFS 1999, 2000b), and spruce aphid (Lynch 2004). Additionally, armillaria root disease, and associated blowdown, was observed in Engelmann spruce and corkbark fir in the mixed-conifer forest type in 2008. Armillaria root disease activity may be increasing due to the increase in food substrate that became available from spruce and fir mortality, and it appears that armillaria is infecting Engelmann spruce and other species weakened by drought and defoliators, and may be spreading to relatively healthy trees, although further study is warranted (A. Lynch and M.L. Fairweather, USFS, pers. comm. 2008). As the spruce-fir forest is lost due to insects, disease, and other sources of mortality, it is unclear what forest type may replace it.

Threats due to insects in the mixed-conifer forest currently include bark beetles in Douglas-fir and southwestern white pine, and defoliators in Douglas-fir and spruce. These agents are generally not exclusive but interact with each other and other stressors such as drought, root disease, and dwarf mistletoes to cause tree mortality. Increasing levels of drought due to climate change (see below) likely will work in combination with increasing levels of insect outbreaks and wildfires, which will likely directly impact the environment and resources in the Pinaleño Mountains.

Currently, Arizona is experiencing a severe, multiple-year drought (refer to <http://www.azwater.gov/azdwr/StatewidePlanning/Drought/DroughtStatus.htm> and <http://www.climas.arizona.edu/outlooks/swco>), and current models suggest that a 10 to 20 year (or longer) drought is anticipated (Swetnam and Betancourt 1998, Woodhouse and Overpeck 1998, McCabe *et al.* 2004, Seager *et al.* 2007). While this drought is apparently within natural historical variation (Swetnam and Betancourt 1998), mean annual temperatures are forecasted to

rise 4.4-6°C (8.1-11.0° F) in the 21<sup>st</sup> century (Intergovernmental Panel on Climate Change 2007), which in turn are predicted to be accompanied by a more arid climate (Seager *et al.* 2007), increasing insect outbreaks in Southwestern forests, and increasing wildfires (Betancourt 2004).

Human activities in the Pinaleño Mountains and within Mt. Graham red squirrel habitat include transportation, recreational use, scientific study, and forest administration and management. The 56.3 kilometer (km) (35.2-mile) Swift Trail (Arizona Route 366) is the main road providing access to the mountain. The lower 34.9 km (21.85 miles) of the road are paved, while the upper 21.4 km (13.35 miles) are graded dirt. The entire road is open to vehicular use from April 15 to November 14 (snow permitting), with seasonal closure occurring at the beginning of the dirt portion of the road. Non-motorized recreation is allowed beyond the road closure during the winter months. Improvements to Swift Trail may occur in the future, which could include paving the remaining portion of graded dirt road to Riggs Flat Lake (located near the end of Swift Trail).

Recreational opportunities within the range of the Mt. Graham red squirrel include eight developed campgrounds, as well as a number of hiking and mountain biking trails. Riggs Flat Lake, located near the end of Swift Trail, is an 11-acre impoundment providing fishing opportunities for rainbow, brown, and brook trout. There are two areas permitted for special use of summer homes on the mountain, the Columbine and Turkey Flat cabin areas, containing 14 and 74 summer homes, respectively. Other developments within the red squirrels' range include a Bible Camp and a Boy Scout Camp.

The Mount Graham International Observatory (MGIO) is accessed off of Swift Trail and includes an access road and three telescopes on 3.23 hectares (ha) (eight acres [ac]) on and around Emerald Peak. These telescopes were authorized under the Arizona-Idaho Conservation Act (1988), which also established a 708 ha (1,750 ac) Mt. Graham Red Squirrel Refugium surrounding the Hawk Peak-High Peak areas, as well as a 60.7 ha (150 ac) research area (including the footprint of the telescopes) to monitor the effects of the MGIO on the Mt. Graham red squirrel. Activities within the research area and use of the telescopes are ongoing. There is the potential that up to four more telescopes could be constructed on an additional 3.23 ha (eight ac) within the research area in the future.

Within the proposed action area, USFS Administrative Sites are established at Heliograph Peak, Columbine Work Center, and Webb Peak Lookout. There are also fire lookout towers on Clark, West, Webb, and Heliograph peaks. Other than treatments that will occur through the PERP (described above), there are no planned activities near these locations that would require additional section 7 consultation.

## **Biology and Status of the Mt. Graham Red Squirrel**

Mt. Graham red squirrels are small, grayish-brown arboreal rodents with a rusty to yellowish tinge along the back (Spicer *et al.* 1985). They are highly territorial (Smith 1968), creating and defending middens within their territories. Middens are areas that consist of piles of cone scales

in which squirrels cache additional live, unopened cones as an over-wintering food source. Placement of these middens tends to be in areas with high canopy closure near food sources (e.g. Douglas-fir, corkbark fir, and Engelmann spruce). This type of placement allows specific moisture levels to be maintained within the midden, thereby creating prime storage conditions for cones and other food items, such as mushrooms, acorns, and bones. They also seem to prefer areas with large snags or downed logs that provide cover and safe travel routes, especially in winter, when open travel across snow exposes them to increased predation.

Female Mt. Graham red squirrels give birth to fewer young (reported means=2.35 and 2.15) compared to other red squirrels (reported means=3.69 and 3.72) (Rushton *et al.* 2006 and Munroe *et al.* 2009, respectively). Nests can be in a tree hollow, a hollow snag, a downed log, or among understory branches of a sheltered canopy. Nests may be built in natural hollows or abandoned cavities made by other animals, such as woodpeckers, and enlarged by squirrels (USFWS 1993). Froehlich (1990) found that Mt. Graham red squirrels built 60 percent of their nests in snags, 18 percent in hollows or cavities in live trees, and 18 percent in logs or underground. Only four percent of nests were bolus grasses built among branches of trees (also called dreys). Slightly different proportions were found by Morrell *et al.* (2009), who noted 67 percent of the Mt. Graham red squirrel nests within their study area were located in tree cavities, 27 percent were bolus nests, and seven percent were ground nests. Leonard and Koprowski (2009) found that Mt. Graham red squirrels appear to favor cavity nests over bolus nests, whereas the nearest population of red squirrels in the White Mountains, the Mogollon red squirrel, used predominantly dreys. They speculate that localized processes such as slightly elevated temperatures and isolation may be responsible for the disparity between these two subspecies. In the Pinaleño Mountains, snags are important for cone storage as well as nest location. Both nests and stored cones have been found in the same log or snag.

Maximum longevity for the red squirrel in the wild is reported to be 10 years (Walton 1903) and nine years in captivity (Klugh 1927), although 3-5 years is more typical (Munroe *et al.* 2009). Annual adult mortality of Mt. Graham red squirrels appears to be higher than for red squirrels throughout North America (47 percent vs. 34.73 percent) (Rushton *et al.* 2006). Annual juvenile mortality has not been studied directly, but Munroe *et al.* (2009) suggest it could be higher than other populations of red squirrels due to the extreme natal dispersal distance required to establish a new territory. Studies of radio-collared animals suggest predation accounts for a large majority of mortality in red squirrels (Kemp and Keith 1970, Rusch and Reeder 1978, Stuart-Smith and Boutin 1995a&b, Kreighbaum and Van Pelt 1996, Wirsing *et al.* 2002); however, the availability of alternative prey for predators (Stuart-Smith and Boutin 1995a), availability of food for red squirrels (Halvorson and Engeman 1983, Wirsing *et al.* 2002), and variation in vigilance and use of open areas by individual squirrels (Stuart-Smith and Boutin 1995b) have been suggested to predispose some animals to higher susceptibility to predation. Indications are that 75 to 80 percent of the mortality experienced by Mt. Graham red squirrels is due to predation, most of which is caused by raptors (Koprowski, March 16, 2006 Recovery Team Meeting Minutes).

Rangewide, multi-agency red squirrel surveys, based on a sample of middens throughout the range of the Mt. Graham red squirrel, have been conducted since 1986. Midden surveys showed increasing numbers of Mt. Graham red squirrels into 1998-2000, with peaks over 500, after

which the population declined. Population estimates dropped in 2001 to less than 250; since that time, population estimates have remained fairly stable, varying from approximately 200 to 350.

Koprowski *et al.* (2005) characterized the decline of the Mt. Graham red squirrel in their study area as catastrophic. They noted that in areas of high tree mortality in Alaska and Colorado, red squirrels did not completely disappear but rather persisted in residual stands of trees where conditions remained suitable. The ability of the Mt. Graham red squirrel to survive declines is unknown; however, it apparently survived a similar situation in the late 1600s. Grissino-Mayer *et al.* (1995) sampled fire-scarred trees in four areas of the Pinaleno Mountains from Peter's Flat east to Mt. Graham. The oldest trees in the spruce-fir forest were about 300 years old. They found evidence for a widespread, stand-replacing fire in 1685 that probably eliminated much of the forest atop the Pinaleno Mountains. Although the Mt. Graham red squirrel population persisted through that event, small populations can exhibit genetic or demographic problems that further compromise the ability of the subspecies to survive. Recent genetic analysis (Fitak and Culver 2009) indicates the average relatedness among Mt. Graham red squirrel individuals is over 90 percent, which is near the value of human identical twins and indicates potential impacts from inbreeding depression. Low genetic variability in small populations is a concern because deleterious alleles are expressed more frequently, disease resistance might be compromised, and there is little capacity for evolutionary change in response to environmental change. Koprowski *et al.* (2005) recommended management actions to increase available habitat and population size in the near and distant future. A captive breeding program was also recommended, the concept of which has been endorsed by the MGRS Recovery Team and is the subject of this FEA.

Threats facing the Mt. Graham red squirrel include loss of habitat due to native and exotic insect infestations (Koprowski *et al.* 2005), direct mortality and loss of habitat and middens due to large-scale wildfires (Koprowski *et al.* 2006), loss of habitat due to human factors (e.g., disturbance, conversion to roads, trails, and/or recreation sites, permitted special uses, etc.; U. S. Fish and Wildlife Service 1992), and loss or reduction of food sources due to drought, predation, and apparent dietary and territory competition with Abert's squirrel, which was introduced in the 1940s by the AGFD (Edelman *et al.* 2005). Current management of the Mt. Graham red squirrel includes an annual mountain-wide survey of a random selection of middens to determine population size and trends, as well as research and monitoring activities performed by RSMP and University of Arizona graduate students (under the guidance of Dr. John Koprowski or his designee) to continue refining our understanding of the subspecies and its habitat.

#### **Section IV: ENVIRONMENTAL CONSEQUENCES**

Effects of the three alternatives, including the no action and preferred alternatives, are summarized in the "Summary Table of Environmental Consequences".

The no action alternative would have no direct effect on biological, cultural, economic, or water resources because no activities related to the proposed action would be conducted.

Possible concerns and issues regarding environmental consequences if Alternative B (the preferred alternative) or Alternative C were to be implemented are discussed below, including:

- 1) What are the economic impacts of developing a Mt. Graham red squirrel captive breeding pilot program?
- 2) How would releasing captive-bred Mt. Graham red squirrels impact land use and human activities in the Pinaleño Mountains?
- 3) What are the impacts to the wild population of Mt. Graham red squirrels when individuals are released back into the wild?
- 4) How would removal of either eight or 16 Mt. Graham red squirrels from the wild affect threatened and endangered species and their habitats?
- 5) How would cumulative effects on all resources be affected by the proposed alternatives?

With implementation of Alternatives B or C, no ground-disturbing activities would occur, no vegetation would be removed, driving would occur only on designated roads, and reconnaissance, pre-baiting, and trapping activities would not preclude or displace recreational activities or other human uses of the forest. Therefore, we expect no effects to water quantity, water quality, air quality, cultural and historical resources, visual resources, soils, or geology.

## **Economics**

### ***Alternative A – No Action Alternative***

Under the no action alternative, the FWS would take no action to establish a captive breeding pilot program for the Mt. Graham red squirrel; thus no Federal funds would be expended beyond those already obligated in this and other planning processes, and no economic impacts would occur to achieve the purposes of the proposed action.

### ***Alternative B – Establish Captive Population(s) for Research Purposes with Up to 16 Wild-caught Red Squirrels from the Pinaleño Mountains (Preferred Alternative)***

In 2009 the AESO was awarded a small grant of approximately \$15,000 to begin establishing a captive breeding pilot program for the Mt. Graham red squirrel. These funds were spent on purchasing equipment (e.g., traps, travel crates, soft-release enclosure, radio telemetry equipment, etc.) and future transportation of squirrels. Costs for this project would be expected to increase as up to 16 wild squirrels are brought into captivity and successful husbandry and breeding techniques are learned. Currently, these additional costs would be absorbed by the facilities (e.g., zoos and museums) that have volunteered to participate in this pilot program. The Phoenix Zoo costs to maintain the red squirrels in their care since 2012 was approximately \$42,000.00, during which time they held four red squirrels for six months and the two males for the full year. Maintaining some captive-born red squirrels instead of releasing them would incur additional costs. These institutions plan to absorb the care and husbandry of these squirrels into the general duties of their zoo keepers. Once the pilot program is fully populated with up to 16 wild squirrels, costs should be similar from year to year as captive squirrels are consistently housed, bred, transported, and released to the wild. Funding would continue to be pursued to alleviate some of the costs incurred by facilities participating in this program.

***Alternative C – Establish Captive Population(s) for Research Purposes with up to Eight Wild-caught Red Squirrels from the Pinaleño Mountains***

The economic costs involved with this alternative would initially be less than those detailed in Alternative B, because fewer or smaller captive facilities for Mt. Graham red squirrels would be built and maintained. Over time, the costs of this alternative could equal Alternative B, as more captive-bred squirrels produced could be maintained for breeding purposes rather than released into the wild.

## **Land Use and Human Activities**

### **Alternative A – No Action Alternative**

There would be no impact associated with releasing Mt. Graham red squirrels into the wild on land use and human activities, as no squirrels would be released.

***Alternative B – Establish Captive Population(s) for Research Purposes with up to 16 Wild-caught Red Squirrels from the Pinaleño Mountains (Preferred Alternative)***

Site selection for release of captive-born red squirrels is designed to avoid conflicts between released squirrels and human activities and land use. Release sites would only occur within the Mt. Graham red squirrel's range (Figure 2) and would not be located within 4,000 ft of existing structures, campgrounds, special use areas (e.g., summer homes, Bible and Boy Scout Camps), and the 60.7 ha (150 ac) MGIO research area. This distance was chosen because it is greater than twice the mean dispersal distance recorded for this subspecies (638.6 m, 1,916 ft; Kreighbaum and Van Pelt 1996), and is also greater than the maximum distance a red squirrel was found from its midden (1009 m, 3,028 ft) once it has an established territory (Koprowski *et al.* 2008). This should avoid the potential for released squirrels to disperse into and establish territories within areas that may conflict with human activities. Release sites would be coordinated with the AESO, Mt. Graham Red Squirrel PMP coordinator, USFS, AGFD, and RSMP, and would be detailed in an annual report to the Technical Team each year for their input.

A 4.6 m (14-ft) wide by four m (12-ft) deep by 2.3 m (seven-ft) high soft-release enclosure (Figure 1) would be installed within the Columbine administrative site to provide captive squirrels the opportunity to experience their natural habitat prior to release. From this enclosure, squirrels would be recaptured and released at sites meeting the requirements discussed above. The enclosure has been designed in paneled sections so that it can be assembled using hand tools and small power tools. It would be built on a concrete block floor and would not require any ground-disturbing activities. Therefore, the soft-release enclosure should have no impact to land use and human activities.

Future projects proposed by the USFS potentially could be impacted by releasing Mt. Graham red squirrels into currently unoccupied areas. For example, areas treated through PERP may be considered as potential release sites for captive red squirrels to determine if these areas can or

will provide habitat; however, releasing squirrels into PERP-treated areas would not affect implementation of PERP, as releases would not occur in these areas until after treatment is completed. Additionally, because all release sites would be coordinated with the contacts listed in Appendix 2 (including the USFS), sites can be selected to minimize the potential for released squirrels to affect future USFS activities. In practice, the USFS currently consults with the FWS on activities above 2333 m (7,000-ft) elevation that may impact Mt. Graham red squirrel habitat, as well as areas of known midden locations and red squirrel sightings (A. Casey, USFS, pers. comm. 2010). Therefore, releasing squirrels into areas agreed upon by the USFS would minimize any effects this pilot program has on future activities. Release of squirrels into the wild through the proposed action also would not affect the USFS ability to fight or control fires in the future, as firefighting techniques within the range of the Mt. Graham red squirrel will remain the same (A. Casey, USFS, pers. comm. 2010).

***Alternative C – Establish Captive Population(s) for Research Purposes with up to Eight Wild-caught Red Squirrels from the Pinaleño Mountains***

Impacts to land use and human activities due to released squirrels eventually would be identical to those described under Alternative B, although there would likely be fewer effects because fewer squirrels would be available for release.

## **Threatened and Endangered Species – Effects to the Mt. Graham Red Squirrel**

***Alternative A – No Action Alternative***

Under the no action alternative, the FWS would take no action to establish a captive breeding pilot program for the Mt. Graham red squirrel. Continuing and increasing threats to Mt. Graham red squirrels and their habitat, as well as other threatened, endangered, and sensitive species and their habitats in the Pinaleño Mountains, would continue to affect the population.

***Alternative B – Establish Captive Population(s) for Research Purposes with up to 16 Wild-caught Red Squirrels from the Pinaleño Mountains (Preferred Alternative)***

We conducted an intra-service formal consultation, in accordance with section 7 of the Endangered Species Act of 1973, as amended, to describe in more detail the effects of the chosen alternative on the Mt. Graham red squirrel and other listed species (USFWS 2013). In our biological opinion, we determined the implementation of the pilot project was not likely to jeopardize the red squirrel or destroy or adversely modify designated critical habitat. No other listed species or critical habitat would be adversely affected by the preferred alternative.

Aspects of the preferred alternative could result in some short-term adverse effects to individual red squirrels, but should promote recovery of the red squirrel in the longer term. Effects to red squirrels could result from the following activities: a) reconnaissance and pre-baiting; b) trapping and transport; c) captivity and care (including collecting samples for genetic testing, individually marking each squirrel, monitoring the health of individuals, etc.); and d) releases back to the wild. For pre-baiting, trapping, and handling, the FWS proposes to use the techniques currently

used by Dr. Koprowski in the UA study area as these have proven to be effective and safe (Koprowski 2002 and Koprowski *et al.* 2008).

#### Effects of reconnaissance and pre-baiting activities

An unknown number of individuals would be affected during reconnaissance and pre-baiting activities, but these effects are not anticipated to have meaningful impacts to the populations. We could find no information relating to deleterious effects of human presence (such as would occur during reconnaissance) on the behavior of red squirrels in their natural environment. Mt. Graham red squirrels have been noted to react to the presence of people within their territory (M. Alanen, FWS, personal observation), but human presence does not appear to influence survivorship, as the same red squirrel will occupy a territory even after multiple visits and multiple capture events (e.g., as noted in Koprowski 2005 and Koprowski *et al.* 2008).

The FWS will not trap within the UA study area to avoid interfering with that ongoing project. Outside of that area, there are currently no ongoing trapping efforts so these red squirrels are more naïve about pre-baiting and trapping activities. Of the middens visited during reconnaissance trips, 24-36 middens (in up to four areas of occupied red squirrel habitat) would be pre-baited and a subset of those subsequently trapped to obtain the four red squirrels needed this field season.

Placement of peanuts and peanut butter (or almonds and almond butter) in the midden area for pre-baiting may have both adverse and beneficial effects to red squirrels from increased predation risk, and additional food resources.

Supplemental feeding of red squirrels was experimentally implemented in 1989-1990 (USFWS 1989). This program involved large trash cans filled with sunflower seeds and commercial rodent blocks placed at middens. The summary report included information on other mammals and birds seen in the vicinity of the feeders. Other small mammals (cliff chipmunks, Abert's squirrels, rock squirrels, and woodrats) and birds (chickadee, nuthatches, jays, and juncos) were also found using the supplemental food resources available and the resident red squirrel spent some time defending the feeder at its midden (USFS 1990). There were predators observed or sign recorded (canids, bobcat, coatimundi, goshawk, and red tail hawk. One red squirrel may have been taken by a predator, but the manner of death could not be determined (USFS 1990). However, because there may be a risk of increased predation due to supplemental feeding, the pre-baiting techniques to be used do not concentrate bait at one location that the red squirrel might attempt to defend, or in doing so, be less aware of predators. The FWS will use the method employed by Dr. Kowalski within the UA study area of scattering whole peanuts or almonds and smearing peanut or almond butter on parts of the midden so as to mimic the availability of food items across the area. We expect that normal foraging actions would enable the animals to encounter the food without increasing the risk of predation.

In terms of the effects of supplementing food resources (e.g., during pre-baiting), Layne (1954) reported that once red squirrels are trapped and the food source is learned, the animals will return regularly and be recaptured. Linduska (1950) noted that yearly fluctuations in the trapability of red squirrels correlated with a shortage of natural foods. Sullivan (1990) found that with

supplemental feeding, red squirrel populations were three to four times higher than control populations, and that food resources were likely the driving force behind population fluctuations. Additionally, he found that once food was withdrawn, population densities gradually approached those of the control. It appears that red squirrels are not trap-shy, and will instead take advantage of, and even benefit from, additional food resources when available. Therefore, the effects of pre-baiting could likely be slightly beneficial in the short term to the Mt. Graham red squirrel population at the pre-baited middens.

#### Effects of trapping and transport activities

The proposed action includes the non-lethal take of up to 10 percent of the total population in any calendar year through intentional capture, including individuals trapped incidentally (those trapped and released immediately) or removed through purposeful trapping (those brought into the pilot captive program). According to the most recent mountain-wide census data (conservative Fall 2012 estimate = 214), up to 21 squirrels could be trapped in 2010, with up to 16 of them (seven percent, including no more than eight females) removed from the wild to become a part of the pilot project. Based on the space available at our cooperating zoos, it is highly unlikely that 16 red squirrels would be removed from the wild population in one year. More likely is the removal of fewer than four to six individuals to provide for new cooperators or to replace wild-born individuals that died in captivity. The number of squirrels trapped as a part of this proposed action would fluctuate depending upon the most recent population information, never exceeding 10 percent of the total population in any one calendar year. No more than 16 Mt. Graham red squirrels would be removed from the wild, unless Mt. Graham red squirrels bred in captivity have been released back into the wild and survive and reproduce at a level that meets or exceeds their natural level of survivorship and fecundity. Should wild-caught squirrels die in captivity due to human-related causes (e.g., negligence during trapping, transport, or while in captivity), the total number of wild squirrels allowed to be held in captivity would be reduced by that number.

Red squirrels appear to be less susceptible to handling “shock” than other species of squirrels (e.g., fox squirrels and gray squirrels; Layne 1954, Yahner and Mahan 1992). Yahner and Mahan (1992) suggest that nutritional stress may correlate with instances of handling shock, including two Mt. Graham red squirrels that died during handling in 1988, a year with a poor autumn cone crop. However, use of a cloth handling cone to restrain squirrels during handling has proven effective for individuals of seven tree squirrel species, including 47 Douglas squirrels, eight red squirrels, 13 Abert’s squirrels, 65 western gray squirrels, 43 Mexican fox squirrels, and 857 fox squirrels (Koprowski 2002). Of 2,458 eastern gray squirrels captured and handled, only three died or were injured during use of the handling cone, two of which appeared to have been from nutritional stress and exhaustion (the third was a result of suffocation when the animal’s front paw lodged in its throat while the animal was in the cone) (Koprowski 2002). Additionally, over a seven-year period of trapping and handling Mt. Graham red squirrels (August 2001 through November 2008), only one squirrel in 1,877 capture events died as a result of handling shock; the protocol has since been revised to allow animals that begin to escape during handling be allowed to do so (Koprowski 2008).

In terms of trap shock (i.e., squirrels found dead in a trap prior to handling), less information is available. Layne (1954) documented one of 149 live-trapped red squirrels dying in a trap. Hamilton (1939) states “the red squirrel has such a nervous temperament that if left long in a trap it will injure or fret itself to death,” and recommends checking traps frequently and removing trapped squirrels immediately. No trap deaths or injuries have occurred with Mt. Graham red squirrels during the 1,877 capture events conducted by Koprowski, which is likely due to Koprowski *et al.* (2008)’s protocol of checking traps every two hours and closing them to capture each night. The proposed action would follow this protocol, in addition to placing pieces of wood and bark across and against the sides of the traps to provide shade and protection within the trap, and if the weather becomes inclement, the traps would be checked immediately and closed to capture until the weather event has passed.

The effect of trapping and immediately releasing Mt. Graham red squirrels (as would happen if the wrong age or sex of squirrel were accidentally captured during trapping activities) is likely to have minimal impact on the captured individuals. From September 1 through December 31, 2006, Dr. Koprowski captured 34 individual Mt. Graham red squirrels (Koprowski 2007). From this time period through November 30, 2009, 15 of these individuals were captured two to five times, five were captured six to nine times, and nine were captured 10 times or more, with the greatest number of re-captures of an individual during this time period totaling 16 (Koprowski 2008 and 2009). All of these animals were successfully released after each capture event, and, while the ultimate fate of each squirrel is unknown, the fact that many were trapped multiple times over this time period appears to indicate that Mt. Graham red squirrels will tolerate being trapped and released multiple times with minimal negative effects.

We were unsuccessful in finding information related to mortality of red squirrels during transport. The limited information we have comes from three Mt. Graham red squirrels that were captured on Mt. Graham and delivered to a State and Federally permitted wildlife rehabilitator in Tucson, Arizona. Two of these individuals were a young-of-the-year sibling pair captured at 3:30 pm on May 23, 2004 by the Red Squirrel Monitoring Program, who cared for them until a FWS employee picked them up by vehicle the next day at 8:30 pm. They were carried in a secure transport box along with formula and feeding supplies and delivered safely to the wildlife rehabilitator, who cared for them until October 28, 2004, when they were then delivered to the Arizona-Sonora Desert Museum, an AZA member and State and federally permitted facility. The Museum cared for them until their deaths approximately 3.5 and 4.5 years later (see Effects of captivity and care). The other individual (approximately five days old) was found after dark at the base of a nest tree on May 25, 2010. He was nursed back to health by the Red Squirrel Monitoring Program, who then delivered him to the same wildlife rehabilitator on May 28, 2010. The wildlife rehabilitator cared for the young squirrel until he succumbed to pneumonia on Jun 30, 2010.

Of the anticipated effects of the proposed action, removal of up to 16 Mt. Graham red squirrels from the wild would be expected to have the greatest negative effects. Attempts would be made to capture dispersing juvenile squirrels, which, according to Munroe *et al.* (2009), likely suffer a high rate of mortality due to the extreme distances they must travel to locate a new territory. Therefore, capturing these individuals just prior to or during dispersal should lessen the impact

on the overall population, as keeping these individuals in captivity could extend their life expectancy while at the same time provide individuals for future release. Should capturing dispersing juveniles prove unsuccessful, up to eight adults (including up to four females) could be captured. Currently, eight adults represent six percent of the overall population. While a short-term negative effect on the overall population may be caused by removing these individuals from the wild, it is likely that in the long-term these individuals would be replaced by recruitment of wild-born juveniles and possibly by animals produced in captivity. Mt. Graham red squirrels were known to have been lost during the Nuttall Complex Wildfire in 2004, including at least four adult males and three adult females (Koprowski *et al.* 2006). We suspect that these losses were reflected in the decreased population numbers during the year following this fire. However, since that time the population has increased to a size similar to pre-fire numbers, and continues to fluctuate annually between approximately 200 and 350 squirrels. We expect the removal of up to four adult males and four adult females would affect the overall population to a lesser extent than the Nuttall Complex Wildfire, as no habitat would be lost due to the proposed action, and individuals produced in the wild by natural recruitment and in captivity and then released would be available to replace those removed from the wild.

#### Effects of captivity and care

The maximum longevity for red squirrels in captivity is reported to be nine years, with signs of aging becoming apparent around age five or six (Klugh 1927). Layne (1954) captured 22 red squirrels and kept them in captivity for periods ranging from two days to 10 months. Two Mt. Graham red squirrels have been kept in captivity in the past, a young-of-the-year male and female sibling pair that were collected on May 23, 2004 and housed primarily at the Arizona-Sonora Desert Museum in Tucson, Arizona. The male red squirrel died in captivity on December 13, 2007 (approximate age of 3.5 years), possibly as a result of excessive feeding that may have contributed to the development of a tumor of fatty tissues in the thorax and subsequent hypoxia due to severe lung compression. The female died on December 11, 2008 (approximate age of 4.5 years) due to a bacterial infection. Additionally, one very young red squirrel (approximately five days old when found) was kept in captivity at a wildlife rehabilitation facility in Tucson, Arizona, until it succumbed to pneumonia on June 30, 2010, at approximately six weeks of age. Pneumonia is a common cause of death in young red squirrels (J. Koprowski, UA, pers. comm. 2010). None of the squirrels were bred, as other unrelated Mt. Graham red squirrels were not available in captivity at that time. However, Prescott and Ferron (1978) were able to successfully breed red squirrels three times in outdoor enclosures, even though female red squirrels are in estrus for less than one day each year. Eight pups were produced from these three breeding events. They state that adult red squirrels are easily kept in captivity, and despite their territoriality, can tolerate the presence of conspecifics in the same enclosure, provided that the amount of food is always slightly more than their needs. It is unknown if this could be a successful strategy with Mt. Graham red squirrels, as the two that were held in captivity at the Desert Museum were housed in separate cages.

The four red squirrels (two males and two females) taken from the wild in the summer of 2011 were taken to the Phoenix Zoo for holding. The two males (judged to be over a year old at capture) are still in the indoor enclosures prepared by the Phoenix Zoo in anticipation of the pilot project. The two females (judged to be juveniles) died in July, 2012, of unknown causes.

Necropsy and histopathology reports were negative as to cause. With these red squirrels, the Phoenix Zoo initiated development of their captive breeding protocol (Wells 2012) and their husbandry program, including the diet fed to the red squirrels and handling protocols for physical exams (Wells 2013).

The effects of captivity and care would include the non-lethal harassment of up to 16 wild-caught individuals and an unknown number of captive progeny annually while in captivity due to genetic testing, health screenings, individually marking each squirrel, etc. Harassment of squirrels while in captivity due to health care activities and genetic testing is unlikely to result in mortality, as indicated by the normal life-spans of the Mt. Graham red squirrels kept at the Arizona-Sonora Desert Museum (3.5-4.5 years). Harassment activities at the Museum included routine veterinarian examinations (including anesthetization and microchip implantation) and general care (cage cleaning, feeding, enrichment, etc.). Additionally, the RSMP has individually marked nearly every Mt. Graham red squirrel within their study area with color-coded ear tags (more than 100 individuals), as well as outfitted many with radio-telemetry collars to track their movements. These individuals do not appear to have been negatively affected by these markers, as indicated by the number of times they were subsequently seen and captured (e.g., as noted in Koprowski 2005 and Koprowski *et al.* 2008). However, captive breeding events have not been attempted with this subspecies, so there could be potential for some injury or mortality of captive squirrels to occur while husbandry requirements are being determined, particularly in the first few years of the program.

#### Effects of release to the wild

Several infectious agents have been reported for red squirrels including tularemia (Burroughs *et al.* 1945), *Haplosporangium* (Dowding 1947), Adiaspiromycosis (Dvorak *et al.* 1965), Silverwater virus (Hoff *et al.* 1971), California encephalitis (Masterson *et al.* 1971), and Powassan virus (McLean 1963, McLean *et al.* 1968). A diversity of parasites has been reported from red squirrels in various parts of their range (reviewed by Flyger and Gates 1982). All animals coming into captivity and prior to release into the wild would undergo a 30-day quarantine period (per AZA guidelines and standards), which requires a complete physical examination, infectious disease testing, and all relevant vaccinations, making it unlikely that captive animals released into the wild would transmit diseases or parasites to the wild population. Additionally, parasite and disease infestations are not known to contribute to the mortality of Mt. Graham red squirrels (J. Koprowski, UA, pers. comm. 2008).

Currently we do not know the most successful strategy to release captive-raised Mt. Graham red squirrels into the wild. One of the purposes of the pilot program would be to determine the best release techniques to ensure captive Mt. Graham red squirrels have the best chance at survival once released. We will use a soft release technique, in which individuals would spend approximately seven to 10 days in the soft-release enclosure to acclimate to local conditions prior to release. A person familiar with caring for captive squirrels (e.g., zoo personnel) would stay at the Columbine administrative site the entire time squirrels are in the enclosure to monitor their behavior and condition, ensure they receive proper care, and provide a human presence to prevent captive squirrels from being harmed by other wildlife (e.g., bears) or people.

Candidates for release would be assessed as to whether they exhibit essential behavioral skills, including food recognition and acquisition, caching behavior, predator avoidance, and finding refugia. Each released Mt. Graham red squirrel would be individually tagged with color-coded ear tags, and radio-telemetry would be used to track their movements post-release.

The effects of building a soft-release enclosure are expected to be minimal. The enclosure (Figure 1) would be installed within the USFS's Columbine administrative site on Mt. Graham. Installing the enclosure at this location would minimize conflicts with human activities and impacts to the wild squirrel population, while also providing captive squirrels the opportunity to experience the natural weather and elevational conditions within their habitat prior to release. Locating the enclosure at Columbine also provides the convenience of running water and electricity (should it be needed) so that captive squirrels can easily be cared for while housed in the soft-release enclosure. The soft-release enclosure has been designed in paneled sections so that it can be assembled using hand tools and small power tools (e.g. screwdrivers and drills) and would be attached to a floor made out of concrete blocks. Its exact location would be selected within the Columbine administrative site to avoid any new ground disturbing activities. From this enclosure, squirrels would be recaptured and transported to release sites.

Interactions between released squirrels and wild squirrels would be expected to occur, but should be minimized not releasing captive-born red squirrels at existing occupied sites. Red squirrels are territorial, and therefore wild squirrels would defend their midden from intruders, including released squirrels. There could be the potential that wild squirrels could be harmed by released squirrels during these encounters, including being displaced, although it is more likely that the wild squirrels would have an advantage over released squirrels (most often they would be older and already familiar with the area), and therefore would be able to drive them away. Locations for release of captive squirrels would be chosen to minimize potential encounters between squirrels while still allowing released squirrels the opportunity to establish their own territories. Release sites would only occur within the Mt. Graham red squirrel's range (Figure 2), and locations could include gaps within the current distribution of red squirrels, currently unoccupied areas that appear to contain habitat, such as West Peak, and/or silviculturally treated areas (such as those that would be treated through the PERP). Future projects proposed by the USFS potentially could be impacted by releasing Mt. Graham red squirrels into currently unoccupied areas. However, because all release sites would be coordinated with the contacts listed in Appendix 2 (including the USFS), sites could be selected to minimize this impact. In practice, the USFS currently consults with the FWS on activities above 2,333 m (7,000-ft) elevation that may impact Mt. Graham red squirrel habitat, as well as areas of known middens and red squirrel sightings (A. Casey, USFS, pers. comm. 2010). Therefore, releasing squirrels into areas agreed upon by the USFS would minimize any effects this pilot program would have on future activities. All areas of release would be detailed in an annual report to the Technical Team each year for their input.

#### Effects of Mitigation Measures

The proposed mitigation measures incorporated into this alternative would aid in offsetting the effects of the proposed action on the Mt. Graham red squirrel population through the following:

1. *Efforts would be made to capture juvenile individuals to populate this pilot program. If, however, trapping of juveniles proves unsuccessful, up to eight adult squirrels (including up to four females) may be captured and brought into captivity. No more than 16 squirrels that have been removed from the wild would be held in captivity at any time. Should wild-caught squirrels die in captivity due to human-related causes (e.g., negligence during trapping, transport, or while in captivity), the total number of wild squirrels held in captivity would be reduced by that number. If a wild-caught squirrel should die in captivity due to natural causes (e.g., old age, disease, or breeding attempts), the individual would not be replaced by another wild-caught squirrel unless Mt. Graham red squirrels bred in captivity have been released back into the wild and have demonstrated they survive and reproduce at a level that meets or exceeds their natural level of survival and fecundity. Captive-born squirrels that die in captivity due to either human-related or natural causes would not reduce the total number of wild-caught squirrels that may be held in captivity.* Attempting to remove only dispersing juveniles from the wild population should minimize the effect on the overall population, as it is likely that the mortality rate of dispersing juveniles in the wild is high due to the extreme distance they must travel from their natal area to establish a new territory (Munroe *et al.* 2009). Keeping juvenile red squirrels in captivity would likely extend their lifespan to that characteristic of other populations of red squirrels (3-5 years), as indicated by the two that were housed at the Arizona-Sonora Desert Museum for 3.5-4.5 years. If trapping of juveniles proves unsuccessful, removing up to eight adult squirrels (including up to four females) would temporarily affect the overall population, but likely would not have long-term effects, since wild-born red squirrels may occupy the midden once the adult is removed and, if captive breeding is successful, offspring would be produced and released to augment the wild population and replace those removed from the wild. Additionally, keeping animals off-site (out of the Pinaleno Mountains) and determining successful breeding techniques for this subspecies would assist in its long-term conservation, should it be decided that a full captive-breeding program is warranted.
2. *No more than 10 percent of the population (based on the most recent mountain-wide census data) would be trapped as a part of this proposed action in any one calendar year, including individuals trapped incidentally and released immediately (e.g., during an attempt to capture a female, a male is incidentally caught) and those brought into captivity.* This ensures that potential effects are limited to a small percentage of the population in any one year.
3. *Trapping and handling of Mt. Graham red squirrels would be conducted by AESO staff and/or individuals holding Federal and State permits (including trapping as a permitted activity) for this subspecies. Trapping and handling techniques would follow those outlined in Koprowski *et al.* (2008) and Koprowski (2002). Briefly, collapsible, single door live traps (Tomahawk Live Trap, Tomahawk WI: Model # 201) would be used, and bait would consist of peanuts and/or peanut butter or an acceptable substitute (e.g., almonds and/or almond butter). Traps would be checked every two hours and closed to capture each night. Handling of red squirrels would be kept to a*

*minimum; however, if handling is required (e.g., to determine the weight of the squirrel), a cloth handling cone (Koprowski 2002) would be used. Additionally, while traps are open, pieces of wood and bark would be laid across and against the sides of the traps to provide shade within the trap, and if the weather becomes inclement, the traps would be checked immediately and closed to capture until the weather event has passed.* Using these techniques, Dr. John Koprowski and his crew experienced only one squirrel death in 1,877 captures over a seven-year period. Following these techniques would ensure trapping and handling of red squirrels would be done in such a way as to reduce stress to the animal, thereby avoiding trap- and handling-related mortality to the greatest extent practicable.

4. *Mt. Graham red squirrels would be transported to a participating facility or suitable holding location within 24 hours of capture. Transportation would follow International Air Transport Association (IATA) airport code regulations for flight and American Zoo and Aquarium Association (AZA) standards for overland transport. They would be transported in species appropriate enclosures (e.g. Sky Kennel, small size), and provided adequate water and food, if necessary. Climate would be controlled through heating or air conditioning within the vehicle (car, truck, and/or cargo plane) during transportation so that the squirrels do not experience heat or cold related stress during transport.* Transporting red squirrels to participating facilities or suitable holding locations within 24 hours of capture would ensure proper care is initiated as quickly as possible. Providing a quiet, dark environment with sufficient food and water during transport would further reduce stress to the animal.
5. *Squirrels released back into the wild would only be released when the snow has melted, food resources are available, and sufficient time is available for the released squirrels to cache cones and fungi for the winter (preferably between May through August). To the greatest extent possible within this timeframe, release events would be timed to coincide with natural juvenile dispersal during that year.* Releasing red squirrels to the wild at this time, especially in coordination with the natural dispersal period, would give released individuals the opportunity to locate an appropriate territory and begin caching food for the winter during a time when food resources are available and red squirrels are naturally establishing new territories in the wild.
6. *Release sites would be coordinated with the AESO, the PMP coordinator, USFS, AGFD, and RSMP (contacts listed in Appendix 2), and would be selected to avoid conflicts with human activities and minimize impacts to the wild squirrel population, while also providing captive squirrels the greatest opportunity for survival. A soft-release enclosure would be installed within the Columbine administrative site to minimize conflicts with human activities and impacts to the wild squirrel population, while also providing captive squirrels the opportunity to experience their natural habitat.* Release sites would be coordinated with the AESO, Mt. Graham Red Squirrel PMP coordinator, USFS, AGFD, and RSMP, thereby ensuring that all agencies and experts can provide input on the best locations for release. Release sites would only occur within the Mt. Graham red squirrel's range (Figure 2), and locations could include

gaps within the current distribution of red squirrels, currently unoccupied areas that appear to contain habitat, West Peak, and/or silviculturally treated areas that do not currently provide habitat (such as those that would be treated through the PERP). This should minimize effects to both released and wild squirrels.

7. ***Ear tagging and radio-telemetry equipment and techniques would follow the materials and methods outlined in Koprowski et al. (2008). Briefly, released Mt. Graham red squirrels would be fitted with uniquely numbered ear tags (Monel 1005-1, National Band and Tag) with colored ear disks (1 cm Model 1842, National Band and Tag) for individual identification. Radiocollars (SOM 2190, Wildlife Materials International) weighing <5 percent of body mass would be fitted and replaced as needed (approximate life = 1 yr). Using these materials and methods, Dr. John Koprowski and his crew have not experienced any squirrel deaths attributable to ear tagging or radio collars during eight years of research. Following these techniques would ensure tagging and collaring of red squirrels would be done in such a way as to avoid marking-related mortality to the greatest extent practicable.***
8. ***Facilities that participate in this program would be members of the AZA or would be able to demonstrate they can meet or exceed the accepted standards developed by the AZA.*** Facilities that participate in this program would be members of the AZA, or would be able to demonstrate they can meet or exceed the accepted standards developed by the AZA, ensuring the latest guidance and standards for animal care would be followed at each facility.
9. ***Implementation of the proposed project would follow the FWS's Policy Regarding Controlled Propagation of Species Listed under the Endangered Species Act (65 FR 56916).*** Facilities that participate in this program agree to follow the FWS's Policy Regarding Controlled Propagation of Species Listed under the Endangered Species Act, ensuring compliance with the FWS's guidelines and policies.
10. ***The Technical Subgroup of the Mt. Graham Red Squirrel Recovery Team would review the pilot program annually to ensure the program is meeting its objectives. Based on their review, they may recommend that FWS: a) develop a full captive-breeding program, which may involve holding more than 16 wild-caught squirrels in captivity, or b) discontinue the pilot program because it is clearly not benefitting the subspecies.*** By annually reviewing the pilot program, the Technical Subgroup of the Mt. Graham Red Squirrel Recovery Team would be able to provide a recommendation for the future of the captive breeding program based on the best available information.

These mitigation measures would reduce the impact of the proposed action on the Mt. Graham red squirrel population, reduce stress on individuals, and provide information on the husbandry and breeding needs of the squirrel and techniques for release. We expect the long-term benefits of the proposed action would outweigh the short-term effect of trapping up to 10 percent of the wild population (including the removal and captive holding of up to 16 wild individuals) and the

additional harassment of an unknown number of squirrels during reconnaissance, pre-baiting, and release activities.

***Alternative C – Establish Captive Population(s) for Research Purposes with up to Eight Wild-caught Red Squirrels from the Pinaleño Mountains***

Impacts to Mt. Graham red squirrels due to this alternative are expected to be identical to those described under Alternative B, with the exception that up to eight red squirrels would be removed from the wild instead of 16. This represents four percent of the current population rather than six percent (Fall 2012 conservative estimate = 214). While the impact to the wild population potentially would be less than that expected by implementing Alternative B, it is possible that this alternative would not provide the flexibility required to develop the husbandry, breeding and release protocols that are the purpose of the proposed action. With a lower limit on the number of Mt. Graham red squirrels that could be removed from the wild, enough captured individuals of the appropriate sex might not be available due to mortality while in captivity for breeding and production of a sufficient number of young for release.

**Additional Endangered, Threatened, and Sensitive Species Potentially Affected**

***Alternative A – No Action Alternative***

Under the no action alternative, the FWS would take no action to establish a captive breeding pilot program for the Mt. Graham red squirrel. Therefore, there would be no effects to other threatened, endangered, and sensitive species and their habitats in the Pinaleño Mountains.

***Alternative B – Establish Captive Population(s) for Research Purposes with up to 16 Wild-caught Red Squirrels from the Pinaleño Mountains (Preferred Alternative)***

Mexican spotted owl (*Strix occidentalis lucida*), bald eagle (*Haliaeetus leucocephalus*), northern goshawk (*Accipiter gentilis*), Apache trout (*Oncorhynchus apache*), and Gila trout (*Oncorhynchus gilae*) have been documented within the range of the Mt. Graham red squirrel. No effects on either fish species are expected, as no work would be conducted in the streams they inhabit, and no removal of vegetation (which could increase sedimentation in these streams) would occur due to this alternative.

Effects to the raptor species are expected to be minimal. The presence of a small number of people in forested areas while implementing the preferred alternative is not likely to adversely affect these species. The soft-release enclosure would be located within the Columbine administrative site, which is an area that does not provide habitat for these raptors. The presence of traps, peanuts, and peanut butter (or their equivalent as bait) within a midden has the potential to affect the prey base of the owl (squirrels and other small mammals may be drawn to this food resource), but the effects of traps and bait on the prey base are expected to be extremely small, as each area that would be baited and trapped is approximately 0.02 ha (0.05 ac). Therefore, we expect Alternative B to have little to no effect on the Mexican spotted owl, bald eagle, and northern goshawk. In our biological opinion, we determined that implementing the pilot project

may affect, but is not likely to adversely affect the Mexican spotted owl and would have no effect to its critical habitat (USFWS 2013).

***Alternative C – Establish Captive Population(s) for Research Purposes with up to Eight Wild-caught Red Squirrels from the Pinaleño Mountains***

Impacts to other threatened, endangered, and sensitive species and their habitats due to this alternative eventually would be identical to those described under Alternative B, although likely would have fewer effects initially because fewer squirrels would be trapped and fewer would be available for release.

## **Cumulative Effects**

The Council on Environmental Quality defines cumulative effects as “the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions.” Cumulative impacts can be concisely defined as the total effects of the multiple land uses and development, including their interrelationships, on the environment.

***Alternative A – No Action Alternative***

Under the no action alternative, the FWS would take no action to establish a captive breeding pilot program for the Mt. Graham red squirrel. Therefore, there would be no cumulative effects on the environment.

***Alternative B – Establish Captive Population(s) for Research Purposes with up to 16 Wild-caught Red Squirrels from the Pinaleño Mountains (Preferred Alternative)***

Most of the current land uses and human activities in the focus area of this proposal were described in the “Affected Environment” herein. The primary uses of the area include transportation, recreational use, scientific study, and forest administration and management. Of these primary uses, the proposed project is most likely to add to the impacts that occur and would continue to occur through scientific study. Current and ongoing research projects include annual or semi-annual mountain-wide censuses of randomly selected middens within the range of the Mt. Graham red squirrel, which have effects similar to those described above during reconnaissance.

Additionally, Dr. John L. Koprowski is permitted to capture up to 100 adult male and 100 adult female Mt. Graham red squirrels each year and ear-tag them, of which 60 of each sex may also be fitted with a radio collar. These individuals may be captured multiple times throughout the year and over multiple years to monitor residency, survivorship, and reproductive performance. The radio-collared individuals are also tracked throughout the year and over multiple years to determine habitat use throughout the day as well as during different seasons. Dr. Koprowski was also recently permitted to capture up to 40 juvenile male and 40 juvenile female Mt. Graham red squirrels each year and ear-tag them, of which up to 25 of each sex may also be fitted with a radio collar to monitor habitat use, territory size, space use, and movements. The effects of Dr.

Koprowski's research are similar to those described above during reconnaissance, pre-baiting, trapping, and handling activities.

#### Cumulative effects of reconnaissance and pre-baiting

The proposed project would add to the impacts that are currently occurring to the Mt. Graham red squirrel population due to human presence and supplementing food resources (e.g., during pre-baiting). Currently, an annual mountain-wide census of randomly selected Mt. Graham red squirrel middens is conducted each fall, and Dr. John Koprowski and the RSMP continue to study the Mt. Graham red squirrel population year-round. This project would add the presence of one to four more people within the range of the Mt. Graham red squirrel during the activities of reconnaissance and pre-baiting outside the area studied by Dr. Koprowski. As discussed above, human presence near Mt. Graham red squirrels and their middens does not appear to negatively impact Mt. Graham red squirrels. While Mt. Graham red squirrels may react to the presence of people within their territory (M. Alanen, FWS, personal observation), human presence does not appear to influence survivorship, as the same red squirrel would occupy a territory even after multiple visits and multiple capture events (e.g., as observed in Koprowski 2005 and Koprowski *et al.* 2008). Pre-baiting using the techniques used by Dr. Koprowski has not appeared to increase the risk of predation to red squirrels. Therefore, the cumulative effects of human presence would not be expected to detrimentally affect the Mt. Graham red squirrel.

As discussed above, food resources are likely the driving force behind red squirrel population fluctuations (Linduska 1950, Sullivan 1990). Therefore, the cumulative effects of pre-baiting Mt. Graham red squirrel middens due to the proposed project, in addition to pre-baiting activities performed by Dr. Koprowski and the RSMP, would likely be slightly beneficial to the Mt. Graham red squirrel population.

#### Cumulative effects of trapping

As mentioned above, Dr. Koprowski is permitted to capture up to 100 adult male and 100 adult female Mt. Graham red squirrels each year and ear-tag them, of which 60 of each sex may also be fitted with a radio collar. He is also permitted to capture up to 40 juvenile male and 40 juvenile female Mt. Graham red squirrels each year and ear-tag them, of which up to 25 of each sex may also be fitted with a radio collar. All individuals may be captured and monitored multiple times throughout the year and over multiple years to assess habitat use, territory size, movements, survivorship, and reproductive performance. A summary of captures based on the last three Annual Reports for Dr. Koprowski's permit can be found in Table 1. The proposed project could add the presence of one to four more people during trapping activities and additional capture events equaling up to 10 percent of the total population (based on the previous mountain-wide census) outside of Dr. Koprowski's study area. For calendar year 2013, this would mean an additional 21 capture events could occur (conservative Fall 2012 estimate = 214).

As discussed previously, the Mt. Graham red squirrel appears to tolerate multiple capture and handling events, with only one handling death having occurred during 1,877 capture events (Koprowski 2008). Of the 34 individuals Dr. Koprowski captured from September 1 through

Table 1. Demographic summary of Mt. Graham red squirrel

Note: these animals were captured by Dr. John Koprowski from December 1, 2009 to November 30, 2012. The same individuals may be captured multiple times within one year, as well as over a number of years.

Report year		Age at first capture in reporting period				Total individuals captured	Total capture events
		Juvenile	Sub-Adult	Adult	Unknown		
2010	Male	6	4	20	None	30	130
	Female	8	2	18	None	28	
	Total	14	6	38	None	58	
2011	Male	10	6	11	2	29	152
	Female	9	9	13	3	34	
	Total	19	15	24	5	63	
2012	Male	13	2	20	0	35	170
	Female	9	2	18	0	29	
	Total	22	4	38	0	64	

December 31, 2006, 85 percent (29 of 34) were captured at least twice over the next three years, while 50 percent (17 of 34) were captured at least five times over the same period. None of these squirrels died or were injured during capture or handling, and the multiple captures is evidence of survival between captures. Therefore, it does not seem likely that the cumulative impact of capturing an additional number of squirrels equaling up to 10 percent of the population would negatively impact the Mt. Graham red squirrel population. Additionally, as discussed previously, the presence of one to four more people during trapping activities is unlikely to detrimentally affect the Mt. Graham red squirrel.

All activities related to this project would be coordinated with the contacts listed in Appendix 2, including trapping and release locations of Mt. Graham red squirrels. No habitat modifications would occur as a result of this project. Therefore, this project would not affect past, current, and ongoing research activities related to the Mt. Graham red squirrel and its habitat.

***Alternative C – Establish Captive Population(s) for Research Purposes with up to Eight Wild-caught Red Squirrels from the Pinaleno Mountains***

Cumulative effects due to this alternative are expected to be less than those described under Alternative B, as fewer squirrels would be trapped and removed from the wild as a part of the captive breeding pilot program.

## Summary Table of Environmental Consequences

<b>Resources</b>	<b>Alternative A – No Action Alternative</b>	<b>Alternative B – Establish a Captive Population(s) With Up to 16 Wild-caught Red Squirrels from the Pinaleno Mountains (Preferred Alternative)</b>	<b>Alternative C – Establish a Captive Population(s) With Up to Eight Wild-caught Red Squirrels from the Pinaleno Mountains</b>
<b>Economics</b>	No effects.	Costs of establishing a captive breeding pilot program for the Mt. Graham red squirrel would be relatively low at the beginning, but would be expected to increase as 16 wild squirrels are brought into captivity and successful husbandry and breeding techniques are learned. Once established, costs would be similar from year to year as captive squirrels are consistently housed, bred, transported, and released to the wild.	Costs of establishing a captive breeding pilot program for the Mt. Graham red squirrel would be relatively low at the beginning, but would be expected to increase as eight wild squirrels are brought into captivity and successful husbandry and breeding techniques are learned. Costs associated with this alternative initially would be less than Alternative B, but over time could be similar, if captive-bred squirrels are kept in captivity for breeding purposes.
<b>Land Use and Human Activities</b>	No effects.	Minimal effects, as trapping-related activities would not preclude recreational or other human activities, and squirrels would be released at least 4,000 ft away from existing structures, campgrounds, special use areas (e.g., summer homes, Bible and Boy Scout Camps), and the 150-ac MGIO research area.	Minimal effects, as trapping-related activities would not preclude recreational or other human activities, and red squirrels would be released at least 4,000 ft away from existing structures, campgrounds, special use areas (e.g., summer homes, Bible and Boy Scout Camps), and the 60.7 ha (150-ac) MGIO research area.
<b>Threatened, Endangered, and Sensitive Species</b>	No effects initially, but continuing and increasing threats to Mt. Graham red squirrels due to habitat loss, predation, and competition with introduced Abert's squirrels would result in the increasing likelihood of losing this subspecies in the wild due to stochastic events and/or catastrophic decline. No impacts to other threatened, endangered, and sensitive species within	Some short-term negative effects initially due to the removal of up to 16 Mt. Graham red squirrels from the wild and the potential incidental loss of some individuals during the establishment of the pilot program. Long-term effects likely would be beneficial because some individuals would be maintained off-site (out of the Pinaleno Mountains) and augmenting the wild population with captive-produced progeny would help to recover the subspecies. Minimal to no impacts to other threatened, endangered, and sensitive	Some short-term negative effects initially due to the removal of up to eight Mt. Graham red squirrels from the wild and the potential incidental loss of some individuals during the establishment of the pilot program. Long-term effects likely would be beneficial because some individuals would be maintained off-site (out of the Pinaleno Mountains) and augmenting the wild population with captive-produced progeny would help to recover the subspecies. Minimal to no impacts to other threatened, endangered, and sensitive

	the focus area.	species within the focus area.	species within the focus area.
<b>Soils and Geology</b>	No effects.	No effects.	No effects.
<b>Cultural and Historical Resources</b>	No effects.	No effects.	No effects.
<b>Air Quality</b>	No effects.	No effects.	No effects.
<b>Water Quantity</b>	No effects.	No effects.	No effects.
<b>Water Quality</b>	No effects.	No effects.	No effects.
<b>Visual</b>	No effects.	No effects.	No effects.
<b>Cumulative Effects</b>	No effects.	Minimal effects, as Mt. Graham red squirrels appear to tolerate multiple capture and handling events. Additionally, all project-related activities would be coordinated between the AESO in collaboration with AGFD, USFS, the PMP coordinator, and the RSMP.	Minimal effects, as Mt. Graham red squirrels appear to tolerate multiple capture and handling events. Additionally, all project-related activities would be coordinated between the AESO in collaboration with AGFD, USFS, the PMP coordinator, and the RSMP.

## **Section V. Development of the Environmental Assessment**

### ***List of Preparers***

This FEA was prepared by Marit Alanen and Lesley Fitzpatrick of AESO of the FWS with assistance from Debra Bills of AESO and Marty Tuegel and Melissa Castiano of the Ecological Services Office in the Southwest Regional Office.

### ***Agency Involvement***

The development of the DEA was coordinated with the AGFD Region V (Tucson, Arizona), USFS (Coronado National Forest, Safford Ranger District, Safford, Arizona), the Red Squirrel Monitoring Program, University of Arizona, School of Natural Resources and the Environment, Tucson, and the Phoenix Zoo.

### ***Public Review***

This document was made available for public review for 30 days (September 10 through October 12, 2010). Public comments were received and are included in Appendix 3 along with our responses to those comments.

## **List of Acronyms**

AESO = Arizona Ecological Services Office of the U.S. Fish and Wildlife Service

AGFD = Arizona Game and Fish Department

DEA = draft Environmental Assessment

FEA = final Environmental Assessment

FWS = U.S. Fish and Wildlife Service

NEPA = National Environmental Policy Act

PMP = Population Management Plan

RSMP = Red Squirrel Monitoring Program, University of Arizona, School of Natural Resources and the Environment

USFS = U.S. Forest Service

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**Appendix 1: Letters between the Mt. Graham Red Squirrel Recovery Team  
and Dr. Benjamin Tuggle**



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

P.O. Box 1306  
Albuquerque, New Mexico 87103  
<http://ifw2es.fws.gov>

In Reply Refer To:  
R2/ES-TE  
CL 6-15

JUN 14 2006

William J. Matter, Ph.D.  
Team Leader  
Mt. Graham Red Squirrel Recovery Team  
325 Bio Sciences East Building  
Tucson, Arizona 85721

Dear Dr. Matter:

Thank you for your letter of May 22, 2006, requesting concurrence on the Mount Graham Red Squirrel Recovery Team's (recovery team) recommendation to initiate captive propagation planning and implementation for the Mount Graham red squirrel (squirrel). Given the squirrel's current population size and the substantial decline in habitat quality and quantity on Mount Graham in the face of continuing threats, I concur that it is time to investigate a captive propagation program for the squirrel.

As I understand your letter, the recovery team will guide the development of a pilot captive propagation plan; should the team determine that implementation of the pilot program may aid in the recovery of the squirrel, implementation of the pilot program will be used to answer a variety of questions pertaining to removal of squirrels from the wild, breeding and rearing techniques, long-term population maintenance, and release protocols. Answers to these questions will be critical in determining whether a larger captive propagation effort for the squirrel may be an effective recovery tool to improve the species' status.

Please keep me apprised of the recovery team's progress on this project. In particular, please notify me when the recovery team has reached decision points regarding implementation of the pilot or full captive propagation programs. I commend the recovery team's proactive approach in considering the need for captive propagation of the Mount Graham red squirrel. Please feel free to coordinate with Paul Barrett of my staff, at 520-670-5160 (ext. 228). I look forward to our progress on this important recovery project.

Sincerely,

  
Larry Bell  
Regional Director

cc: Supervisor, Ecological Services Field Office, Phoenix, AZ  
Assistant Field Supervisor, Ecological Services Sub-office, Tucson, AZ  
Recovery Coordinator, Region 2, Albuquerque, NM

May 22, 2006

Benjamin N. Tuggle, Ph.D.  
Acting Regional Director  
Southwest Region 2, USFWS  
P.O. Box 1306  
Albuquerque, New Mexico 87103

Dear Dr. Tuggle:

At the May 8, 2006 meeting of the Mount Graham Red Squirrel Recovery Team, members in attendance voted to submit a request to you for approval to plan and, if deemed appropriate by the Recovery Team, initiate emergency removal from the wild of a limited number of endangered Mount Graham red squirrels, *Tamiasciurus hudsonicus grahamensis* (MGRS) to: 1) establish at least one captive population; 2) begin a small-scale pilot program of maintenance and breeding of captive animals; 3) plan and initiate studies of the efficacy of release of captive-bred animals to augment the existing population in the wild; and 4) eventually develop and initiate a larger-scale captive breeding and supplemental release program for the species. Below, I briefly outline the rationale for this request, offer details on the process to accomplish the proposed tasks, and note challenges to implementation.

### **Need to Establish a Captive Population of Mount Graham Red Squirrels (MGRS)**

The species was listed as endangered in 1987 because its range and habitable area had been greatly reduced, and remaining habitat was threatened by a number of factors. The estimated (conservative estimate, AZ Game & Fish Department) population size has gone from a low of 99 ( $\pm 53$ ) animals in 1989 to a high of 562 ( $\pm 12$ ) in 1999. Estimated population size declined after 1999 and has changed relatively little over the past 4-5 years; the latest estimate in fall 2005 was 276 ( $\pm 12$ ) animals.

More importantly, the already limited area of habitat was severely reduced by the 1996 Clark Peak Fire (6,700 acre/2,710 ha within the burn perimeter) and the 2004 Nuttall Complex Fire (over 29,000 acre/11,700 ha within the burn perimeter). Danger of catastrophic fire remains high due to continuing drought, heavy fuel loads, and increasing numbers of dead trees due to insect infestation and tree disease. Living trees stressed by recent fires and drought are particularly susceptible to insects and disease. Ongoing efforts for fuel reduction and forest thinning will have long-term benefits for MGRS, but may have negative impacts on survival and habitable area for MGRS in the short-term.

Recent research directed by Dr. John Koprowski of the University of Arizona indicates that, although red squirrels can live to 15-20 years, few MGRS now live beyond 2 years due to high predation and other forces of mortality. Also, MGRS occur in unusually low density, have much larger home ranges, and show low productivity compared to closely related red squirrels in the

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MAY 25 2006

White Mountains of Arizona. Dr. Koprowski's preliminary evaluation of newly acquired satellite imagery shows extensive loss of habitable conditions within areas known to have formerly supported MGRS, especially within the high-elevation refuge area (also designated as critical habitat) for MGRS. A post-fire survey of 1,251 known middens found that only 455 still exist (almost a 64% loss). The pattern of habitat loss has resulted in greater isolation of inhabited patches from each other. Also, introduced Abert's squirrels, much larger than MGRS, may be excluding red squirrels from some habitable areas; definitive data are not available.

In combination, these conditions are an extraordinary threat to persistence of MGRS and represent a reasonable trigger for our request to plan and eventually implement the proposed emergency removal and creation of a captive population.

### **Process for Captive Population(s), Pilot Breeding, and Supplemental Release Program**

Little information is available on holding and rearing captive red squirrels. We will collect information on maintenance and breeding and identify personnel with expertise. We will canvas zoos and museums to identify facilities with interest and capability of holding a captive population of red squirrels. The Arizona-Sonora Desert Museum in Tucson currently holds two young MGRS siblings removed in 2005 after death of their mother. We propose to start with capture and removal of up to 16 individuals from Mount Graham, but the age and sex of individuals and sites of capture must be determined so as to minimize the impact of removal on the wild population. Eventually more than one captive population should be established to guard against loss of all captive animals in a single catastrophic event. Participating zoos will determine conditions appropriate for maintenance and successful breeding of captive MGRS. Some young produced will be released to augment the wild population and help ensure full colonization of remaining habitat fragments. Different release protocols (age of animals, timing of release, site of release) will be studied to help identify effective practices. Parallel efforts to study holding and rearing of non-endangered red squirrels in other regions will be considered. Proposals for funding must be developed to meet costs of rearing and studies of rearing and release protocols. Young squirrels produced that are not used in a release program will be added to the captive population or eventually used to establish an additional captive population. There are few data on the genetic makeup of MGRS, and this information is critical to long-term decisions on removal of individuals, captive breeding, and supplemental release. We will seek funding for genetic analysis (pedigree and genetic variation), including analysis of animals captured or released during the proposed pilot program. Facilities and expertise for analysis are available at the University of Arizona and Arizona State University.

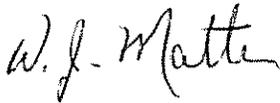
### **Challenges and Information Needs**

Identification of the most appropriate number, age and sex of MGRS to remove from the wild, and identification of the best sites for removal to minimize risk to the wild population and risk of genetic loss must occur. Effective protocols for holding, breeding, and rearing of MGRS must be identified, as well as effective protocols for successful release of captive-reared MGRS. Information is needed on risks of release of captive-bred squirrels to the genetic composition and incidence of disease for the wild population of MGRS. If much of existing habitat for MGRS is

lost to fire, insect damage, or other threats, captive-reared animals may not be able to be released for many decades when appropriate forest conditions return. Needs for such long-term population maintenance are unknown.

Thank you for your consideration of our request to proceed with development of a plan for creating a captive population and for eventual implementation if deemed appropriate by the Recovery Team. Should you require additional information, members of the Recovery Team and I will be available to discuss this issue with you in person or by phone. My phone number is 520/621-7280. We would appreciate your expeditious response to this request, as we anticipate that conditions on Mt. Graham may decline precipitously this summer due to drought conditions and the forecasted intense wildfire season.

Sincerely,

A handwritten signature in black ink that reads "W. J. Matter". The signature is written in a cursive style with a large, prominent "M".

William J. Matter, Ph.D.  
Team Leader  
Mt. Graham Red Squirrel Recovery Team  
c/o 325 Bio Sciences East Bldg.  
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Tucson, AZ 85721  
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[Jim\\_Rorabaugh@fws.gov](mailto:Jim_Rorabaugh@fws.gov), [Thetis\\_Gamberg@fws.gov](mailto:Thetis_Gamberg@fws.gov)

## **Appendix 2: Mt. Graham Red Squirrel Captive Breeding Pilot Program Contacts**

Ms. Marit Alanen, Mount Graham Red Squirrel Lead Biologist  
U.S. Fish and Wildlife Service  
201 N. Bonita Ave., Suite 141  
Tucson, AZ 85745  
(520) 670-6150 x 234  
[Marit\\_Alanen@fws.gov](mailto:Marit_Alanen@fws.gov)

Mr. Stuart Wells, Director of Conservation and Science, Mount Graham Red Squirrel Population  
Management Plan and Stud Book Coordinator  
The Phoenix Zoo  
455 N. Galvin Parkway  
Phoenix, AZ 85008  
(602) 914-4317  
[swells@theiphxzoo.com](mailto:swells@theiphxzoo.com)

Ms. Anne Casey, District Biologist and Recreation Staff  
Safford Ranger District, Coronado National Forest  
711 14th Ave., Suite D  
Safford, AZ 85546  
(928) 348-1962  
(520) 780-8091 cell  
[acasey@fs.fed.us](mailto:acasey@fs.fed.us)

Mr. Tim Snow, Region V Nongame Biologist  
Arizona Game and Fish Department  
555 N. Greasewood Road  
Tucson, AZ 85745  
(520) 388-4449  
[TSnow@azgfd.gov](mailto:TSnow@azgfd.gov)

Dr. John Koprowski, Professor, Director of the Red Squirrel Monitoring Program  
Wildlife and Fisheries Science  
School of Natural Resources and the Environment  
214 Biological Sciences East  
University of Arizona  
Tucson, AZ 85721  
(520) 626-5895  
[squirrel@ag.arizona.edu](mailto:squirrel@ag.arizona.edu)

## **Appendix 3: Letters of Comment and Responses to Comments**

### *RESPONSES TO COMMENTS*

We received comments on the draft Environmental Assessment (DEA) from the following entities:

- Ms. Sandy Bahr, Grand Canyon Chapter, Sierra Club, Phoenix, AZ
- Mr. Michael D'Amico, Tucson, AZ
- Mr. Roger Featherstone, Mount Graham Coalition, Tucson, AZ (included comments from Center for Biological Diversity, Flagstaff, AZ)
- Mr. Eric Gardner, Nongame Branch Chief, Arizona Game and Fish Department, Phoenix, AZ
- Mr. Roger McManus, International Union for Conservation of Nature,
- Ms. Jenny Neeley, Conservation Policy Director, Sky Island Alliance, Tucson, AZ
- Dr. Peter Warshall, Scientists for the Preservation of Mt. Graham, Tucson, AZ (two comment letters sent)

In our review of the comments, we placed each comment in a specific category to allow us to respond to similar comments efficiently. Generally, comments fell into two major areas; process comments that addressed NEPA issues including purpose and need and the structure of the DEA and technical comments relating to scientific information presented in the text. Each comment area contained several categories of related comments that were examined together.

In the text below, the comment topic is underlined and the response text is not. For process comments, some are answered specifically; others are reflected in changes to the organization and presentation of the alternatives and other sections in this FEA. Technical comments on information presented in the DEA were examined and corrections or additional explanation was provided directly to the text of the FEA as appropriate.

### GENERAL COMMENTS

We received several comments expressing general support for the proposed pilot project even if there were other questions on details of the action.

### PROCESS COMMENTS

We received a number of comments relevant to policy and regulatory requirements of NEPA and others relevant to the explanation of purpose and need, descriptions of the alternatives, and other points of concern.

### GENERAL NEPA COMMENTS

1. Lack of a cover sheet: The Department of the Interior Departmental Manual 516 (3.4) does not require a cover sheet for an EA.
2. The table of contents did not have a list of tables and figures: A list of tables and figures has been added to the table of contents for this FEA
3. Summary of MOUs, licenses and permits is missing: This section has been added to the FEA
4. Scoping for the EA: The FWS did not have a public scoping period for this EA. Public scoping is not required for an EA. Since we were reacting to a request from the Recovery Team (which has a broad representation of the interested parties on either the Technical or Implementation subgroups), we did not feel public scoping would identify any new issues of concern. Issues that were raised by commenters were in line with what was expected. Notice of the availability of the DEA for public comment was made via a news release and direct mailings to potentially affected or interested publics. Mr. Vince Randall of the Yavapai-Apache Tribe (a member of both the technical and implementation subgroups) received a direct mailing as did the Inter-Tribal Council of Arizona. We received no comments from any Tribes on the DEA.
5. Adequacy of the DEA: Several comments stated that the DEA was not adequate because it did not examine a wider range of alternatives that also addressed other threats and issues that involve the recovery of the red squirrel. This EA is focused on the development of husbandry, captive breeding, and release techniques for the Mt. Graham red squirrel and the range of alternatives considered was focused on meeting that purpose and need.  
Other commenters requested that an environmental impact statement (EIS) be completed to ensure all possible alternatives and options were properly considered. Issuance of a DEA is part of the NEPA process to determine if there are significant effects to the human environment resulting from the implementation of a proposed action that would require the development of an EIS, or if no such effects are likely to occur, to prepare a finding of no significant impact (FONSI). After our review of the comments provided, the FWS does not believe that significant impacts to the human environment exist due to the proposed action and that an EIS is not necessary.
6. Summary and conclusions: Comments were received that the FWS did not provide sufficient information on major conclusions, or areas of controversy relating to the proposed action. The FWS believes we have addressed all issue appropriately in the DEA and the FEA and have not identified any significant issues.
7. Clarification of the no action alternative: Comments were received that the no-action alternative was inadequately described. The FEA has added language to more fully describe the no-action alternative.
8. Purpose and need: Several comments referred to a lack of clarity in this section, which has been expanded and revised in the FEA.
9. Scope of the EA: Comments were received that wanted to expand the scope of the action to include other recovery components. This NEPA process focuses on one aspect of the overall recovery program for the red squirrel; the potential development of techniques to maintain a captive breeding population and to release captive born young red squirrels into the wild in the Pinaleño Mountains. Approval of this pilot project does not eliminate or replace the Recovery Plan or recovery tasks contained therein. This FEA does not

address actions that could be taken to address the Abert's squirrel population or the loss of habitat due to other factors such as wildfire. Projects to address these issues will require their own NEPA processes (as the CNF has done with its fuels and forest restoration programs). Similarly, efforts to translocate red squirrels to unoccupied habitats in the Pinaleño Mountains are not precluded or rejected under this FEA, as the initiation of those recovery tasks is not within the scope of the action. Implementation of recovery actions is an ongoing process, and this FEA addresses one specific task among many. The FWS and its partners continue to work to implement the recovery actions to benefit the red squirrel.

10. Environmental consequences: Comments were received that the FWS had not provided sufficient information on the environmental consequences of implementing the proposed action. The FWS has clarified the language in this section in response to comments.
11. Relationship to section 7 of the ESA: Comments were received concerning the relationship of the DEA to section 7 of the ESA. The FWS has completed a formal section 7 consultation on the preferred alternative that addresses the effects of the pilot program to listed species in the Pinaleño Mountains including the red squirrel. The biological opinion also analyzed the effects of actions authorized through issuance of section 10(a)(1)(A) recovery permits for cooperators to capture, hold, and plan release strategies as part of the proposed action. Implementing this proposal has no effect on other biological opinions, including RPA3 from the 1988 biological opinion on the Forest Plan and the MGIO.
12. Cumulative effects section: Several commenters indicated that the cumulative effects section was incomplete because there was not a complete discussion of the other approved actions ongoing in the Pinaleño Mountains such that the incremental effect of the proposed action could be properly evaluated. In evaluating cumulative effects, the affected environment section incorporates all the effects of past, present, and reasonably foreseeable future actions. For all resources, the aggregate effect of past and present actions was considered to be represented by the current, existing condition of the resource (Council on Environmental Quality, 2005). Therefore, the specific effects of individual past and present actions are not cataloged in detail in the analysis. In order for direct or indirect effects to incrementally add to the effects of past, present, or reasonably foreseeable future actions, they must overlap with those effects in time or space (Council on Environmental Quality, 1997). The only past, present, or reasonably foreseeable action that overlaps with the effects of the proposed action is the ongoing monitoring and research actions that involve the capture and handling of red squirrels. We addressed the cumulative effects relating to this issue in our FEA. We believe our cumulative effects analysis is complete.
13. Other alternatives considered: Several comments indicated that our rejection of Alternatives D (use of White Mountain red squirrels for the pilot project) and E (to translocations of Mt. Graham red squirrels to another mountain range in Arizona) was not appropriate based on our conclusion that these alternatives were not linked to the purpose and need defined in the DEA. For the FEA, we have clarified our purpose and need statements, and further described why these two alternatives were not selected. These alternatives contain potential actions that may be of value for the recovery of the red

squirrel; however, they are not appropriate for this pilot project as we have described in the text of the FEA.

14. Additional mitigation measures: One commenter asked if there were other mitigation measures (NEPA Regulations 1508.20) not included in the DEA that would change the choice of alternatives. We reviewed the mitigation measures listed and have not identified any additional measures that would reduce the effects of developing and evaluating a trapping and captive husbandry program and release protocols under the pilot program. A mitigation measure to use White Mountain red squirrels would reduce the effects to the Mt. Graham red squirrels; however, since using other red squirrel subspecies would not meet the purpose and need, this measure is not viable.
15. Tiering or phasing of implementation of the pilot project: Several comments related to the proposed pilot project as comprising three to four distinct “phases” and that there was uncertainty as to which portions of the pilot project were included in this EA and which would be addressed through additional compliance. Our intent in this EA is to provide NEPA compliance for the suite of actions through and including development of release protocols for captive-born red squirrels over a 10-year period. It includes the actual release into the wild of captive-born red squirrels and the monitoring of those red squirrels. Additional compliance for these actions would not be necessary. However, should the program be fully implemented or the pilot project extend longer than 10 years, additional compliance may be needed.
16. Comparison of alternatives: Comments were received that the indicators for judging between alternatives were not clear, and that there was little difference between the two action alternatives. We have added language to clarify this point.
17. Costs of the project and timelines: Commenters asked for information on the costs to be incurred from each activity included in the proposed pilot project and when those activities would be initiated. The FWS intends to initiate the capture of Mt. Graham red squirrels in the summer/fall of 2013 and transport them to the Phoenix Zoo and Miller Park Zoo. The zoos will attempt captive breeding in 2014. Implementation of release actions will depend on the availability of young of the year to release. The primary costs to the project are the maintenance of the wild-born and captive-bred red squirrels in the cooperating zoos. In 2012, the Phoenix Zoo spent approximately \$42,000.00 to maintain the red squirrels they had. Capture and release effort costs are not expected to be costly and will be met with FWS and cooperator base funding.

## PURPOSE AND NEED COMMENTS

In response to several comments on the Purpose and Needs section, the FWS has revised and incorporated more information to support our intention in implementing this pilot project.

1. Initial development of the pilot project: The FWS began to plan for some eventuality of implementing a pilot captive breeding and release project with the support of the Recovery Team and then Acting Regional Director of the Southwest Region of the FWS in 2006. Planning and development of voluntary partnerships can take several years, and opportunities to provide funding that could assist in any future implementation were evaluated and taken where possible. This includes obtaining grants for supplies and work

with the Phoenix Zoo to set up a memorandum of understanding for future work. The opportunity to use the equipment and the new facilities at the Phoenix Zoo was tested in 2011 when the FWS captured four red squirrels as an emergency measure as the wildfire conditions were extreme and losses of red squirrels could occur if there was another fire. Having the equipment and facilities in place enabled housing of these red squirrels at the Phoenix Zoo where they could be held but not bred. Implementation of active trapping and efforts to breed Mt. Graham red squirrels in captivity are contingent on the completion of the biological opinion and signing of the Finding of No Significant Impact by the FWS.

Initiation of the pilot project does not automatically lead to the implementation of a full captive breeding and repatriation project; that decision would be made by the FWS if determined to be appropriate. As part of the implementation of the pilot project, annual reports documenting the actions taken under the proposed action to breed, rear, and release red squirrels that survive and breed in the wild will be used to evaluate progress. Success will be measured for husbandry based on captive survival; for breeding by the production of viable young; and for release by captive-born individuals surviving overwinter and producing viable young that can survive in the wild. We cannot say at this point that these efforts will be successful and have the potential for future benefits to the red squirrel; that is the purpose of the pilot project. Use of the information from a successful pilot project provides an additional tool (but not the only tool) for use in recovering the red squirrel.

2. Maintaining a captive population as a “buffer” against extinction: Several comments were received on this topic questioning the inclusion of this specific action in the purpose and need, particularly as this linkage eliminated our consideration of using White Mountain red squirrels for the initial pilot project instead of Mt. Graham red squirrels. To respond to these comments, the FWS reviewed the 2006 letter from the Recovery Team to the Acting Regional Director, and his response to the Team. In the letter from the Recovery Team, it is clear that they viewed the project as providing the first captive population for red squirrels with, as needed, the expansion of that captive population to one or more other sites. Thus, the development and maintenance of a captive population as part of the pilot project is an integral component. Results from the pilot project and recovery needs of the red squirrel will determine the continuation or expansion of the captive population into the future. However, since up to 16 wild-born red squirrels in captivity is not a sufficient number to establish a genetically robust refuge population, the implementation of the pilot project does not address this secondary concept. We have added additional text to the FEA to clarify this point and removed references to the “buffer” concept.
3. Captive breeding may not provide for increased populations: A comment was made that we do not know why the red squirrel populations are low. Commenters noted that it could be due to low productivity, or the lack of sufficient habitat to support a larger population. If the population is habitat limited, then producing captive born individuals to release should not be a high priority. The FWS recognizes that the information on this is incomplete and a definitive answer to provide a way forward is not yet available. However, we believe a captive breeding pilot project is a way to address development of

a tool to assist in recovery in the future, particularly in the event of a catastrophic event, and still has value if the issue is reproduction. The implementation of a large captive breeding program is not a definitive next step if the pilot project is successful.

4. Timing of the program: Comments were received on questioning the need to initiate the pilot program at this time. The FWS Acting Regional Director stated in 2006 that it was time to “investigate” a captive breeding program. We are already seven years away from the determination this project was needed. Our interpretation of “investigate” is to initiate the pilot project considered in this EA. The “implementation” of a larger captive breeding program is not the purpose of this action, nor analyzed in this EA; that larger project would not be considered without the information gained from the pilot project and future species status as determined by the Recovery Team and FWS. The pilot project is set up for 10 years. Each year the results of work done will be documented and presented to the Recovery Team and they will use those results to recommend if the pilot should continue or if the larger project is appropriate to implement.
5. Purpose and need should include the “Who, what, when, and where” details of the project: The FWS believes this information should be placed in the description of the Alternatives.
6. Will this project aid the recovery of the red squirrel and how much?: The proposed pilot project will, if it is successful, provide another conservation tool to use to foster recovery of the red squirrel. There is some loss to the current red squirrel population if captured animals die; however, the number of animals to be captured is within the annual mortality rate of juvenile Mt. Graham red squirrels, and unlikely to have a significant negative effect to the population. The amount of recovery benefit derived from the pilot project will not be known until results are obtained.

#### COMMENTS RELATED TO THE RECOVERY PLAN

We received several comments pertaining to the linkage between the EA for the proposed pilot project and the Recovery Plan.

1. The proposed action should be halted until a new Recovery Plan is finalized: The DEA was released in September, 2010. The draft Revised Recovery Plan was released in August, 2011 for public comment. We have reviewed the comments received on the draft revised plan and there were no comments on the recovery actions (1.2.4, 3.10, 3.11, and 3.12) that concern the proposed pilot project. While the draft revised plan has not been officially finalized, it is the current active plan for FWS implementation. The recovery actions incorporated into the proposed pilot project are priority 1 and are deemed necessary to prevent extinction.
2. Relationship between the DEA and the Recovery Plan: The DEA was prepared to implement specific recovery tasks contained in the 1983 plan and more fully stated in the 2011 draft revised plan. The DEA, or this FEA, are not recovery plans and do not alter the priorities, other recovery activities, or directions for recovery that are contained in the recovery plan. The suite of actions included in a recovery plan are beyond the scope of one, project specific EA to address. Recovery plans are not themselves subject to NEPA compliance (they are planning documents); however, consideration of NEPA and section

7 and section 10 compliance is inherent in the implementation of any federally funded recovery action and before those actions are implemented, compliance would be completed. The DEA and the subsequent FEA are limited in scope to addressing the effects of implementing a pilot project for captive breeding and release protocols, not any other recovery action included in the draft revised recovery plan.

## COMMENTS ON ALTERNATIVES/NEW ALTERNATIVES

We received comments from most commenters on the five alternatives in the DEA and suggestions for additional alternatives for consideration. Comments and responses for each alternative are provided.

### No Action Alternative

1. The no action alternative is not adequately described: The description of the no action alternative has been revised to reflect that other actions to recover the red squirrel will continue to be implemented. We have also included information on the known ongoing projects for reference.

### Alternative B

1. Alternative B is not adequately described: We have included additional information on the processes to be undertaken with this alternative and what those entail as products to be used in recovery.
2. Decision metrics for Alternatives B and C: Comments were received about the criteria that would be used to determine if the outcomes of the pilot project were successful. The Recovery Team will evaluate progress yearly, and determine if the pilot project should continue. The measure of success is related to the number of red squirrels remaining alive in captivity, the number of successful births and rearing of young squirrels to release the success of the release protocols and the survival of released red squirrels to breed successfully in the wild with recruitment of their young to the population. Specific numbers have not been set for those criteria and will be developed by the Recovery Team.
3. Focus of the alternative is to protect the red squirrel against catastrophic wildfire: The intended goal of the pilot project is to have the techniques available to support a captive population of red squirrels to both provide individuals for repatriation (if appropriate) and as a managed refuge population (or populations) off site in the event of a catastrophic event in the Pinaleños that further reduces the available habitat (and thus population numbers) of red squirrels. The pilot project does not address the ongoing threats to the red squirrel and its initiation does not imply that the FWS or the Recovery Team is no longer working to address those issues. This is a pilot project that may or may not be successful, and if it is successful, any future use of the techniques developed would need to have habitat available for repatriated red squirrels.
4. Goals for each component of the pilot project: Commenters noted that the particular goal of each component was not clear. We have expanded the description of the proposed action in the FEA to reflect each stage of the process. Implementation of subsequent steps is dependent on the success of the previous steps. The annual review by the

Technical Committee of the Recovery Team will provide the venue to evaluate success of each step.

5. Future options related to the decision: Commenters asked about options available to the FWS and the Recovery Team if the pilot project was successful or failed to meet its goals (not having a backup plan if not successful). If the project succeeds, we believe there will be a new tool to use in recovery efforts that may also benefit translocations of wild red squirrels. The decisions on repatriating captive born animals (as adults or juveniles, males and females or females only) will be made based on results of the program and other considerations of the most effective way to implement a larger program if such a program is deemed necessary. Initiation and completion of the pilot project does not automatically result in the implementation of a larger captive breeding program later.

#### Alternative C

1. Alternative C is not different enough from Alternative B to provide a full range of options: Alternatives developed for this FEA were based on the purpose of the proposed project; to identify husbandry, breeding, and release protocols as part of a pilot project for captive breeding of Mt. Graham red squirrels. Alternatives B and C both meet that purpose. With the current state of knowledge on breeding, rearing, and successfully releasing Mt. Graham red squirrels to the wild, we were unable to develop alternatives that focused on different available techniques for implementing a pilot project. Alternative C differs from Alternative B in that it is more conservative of the wild population of Mt. Graham red squirrels through the reduction in the numbers that could be removed from the wild. Alternative C was not selected due to concerns that the limit of eight Mt. Graham red squirrels might not, due to the experimental nature of the pilot project, be sufficient to allow for the necessary learning that is the core of the project if mortalities in captivity were high in the initial husbandry portions of the project or the number of females breeding successfully in captivity was low.

#### Alternative D

1. Alternative D was improperly rejected: Several commenters questioned why we rejected a pilot project using White Mountain red squirrels to gain the information on captive rearing, breeding, and release. The FWS believed that using another red squirrel subspecies at this time was an option and included it in the DEA. We believe that it is most effective and most efficient to work with the Mt. Graham red squirrel at this time and have some steps of the husbandry process already completed due to the holding of red squirrels by the Arizona-Sonora Desert Museum and emergency removal of four red squirrels from the Pinaleños in 2011 to the Phoenix Zoo. Those efforts by the Phoenix Zoo and previous ones by the Arizona-Sonora Desert Museum have indicated that red squirrels can be kept in captivity and those initial steps with another subspecies do not need to be repeated.

#### Alternative E

1. Alternative E was improperly rejected: Commenters stated that Alternative E, which involves translocating wild-born juveniles from occupied habitats to what are believed to be suitable but unoccupied habitats elsewhere in the Pinaleños was a suitable option to

pursue instead of the captive breeding project. The FWS supports implementation of this recovery action and believes it has great value and can contribute to knowledge of release techniques and identification of suitable habitat. However, it does not meet the purpose and need derived from the 2006 Recovery Team request to the Acting Regional Director and therefore was rejected.

#### New Alternatives Suggested

1. Hybrid alternatives that address several threats to the red squirrel should be implemented instead of a captive breeding program: Commenters were concerned that implementing this project did not focus on addressing the significant threats to red squirrels from Abert's squirrels and habitat loss. The purpose of the proposed action is to evaluate the potential to develop captive husbandry and breeding methods and a successful release protocol for Mt. Graham red squirrels. The proposed action does not address competition with Abert's squirrels or habitat loss. It is designed to implement a specific set of tasks in the draft revised recovery plan. The FWS and the Recovery Team intend to pursue implementation of other recovery actions and separate compliance would be completed for them in the future. The projects suggested do not meet the purpose and need identified for this EA.
2. Release of captive born male red squirrels: A comment was made on whether the proposed action would repatriate both male and female red squirrels to the Pinaleños when it might be appropriate to favor the introduction of females. The FWS understands that there are many components of the release protocols that need to be developed as the pilot project is implemented. We will include this concept as one to be considered in that process.

#### TECHNICAL QUESTIONS/COMMENTS

We also received some technical comments and suggested revisions on several topics. Below we briefly discuss the topics and concerns. Additions or corrections to the text of the FEA were made as appropriate based these comments.

#### Impacts to the wild population:

1. The need to proceed with a clear need to implement captive breeding: The FWS believes we have a clear need and direction to undertake this pilot project.
2. Effects of removal of up to 16 red squirrels: In our biological opinion for this pilot project, the FWS evaluated the effects of removal of up to 16 Mt. Graham red squirrels from the population over a period of 10 years. The focus on removing young of the year individuals that have a natural high mortality rate has less effect than removing age 1+ individuals that have shown the ability to survive and breed in the wild. If age 1+ individuals were removed, the reduced number of individuals that could be taken (up to eight individuals) would reduce the effects to the age 1+ population. Further, removal of all 16 either young of the year or eight age 1+ individuals would not occur in one year but would be spread out over several years, thus having a smaller effect on the population in any year. The FWS believes the removal of this number of red squirrels will not harm the population if it is done according to the protocol in the alternatives.

3. Genetic consequences: The FWS believes that the initial removal of so few animals from a population that is so closely related will not affect the existing genetic diversity. The Population Management Plan and studbook will track the genetic composition of the captive population. A portion of the release protocol will identify any restrictions on the release of captive born individuals related to their genetic information. If a larger captive breeding effort is implemented later, genetic management of the population would be an important component.

#### Population model:

1. Concerns about the population model: There are concerns that the way the annual red squirrel population estimate is made has errors that may result in increased effects to the red squirrel population through removal of over 10 percent of individuals: The 10 percent figure refers to the maximum number of red squirrels that could be trapped in one year, not the number to be removed. Removal of red squirrels is capped at 16 individuals for the entire pilot project.
2. Questions about what the 10% of the population means and would trapping stop if the population drops below some level: The FWS has included a commitment that no trapping or removal would occur for the pilot program if the population dropped below 200 individuals.
3. The need to assess the viability of the population prior to removing individuals: There is a concern that the assumptions in the EA concerning the effects of removal of up to 16 individuals are incorrect. In our biological opinion for this pilot project, the FWS evaluated the effects of removal of up to 16 Mt. Graham red squirrels from the population over a period of 10 years. The focus on removing young of the year individuals that have a natural high mortality rate has less effect than removing age 1+ individuals that have shown the ability to survive and breed in the wild. If age 1+ individuals were removed, the reduced number of individuals that could be taken (up to eight individuals) would reduce the effects to the age 1+ population. Further, removal of all 16 either young of the year or eight age 1+ individuals would not occur in one year but would be spread out over several years, thus having a smaller effect on the population in any year. We believe that removal of up to 16 individuals over several years will have minimal effects on the viability of the red squirrel population.

#### Trapping:

1. Technical questions on trapping methods, seasonality, and long term effects of handling: The FWS has provided additional information on these questions in the text of the FEA.
2. Supplemental feeding: Commenters noted that past supplemental feeding caused problems with increased predation on red squirrels where feeding occurred. We are unable to document any increased predation with related to the supplemental feeding experiment from 1989-1990. However, the FWS will use the techniques for pre-baiting used by Dr. Koprowski of the UA in trapping red squirrels. This method has reduced risk of increasing predation since the bait is scattered across the midden and not concentrated in one area that may be defended by the resident red squirrel.

#### Captive care/housing:

1. Questions on alternative housing situations (indoor/outdoor, food etc.): The FWS will rely on techniques to develop husbandry plans in use by the Association of Zoos and Aquariums for captive care facilities. At the Phoenix Zoo the red squirrel enclosures are indoors, at the Miller Park Zoo the enclosure is outdoors.
2. How will the wild behaviors of the captive population be maintained: The FWS must rely on the techniques developed to ensure natural behaviors in captive bred individuals of other species. One of the needed results of the pilot project is the demonstration that captive-born individuals can be released into the wild and survive to breed successfully.
3. Questions about what is currently known and unknown about captive care of red squirrels: Through the Arizona-Sonora Desert Museum and the Phoenix Zoo, we have some information on the husbandry needs of red squirrels. We do not know how different those needs might be between different subspecies. Our current assumption is that there may be behavioral or physiological differences that make use of the Mt. Graham red squirrel to develop husbandry techniques specifically for it more appropriate.
4. Use of the word “territory” to describe red squirrel behavior: No changes were made in the document; red squirrels are territorial in their behavior.

#### Release and post-release survival:

1. How will red squirrels be acclimated prior to release (enclosure size and height, feeding, and other acclimatization): The FWS will rely on the recognized techniques used in releasing captive bred animals to prepare them for release and when they would be released. Details of the release protocols are not available at this time.
2. Selection of release sites: Questions regarding the carrying capacity of available habitat for release and how release sites would be selected were raised. While the release strategy has not been developed, the FWS will coordinate these activities with cooperators and believes that captive bred red squirrels would be released into areas where they have the highest recovery value; that is, suitable habitats not currently occupied. Any habitat area selected for repatriations would first be evaluated to assess suitability (including nest and midden site availability, food resources, and avian predator presence) and sub-standard areas would be avoided.
3. Release sites away from developed areas: Commenters noted that potential release sites were first graded on proximity to existing or future development and not on their value to the red squirrel. It is not the intention of this pilot project to restrict recovery actions needed for the red squirrel. The intent is to be able to first assess release techniques in areas where disturbance from human activities is minimized.

*COMMENT LETTERS*



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October 12, 2010

Marit Alanen  
Arizona Ecological Services  
2321 West Royal Palm Road, Suite 103  
Phoenix, Arizona 85021  
Submitted via email to [marit\\_alanen@fws.gov](mailto:marit_alanen@fws.gov)

Dear Ms. Alanen:

Thank you for the opportunity to review the Draft Environmental Assessment (EA) for Establishment of a Captive Breeding Pilot Program for the Endangered Mount Graham Red Squirrel. Please accept these comments on behalf of the Sierra Club's Grand Canyon Chapter and our 12,000 members in Arizona.

The Sierra Club's mission is "to explore, enjoy, and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; and to educate and enlist humanity to protect and restore the quality of the natural and human environments." Inspired by nature, the Sierra Club's more than 1.3 million members and supporters work together to protect our communities and the planet. Our members have a significant interest in this proposed action as we have been very involved in protection of Arizona's public lands and the wildlife that depend on them, including the Mt. Graham red squirrel.

We commend the U.S. Fish and Wildlife Service (FWS) and associated partners for seeking to actively recover the Mt. Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*) by looking into a captive breeding program. We would all like to see this species recovered, and this program could be an important step toward that recovery. However, we have a number of concerns about the program, as discussed below.

Our biggest concern is that the proposed project does not adequately address the purpose and need for action. This program is being proposed despite the continuing threats to the species. The Mt. Graham red squirrel is highly endangered due to a number of factors, including habitat loss, predation, and interspecific competition with introduced Abert's squirrels. An article published by Koprowski et al. states that decline of the Mt. Graham red squirrel can be characterized as catastrophic.<sup>1</sup> Unless the threats to the species in the wild are resolved, a captive breeding program could be a moot point.

The second point in the "Purpose for Proposed Action" is to "establish a captive group of squirrels outside of Mt. Graham that could serve as a buffer in the event of future wildfire within the habitat in the Pinaleno Mountains or other causes of catastrophic decline of the Mt. Graham red squirrel population" (pg. 5). Similarly, the first point under "Need for Taking the Proposed Action" states that

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<sup>1</sup> Koprowski, J. L., M. I. Alanen, and A. M. Lynch. 2005. Nowhere to run and nowhere to hide: response of endemic Mt. Graham red squirrels to catastrophic forest damage. *Biological Conservation* 126:491-498.

“the Mt. Graham red squirrel remains a highly endangered subspecies that continues to be threatened...” (pg. 5). The EA also states several times that if the no-action alternative is selected, the species and its habitat would continue to be affected by “continuing and increasing threats.” However, regardless of which alternative is implemented, the species will remain highly endangered due to the continuing threats.

The captive breeding program would provide an off-site population and allow for augmentation of the wild population, but will it help the Mt. Graham red squirrel achieve the goal of a self-sustaining population? If the threats continue, declines in the wild population will likely also continue. Does the FWS foresee a time when reintroductions would no longer be necessary and the population could be considered self-sustaining? Or is it possible that the species’ survival would be dependent on continued reintroductions from a captive population?

Are any specific actions being taken to mitigate the threats to this species? For example, are there any plans to remove the introduced Abert’s squirrels from the Mt. Graham red squirrel’s habitat? The EA seems to imply that this proposed action, as well as many aspects of the recovery program, are being planned to minimize impacts on human use and other factors that threaten the species, rather than the other way around. For example, the EA states that “[release] sites can be selected to minimize the potential for released squirrels to affect future [U.S. Forest Service] activities.” Instead, shouldn’t the Forest Service seek to manage their actions in such a way as to not affect this endangered species? Isn’t that required by the Endangered Species Act?

We are also concerned about the emphasis on the need for this project in case of catastrophic events such as wildfire. In the event of a catastrophic wildfire in the squirrel’s range, habitat will be lost. Animals cannot be reintroduced if habitat is severely reduced or eliminated. As Dr. Matter’s letter in Appendix 1 says, “If much of existing habitat for [Mt. Graham red squirrels] is lost to fire, insect damage, or other threats, captive-reared animals may not be able to be released for many decades when appropriate forest conditions return.” What if appropriate forest conditions do not return?

Our other primary concern about this proposal to engage in captive breeding is the potential impact on the wild population. The EA discusses plans to minimize impacts to the wild population from release of captive individuals. However, how will removal of the 8–16 individuals affect the wild population? Primarily, how will genetic diversity be affected? The EA states that “the average relatedness among Mt. Graham red squirrel individuals is over 90 percent” (pg. 19). If biologists seek to increase genetic diversity in the captive population, could that further reduce genetic diversity in the wild population? A limited population of only 250 animals may not provide adequate genetic diversity if key individuals are removed. How does the FWS plan to monitor and mitigate for this possibility?

Related to the impacts on the wild population, the EA states that annual reviews of this program will allow the Technical Subgroup of the Recovery Team to determine if this program is helping the species. Prior to implementation of any action, will guidelines be in place to determine whether or not the program is successful? Or will these decisions be relatively arbitrary?

We would also like to ask about some of the proposed methodology. First, the EA states that traps would be checked every two hours and any squirrels caught would be transported to a facility within 24 hours of capture. Where will the squirrels be held prior to transport? What actions will be done to reduce stress and limit the chance of injury or death?

Have there been any long-term studies on the effects of trapping individuals? The EA references Dr. Koprowski's studies, which documented several recaptures over four months with no evident negative effects. Is there documentation of any longer-term survival or other possible impacts?

Once in captivity, will the squirrels be kept separate from one another or in the same enclosure? The EA is not clear on this point. The only discussion of long-term holding plans is in reference to a study that showed that red squirrels can tolerate the presence of conspecifics in the same enclosure, provided that the amount of food is always slightly more than their needs. No further information is provided, except that biologists are not sure if this would work for Mt. Graham red squirrels. The EA also mentioned two Mt. Graham red squirrels that were temporarily housed at the Arizona-Sonora Desert Museum, one of which died possibly as a result of excessive feeding. In the event that the squirrels are in the same enclosure, how will biologists determine how much food is adequate to reduce territoriality disputes but not enough to cause illness?

The Cumulative Effects section of the EA is incomplete. Cumulative effects are defined as "the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such actions." The EA goes into great depth about Dr. Koprowski's planned studies as well as effects from the proposed action, but it does not discuss any other projects. In a different section of the EA, both the Pinaleno Ecosystem Management demonstration project (already completed) and the Pinaleno Ecosystem Restoration Project (planned) are mentioned. These should be further detailed in the Cumulative Effects section as they affect the area and could impact or be impacted by this proposed project. Similarly, other possible actions by the Forest Service, the Mount Graham International Observatory, etc. should be addressed in this section.

Prior to moving forward with a captive breeding program, we ask the FWS first complete a revised recovery plan and address the most significant issue for the Mount Graham red squirrel, habitat loss. As noted above, captive breeding by itself does nothing to ensure the species' long term viability in the wild, and must be viewed and evaluated in a much broader context.

Thank you again for the opportunity to comment on this EA and for your efforts to recover Mt. Graham red squirrels. We hope to one day see a self-sustaining population of this species. Please contact us with any questions. We look forward to learning more about the FWS's plans.

Sincerely,



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RE: COMMENTS: EA on Pilot Captive Breeding program for Mount Graham Reds Squirrels

To: Marit Alanen, Arizona Ecological Services

From: Michael J. D'Amico, P.O. Box 87373, Tucson, AZ 85754-7373

Pages: 1 of 1

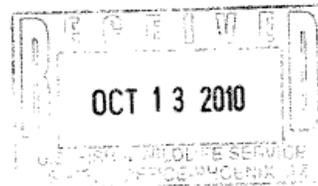
Date: October 12, 2010

This EA is woefully lacking and the USFWS should proceed to either producing a more comprehensive EA or an EIS that fully meets the requirements of all existing laws and regulations. This EA raises questions that should have been addressed before issuance.

1. Where is the cover sheet explaining the specifics of this matter?
2. Why does the summary lack major conclusions, areas of controversy, and issues to be resolved?
3. The purpose and need of this EA lacks adequate information telling us who is going to do be doing what, when, where, how and why?
4. Why is the EIS on the Recovery Plan not cited when you are required to do so since it may have influence with this proposal?
5. Why is there no summarization of permits, licenses, and MOUs?
6. When and where did scoping for this EA take place?
7. Where are the detailed explanations of why 'significant issues' seem not to be a factor?
8. If implemented, does this EA intend to take the place of the Recovery Plan?
9. Why are the environmental and cultural consequences of your proposed actions not flushed out here?
10. Why does the tiering or phasing not explain if an additional EA will be required for the latter phases?
11. How does this proposal affect RPA3?

Thank you for the opportunity to comment.

Sincerely,





Mount Graham Coalition  
PO Box 43565, Tucson, AZ 85733  
(520) 777-9500 Fax (866) 279-6381  
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October 12, 2010

Marit Alanen  
US Fish & Wildlife Service  
Arizona Ecological Services Office  
2321 West Royal Palm Road, Suite 103  
Phoenix, AZ 85021  
Marit\_alanen@fws.gov

RE: **Comments on a Draft Environmental Assessment for the Establishment of a Captive Breeding Pilot Program for the Endangered Mount Graham Red Squirrel**

Comments sent via email to: [marit\\_alanen@fws.gov](mailto:marit_alanen@fws.gov)

Dear Ms. Alanen,

Thank you for the opportunity to comment on the Draft Environmental Assessment for the Establishment of a Captive Breeding Pilot Program for the Endangered Mount Graham Red Squirrel.

The Mount Graham Coalition, Inc., is an international coalition working for ecological preservation of Mt. Graham and other southwestern mountains, riparian areas, and deserts in the region. The mission of Mount Graham Coalition, Inc. is to provide educational and technical assistance to its members and the general public so that they may protect the few remaining natural areas for those plants and animals which exist there, for the sacred nature of these areas, and for the enjoyment of all. We have been active in the protection of Mount Graham – *Dzil Nchaa Si'An* (Big Seated Mountain) – since 1985, and have been incorporated as a non-profit organization since 1993. These comments are submitted on behalf of the Coalition and all of our member groups.

We are also submitting these comments on behalf of the Center for Biological Diversity. The Center for Biological Diversity ("CBD") is a nonprofit corporation with its primary office in Tucson, Arizona, and with other offices throughout the United States. CBD is actively involved in species and habitat protection issues throughout North America and the World, with over 40,000 members. CBD's members (including its staff) include Arizona residents with biological health, educational, scientific research, moral, spiritual, aesthetic, and recreational interests in the protection of the Mount Graham ecosystem.

We have read the comments submitted by the Scientists for the Preservation of Mt. Graham for this action. We incorporate them, by reference into these comments.

#### **In General**

We understand that the survival of the Mount Graham Red Squirrel as a species is serious danger. Therefore, we understand both the urgency and the desire of the US Fish & Wildlife Service (FWS) to do something to help

the population recover. After all, the Endangered Species Act requires the US Fish & Wildlife Service to take the lead in recovering the Mount Graham Red Squirrel population within the critical habitat designated in 1990. We share those goals. However, the proposed action suggested by the Draft EA is not compatible with the goal of recovery of the Mount Graham Red Squirrel. In fact, the proposed action, if implemented, could be counterproductive and result in the net loss of Mount Graham Red Squirrels (MGRS). While we recognize the need for action, action for the sake of action and without a full assessment of the need, purpose and alternatives is not acceptable.

We strongly object to this or any project moving forward until a new and updated Mt Graham Red Squirrel Recovery Plan is completed, released to the public for comment, finalized, and adopted. This should be your highest priority at this time. Such a plan would provide the context needed to accurately assess whether there is a need to move forward with a captive breeding program and would better guide how this process was planned and implemented.

Lack of available habitat is likely more of a negative factor for the MGRS than reproduction and survival rates. The most important single action that should occur, and that would create more available MGRS habitat in the shortest timeframe, would be the removal of large numbers of the introduced Abert's squirrel from the Pinaleno Mountains. The direct competition between the Abert's and the MGRS is well documented, and goes beyond the issue of the MGRS inability to utilize territory occupied by the larger aggressive Abert's squirrel. It has been documented that the Abert's squirrel robs the middens of red squirrels, and compromises their ability to make it through the winter with an adequate food supply. Even if the MGRS is successful in defending its midden, time spent defending the midden is time not spent increasing its food supply for the tough winter months, and also creates stress for the MGRS, both of which compromise the MGRS short and long-term survival.

Recovery and management of the Mount Graham Red Squirrel is fraught with a history of political interference into agency decisions that have short-circuited good science and has gotten in the way of the US Fish & Wildlife Service doing its job. Most of this interference has been on behalf of the University of Arizona, who in their haste to obtain permission to build a series of structures within Red Squirrel critical habitat, halted the process of environmental analysis that may have mitigated the dire situation the MGRS faces today. This political interference resulted in an aborted Biological Opinion (which would have included more robust information on habitat and recovery needs of the Red Squirrel), a delay in the completion of a recovery plan for the Mount Graham Red Squirrel, and mismanagement of MGRS Critical Habitat to protect the University's investment, to the detriment of the Mount Graham Red Squirrel. In fact, the University's industrial development in Red Squirrel habitat, including the clear cutting of prime habitat and the extensive and unnecessary damage done to the surrounding forest to protect telescopes during the 2004 Nuttall Fire, greatly exacerbated the current dire condition of the Red Squirrel population.

While past decisions are partially "water under the bridge," it is instructive to examine this history to better understand how we arrived at this point, and to avoid making similar short-sighted decisions with this proposed project.

Undertaking a captive breeding program in haste, on the basis of a woefully inadequate Environmental Assessment, leaves too much room for disaster. We urge the US Fish & Wildlife to reject this EA, finish all of the science that should have been done 20 years ago, and then prepare a new environmental impact statement to give US Fish & Wildlife Service decision-makers a better and more scientifically supported range of alternatives.

It is troubling to us that the US Fish & Wildlife Service is rushing to approve this plan without adequate public involvement. It appears that the FWS has not only purchased much of the equipment for the preferred alternative, but has already put in motion actions and decisions that should have only been made after a final decision on this action is made. In the end, jumping the gun like this will only make it more difficult for a good decision to be made.

Captive breeding programs, even when well thought out and with a clear need for action, are to be approached with a great deal of caution. In this case, we are dealing with the most endangered mammal in the United States. We only get one chance to do it right. An incorrectly perceived need for hasty action could have disastrous consequences for the Red Squirrel. Even if the program succeeds, there is still the larger question to be answered as to whether the resultant population of Red Squirrels are truly wild and free Red Squirrels or some variant of squirrel with wildly different behavior patterns that could forever alter the Squirrel's destiny. For example, while the FWS captive breeding program for the California Condor in California has been successful in adding additional condors to the population, it has undeniably led to a radically different population of condors in the wild than what previously existed.

#### **Supplemental feeding**

It is impossible to conduct a captive breeding and release program without supplemental feeding. The EA alludes to this fact, but glosses over it. Supplemental feeding has been tried before, with disastrous consequences for the Red Squirrel population. Anything that involves supplemental feeding needs a separate and full assessment by FWS to ensure that further jeopardy to the MGRS is not the result.

#### **Religious Freedom**

The Mount Graham Red Squirrel is integral to the religious freedom of Native American Tribes practicing on Mount Graham. Full consultation (and approval) with the affected Tribes is necessary before this plan can be approved. There is no mention of consultation in this document.

#### **Habitat preservation**

Habitat preservation and restoration remains the best long-term answer to the continued existence of the MGRS. This captive project – if implemented – should not replace efforts to protect and restore MGRS habitat. There is no discussion of aggressive habitat enhancement and recovery.

#### **Specific Comments**

#### **Section I B & C**

The purpose and need for this action are not valid. The reasoning in the EA for the purpose and need are circular. All actions made by FWS regarding the Mount Graham Red Squirrel should further the goal of recovery of the species across its entire critical and suitable habitat. The need and purpose of any action should be weighed against this goal. Instead, in this EA, the need is not recovery of the species, but an incorrectly perceived "need" to develop captive husbandry techniques and release protocols. This may or may not achieve the goal of recovery of the Red Squirrel. The stated purpose of the action is to support the "need." Therefore, the public and decision-makers do not have a clear picture of whether this action actually serves the purpose of species recovery, only that the purpose of the proposed action meets the stated "need." There needs to be discussion of how this action should meet the goal of species recovery, not the need to fulfill a science project.

## **Section II**

Without the benefit of a full EIS and the completion and release of a valid biological opinion, a recovery plan, and the conclusions of all related federal actions, (Special use permit renewal EIS, PERP, etc) we cannot determine a full range of alternatives. It is probably that the completion of these documents would add a range of other alternatives.

The EA does not make clear exactly what the No action alternative is. Since there are number of federal actions that may or may not happen before this plan is approved or rejected, and before a preferred alternative is implemented, there are a number of other possible actions that could change the baseline of "no action." Since this EA is so vague, it is not correct for the EA to state that the purpose and need for the proposed action would not be met since we don't really know what exactly the no action alternative is.

At minimum, the no-action alternative should discuss other projects and actions currently being implemented, or proposed for the future that are of benefit to the MGRS. It is probable that final versions of the Mount Graham Red Squirrel recovery plan, the Pinalaño Ecosystem Restoration Project, and other federal actions could substantially alter the current, unclear, no action alternative.

## **Alternative B**

Alternative B is not clear as to exactly what the plan would be.

A major fault with Alternative B is that there is no backup plan or redundancy. Should the alternative fail, there is no recourse.

Before an Alternative like B or C be implemented, more information is needed on the MGRS. For example, a captive breeding program should be preceded by a full inventory of middens and a comprehensive population viability assessment. The Species Survival Commission Conservation Breeding Specialist Group has expressed interest in being invited by FWS to conduct such a study.

At a minimum, if Alternative B is to move forward there must be a threshold for the number of squirrels that can be captured in any one year, as well as a process for determining conditions that would set this number. The EA suggest that up to 10% of the population could be removed in any single year. We believe 10% is much too high,

and this number, without any explanation as to how it was arrived at, renders it arbitrary and useless – not to mention dangerous to the continued survival of the MGRS.

Other alternatives were improperly rejected. Had there been a valid need and purpose statement for this action, Alternatives D and E and other unknown alternatives could have better achieved the purpose of recovery of the Mount Graham Red Squirrel.

#### **Alternative D**

In particular, Alternative D deserves more discussion. It would make a great deal of sense to experiment with captive breeding and release with a similar population that is not in such dire straits.

The EA later states, “Alternative D involved establishing a captive breeding pilot program using up to 16 Mogollon red squirrels from the White Mountains, Arizona, instead of Mt. Graham red squirrels. The White Mountains support the nearest population of red squirrels to the Pinaleño Mountains. These squirrels share similar life-history traits with the Mt. Graham red squirrel, and therefore could act as a surrogate for the Mt. Graham subspecies in developing captive husbandry, rearing, breeding, and release techniques.”

The EA states that “husbandry requirements for successfully rearing this subspecies in captivity and releasing individuals back into the wild are currently unknown,” and that a primary purpose of the proposed action is to “develop captive husbandry, rearing, and breeding techniques for the Mt. Graham red squirrel, as well as protocols for release of squirrels into the wild.” This could be done with no risk to the MGRS by the implementation of Alternative D.

#### **New Alternative**

We favor a new alternative predicated on the need for action being the recovery of the species and not the need as stated. This alternative would be a mix of a number of features including:

- Begin with a comprehensive population Viability assessment
- Aggressive removal of introduced Abert’s squirrels from all suitable MGRS habitat
- Fire management that would prioritize the protection of habitat
- No more degradation of MGRS habitat
  - Removal of the bible camp and summer cabins in MGRS habitat as called for 20 years ago.
  - An end to discussion of paving the Swift Trail
- Enhancement of existing habitat
  - There should be good ideas that could be implemented in the Final Pinaleño Ecosystem Restoration Project
- Establishment of additional population nodes in suitable, but unused MGRS habitat on Mount Graham
- Alternative D, an experimental captive breeding and release program using White Mountain Red Squirrels to gain experience and knowledge should a captive breeding program be necessary for the MGRS.
- A backup emergency plan to remove all or significant portions of MGRS in case of a catastrophic event such as a fire that would immediately jeopardize the entire population.

**Connected and cumulative activities**

The EA states “areas treated through PERP may be considered as potential release sites for captive red squirrels to determine if these areas can or will provide habitat;” We strongly object to MGRS being used to assess habitat suitability for an experimental restoration project. If MGRS are released into PERP treatment areas in the future, it should only occur after it has been shown that PERP has had no effect on existing squirrels currently found within proposed PERP treatment areas.

If this project is to move forward, we strongly support the process outlined in Alternative D and **strongly object to the use of the highly endangered Mt. Graham red squirrel in such a reckless and experimental fashion.**

**Conclusion**

Due to the highly endangered status of the MGRS, this draft EA should be rejected and a full Environmental Impact Statement should be prepared after (or in conjunction with) all connected and related federal actions currently in process are completed, in particular, the Mt. Graham Red Squirrel Recovery Plan.

The need and purpose for this action is fatally flawed.

We have proposed another hybrid alternative that should be seriously considered as the preferred alternative that includes removal of Abert’s squirrels, protection of existing habitat, habitat enhancement, a change in fire management, and a captive breeding program using White Mountain red squirrels instead of MGRS.

Thank you for this opportunity to comment on the Draft EA. Please keep us informed one this action and any other actions involving the Mount Graham Red Squirrel.

Sincerely,



Roger Featherstone  
Board Chair  
Mount Graham Coalition, Inc.  
PO Box 43565  
Tucson, AZ 85733



THE STATE OF ARIZONA  
**GAME AND FISH DEPARTMENT**

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October 15, 2010

Ms. Marit Alanen  
Arizona Ecological Services Office  
2321 West Royal Palm Road, Suite 103  
Phoenix, Arizona 85021

Re: Arizona Game and Fish Department Comments on the Draft *Environmental Assessment for Establishment of a Captive Breeding Pilot Program for the Endangered Mount Graham Red Squirrel*.

Dear Ms. Alanen:

Thank you for the opportunity to provide comment on the draft Environmental Assessment for the Establishment of a Captive Breeding Pilot Program for the Endangered Mount Graham Red Squirrel. As you are aware, the Arizona Game and Fish Department (Department) remains supportive of establishing a pilot program for determining captive husbandry, rearing, and breeding techniques for the Mount Graham red squirrel, with the potential to establish a group(s) of squirrels off-site from the Pinaleno Mountains. At the same time, however, it is our contention that augmentation through translocations of young of the year may be a more feasible, efficient, and less expensive endeavor than a full captive breeding program (Alternative E that was rejected). With that said, we offer the following comments regarding the draft Environment Assessment (EA):

In general, this draft EA appears to provide adequate information regarding the capture and collection of young red squirrels. We concur the decisive action is "whether [the U.S. Fish and Wildlife Service (Service)] will, in cooperation with others, 1) take no action on removing Mt. Graham red squirrels from the wild, 2) establish a captive population(s) with up to 16 wild-caught Mt. Graham red squirrels, or 3) establish a captive population(s) with up to eight wild-caught Mt. Graham red squirrels." We also recognize the need for including a synopsis of potential release strategies despite the lack of adequate standards for such. The Department also feels that the EA should identify criterion and conditions for expanding the pilot program to a full captive effort.

Our specific concerns with the EA as written are:

1. Page 6 Section II.2 Alternative B recommends capturing up to 16 Mt. Graham red squirrels for the captive breeding program. The intent is to capture juveniles, but an alternative is to capture adults. We are not as concerned with using juveniles as we are with adults who have overcome natural mortality factors and survived their first year. With only 240 adult animals in the population, that equates to 6% of the population. It seems that a simple population model could be used to determine the effects of removing 6% of the breeding population using vital rates before adults are captured. This assessment would answer questions to whether the population could sustain such a loss.

Letter to Ms. Alanen  
Re: AGFD Comments to MGRS Captive Propagation  
October 15, 2010

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2. Page 7, Paragraph 2 states "If it is determined that Mt. Graham red squirrels held in captivity should be exchanged for other wild-caught individuals for these reasons, as mentioned above, it must first be demonstrated that released individuals are able to survive and reproduce at a level that meets or exceeds the natural level of survival and fecundity for this subspecies." First, the natural levels referred to in this statement need to be identified and explained. Second, this may not be feasible to accomplish. It is erroneous to expect the survival and fecundity rates of captive animals will match those of wild animals (even if only in captivity a short time).
3. Page 7, Paragraph 4. Release sites should also be chosen to have a low occurrence of avian predators. That is, it would be in error to release captive bred and somewhat naïve juvenile red squirrels within the territory of a northern goshawk during the breeding season.
4. Pages 7-9 discuss the soft-release enclosure. Our concern is whether this is a release enclosure or actual holding facility at the Columbine Work Center. If it is a soft-release enclosure and these are portable as described, we recommend that they be constructed at the actual release site(s) (to be determined). A separate facility at the Work Center adds to the cost of the project and is not needed.
5. Page 9 discusses relocation of the soft-release enclosure and that "all necessary environmental compliances will be completed prior to relocation" of the pen from Columbine. We suggest that, absent of archeological clearances, the entire release area should be covered or addressed in this EA, thus eliminating the need for additional clearances. If the soft-release pens are constructed without ground disturbances as described, then the need for archeological clearance is also minimized.
6. Page 9 states that candidates for releases would exhibit essential behavioral skills. Is this feasible considering their soft-release enclosures are only 1/10<sup>th</sup> the height of their natural environments (i.e. 7 ft enclosure versus an 80 ft forest)? There are not many cones below 7 ft. We understand the intent of the statement is to assure that animals are not haphazardly released without survival skills. However, including a list of all of these skills implies some level of measurement will be taken to assess these skills.
7. Bottom of Page 9 and top of Page 11 discusses minimizing impacts from releases, specifically minimizing areas with human activity. The EA states that releases "would not be located within 4,000 feet (ft) of existing structures, campgrounds, special use areas (e.g., summer homes, Bible and Boy Scout Camps), and the 150-acre (ac) Mount Graham International Observatory research area (for a description of these areas, see Environmental Setting below)." This eliminates most of the area within the range of the squirrel including West Peak. The highest density of historic middens is found in areas with existing structures including Webb Peak, Bible Camp, Riggs Lake, Columbine, and the MGIO scope area. Existing habitat should dictate where squirrels should be released and ¼ of a mile is too restrictive. The EA should ensure that re-establishing squirrels in these areas should not result in additional impacts to existing land users; not avoid these areas altogether.
8. Page 11 discusses evaluation of the pilot effort by the MGRS Recovery Team and that the resulting decision will be "a) developing a comprehensive captive breeding program involving more than 16 wild-caught Mt. Graham red squirrels, or b) discontinuing the pilot program because it is not meeting its goals." A third option might be to continue at a small scale, with or without a need for additional

Letter to Ms. Alanen  
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October 15, 2010  
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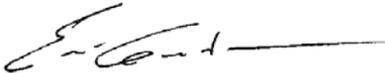
squirrels to be removed from the wild. A fourth would be the translocation alternative that was dismissed (Alternative E).

9. The EA uses a 10% rule (or 25 individuals) to minimize effects of trapping wild squirrels. The Department agrees that removal of squirrels from the wild should not exceed more than 10% of wild population in any given year and that this figure will equal up to 16 squirrels, or the alternative 8 squirrels. Unfortunately, discussion within the EA appears to confuse trapping effort with actual removal of individual squirrels. For example, page 6 indicates that the 10% rule includes individuals trapped "incidentally and released immediately" as well as the 16 squirrels that would be brought in to captivity. Page 23 adds that based on the Fall 2009 survey of 250 individuals that this number equals up to 25 squirrels for 2010. Basically, the potential for 16 brought in to captivity plus an additional 9 (incidental captures). The assumption is that potential effects caused by capture are limited to a small percentage of the population. We question the reasoning for restricting the number of captures, especially considering that the University of Arizona captures up to 200 adult and 80 juvenile squirrels per year (Page 32) without any perceived consequences to the squirrels. We agree that any squirrels that die as a result of capture should be included in the allowable total that can be taken from the wild, and we concur that exchanges (genetic or otherwise) should be allowed as described.
10. The Department concurs with attempts to use young or juvenile squirrels for the pilot effort. We also recognize that results from the effort may indicate that adult squirrels are more suitable for husbandry and breeding efforts and that project outcomes may be adjusted for this reason.

In summary, the Department recognizes that we may already be at the lower threshold limit for recovery for Mount Graham red squirrels. This is in part due to the fact that only 36% (455/1251) of the recorded middens are considered currently useable, population estimates remain near the 200-250 range, the continued threats of fire and insect outbreaks remains high, and information exists regarding very low reproductive and survival rates. We also concur that husbandry techniques should be developed without jeopardizing existing population levels. However, we also feel that other options should also be examined during this pilot project to limit the reliance of Mount Graham red squirrel recovery on just a captive breeding program.

Thank you again for the opportunity to provide comments. If you have any questions regarding our comments, please direct these to Tim Snow in the Tucson Regional Office at (520) 388-4449 or [tsnow@azgfd.gov](mailto:tsnow@azgfd.gov).

Sincerely,



Eric Gardner  
Nongame Branch Chief

:tk

Document ESG MGRS Captive Propagation.AGFD Comments.20101015.docx

**McMANUS Roger**  
<Roger.McMANUS@iucn.org>

10/12/2010 06:31 AM

To "David Hodges" <dhodges73@gmail.com>

cc <marit\_alanen@fws.gov>

bcc

Subject RE: Mt. Graham red squirrel

History:

Hi David,

I know you are very busy and appreciate your efforts.

I met Marit in Tucson and have taken the liberty under the circumstances to include her in this response. My impression too is the Service is lucky to have her.

My understanding is the comment period closes today, and I have not had a chance to read in a busy day today the draft comments I have just now received as well.

So, here are my comments. I think from my reading of the draft, and other materials relating to the management and recovery of this species, and my discussions with Ms. Alanen - that additional understanding of the status of the squirrel population is highly desirable to best plan and implement a recovery effort, including the captive breeding program. The SSC CBSG (Bob Lacey) has indicated they are willing to help in this regard, and I suggest that an important step to ensure the best understanding of the viability of the population is to ascertain whether further work in this area is warranted and can be undertaken.

I am not suggesting that there be serious delay in starting the captive breeding program, but that the Service move aggressively to secure the assistance of the CBSG and or other such experts to help conduct the needed evaluation.

I hope this is helpful, and my best to you both.

Roger

**From:** David Hodges [mailto:dhodges73@gmail.com]

**Sent:** Mon 10/11/2010 10:17 PM

**To:** McMANUS Roger

**Subject:** Mt. Graham red squirrel

hi Roger,

I'm belatedly passing on the information that you asked me for at the last Mt. Graham Coalition Board meeting. The biologist that oversees the program for US F&WS, and is the point for the long-delayed Recovery Plan is Marit Alanen. I think she is one of the good ones and would be receptive to new ideas. Her contact info is:

Ms. Marit Alanen, Mount Graham Red Squirrel Lead Biologist  
U.S. Fish and Wildlife Service  
201 N. Bonita Ave., Suite 141  
Tucson, AZ 85745  
(520) 670-6150 x 234  
[Marit\\_Alanen@fws.gov](mailto:Marit_Alanen@fws.gov)

Sorry to be so tardy with this and please let me know if I can help in any way. Best,

David

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October 12, 2010

Marit Alanen  
Arizona Ecological Services Office  
U.S. Fish and Wildlife Service  
2321 West Royal Palm Road, Suite 103  
Phoenix, AZ 85021  
marit\_alanen@fws.gov

Dear Ms. Alanen,

These comments are being submitted in response to the Draft Environmental Assessment for the Establishment of a Captive Breeding Pilot Program for the Endangered Mount Graham Red Squirrel. Sky Island Alliance (SIA) is a non-profit conservation organization dedicated to the protection and restoration of the rich natural heritage of native species and habitats in the Sky Island region of the southwestern United States and northwestern Mexico. We appreciate the opportunity to comment on this draft assessment.

SIA is generally supportive of this proposal, as we understand the Mount Graham red squirrel (MGRS) is critically endangered and continues to be seriously threatened by habitat loss, predation, and competition from the introduction of non-native Abert's squirrels. However, we believe a captive breeding program should be implemented only after a revised recovery plan for the MGRS is completed. This will ensure that the efficacy of the program is assessed within the context of a broad range of recovery actions, and in light of limited resources that exist for recovery efforts.

The primary justification for this project seems to be the potential for a catastrophic fire event decimating the remaining MGRS population. While a captive breeding program may buffer the species from such an event, it does nothing to protect the remaining MGRS habitat from being destroyed, and thus has only limited potential to ensure the viability of the species to exist in the wild in the long-term. This reality underscores the critical need for aggressive efforts to protect existing habitat, and to restore other areas to allow for expansion of MGRS habitat.

While a captive breeding program may be a useful tool, it does not by itself address the principal cause of the MGRS population decline, which is clearly habitat loss and degradation. If not considered in conjunction with other recovery efforts that more directly address this primary threat, implementing a captive breeding program may forestall other, more effective recovery measures. Unfortunately, according to scientists who have studied captive breeding programs, this is not an uncommon result:

[Captive breeding] has often been invoked prematurely and should not normally be employed before a careful field evaluation of costs and benefits of all conservation alternatives has been accomplished and a determination made that captive breeding is essential for species survival. Merely demonstrating that a species' population is declining or has fallen below what may be a minimum viable size does not constitute enough analysis to justify captive breeding as a recovery measure... Captive breeding can play a crucial role in recovery of some species for which effective alternatives are unavailable in the short term.

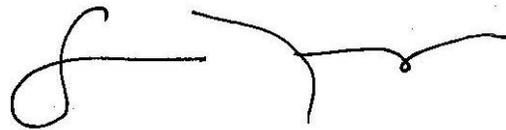
However, it should not displace habitat and ecosystem protection nor should it be invoked in the absence of comprehensive efforts to maintain or restore populations in wild habitats.

Snyder, N. F., Derrickson, S. R., Beissinger, S. R., Wiley, J. W., Smith, T. B., Toone, W. D. and Miller, B., *Limitations of Captive Breeding in Endangered Species Recovery*. Conservation Biology, 10: 338–348 (1996).

Before moving forward on a captive breeding program, the U.S. Fish and Wildlife Service must first revise the outdated recovery plan for the MGRS in order to facilitate a comprehensive look at all potential recovery measures, including additional habitat protections and restoration projects, such as the Pinaleño Ecosystem Restoration Project, which is already underway. A revised recovery plan will allow the Fish and Wildlife Service to assess the effectiveness of each potential recovery measure relative to the others, and in light of the limited funds available for recovery efforts. To implement this project now risks displacing other, potentially more worthwhile recovery efforts, and thus should not be pursued until revised recovery plan is complete.

Thank you for the opportunity to comment on this proposal. We look forward to continuing to work with the Fish and Wildlife Service and its partners on recovery and protection of the Mount Graham red squirrel and its habitat.

Sincerely,

A handwritten signature in black ink, appearing to read 'Jenny Neeley'. The signature is fluid and cursive, with a large initial 'J' and a long horizontal stroke.

Jenny Neeley  
Conservation Policy Director

From: Scientists for the Preservation of Mt. Graham  
Date: Sept 27, 2010  
RE: EA on Captive Breeding Project (No Code on document)  
TO: US Fish and Wildlife Service (no specific name on document)

Dear USFWS:

Enclosed are our comments on the Proposed Captive Breeding program EA. In short, there are two major questions: The Need for This Program at this time, and The Alternative Selected. In addition, there are technical issues that are not addressed.

We feel (1) another draft of the EA should be circulated and that an independent team of conservation biologists similar to the team assembled after Congressional hearing in 1992 or the Society of Conservation Biologists should review this proposal.

The EA says: "Implementation of the field activities is expected to commence during the Fall of 2010." The due date is not until October 15 and there are many unanswered questions. Please remove this from the EA (see Financing below).

## NEEDS FOR PROJECT

The obvious question to conservation biologists who reviewed this document is: What is the carrying capacity of the habitat? Is the population of the MGRS low because it cannot reproduce fast enough to recover? Or is it low because there is not enough habitat (i.e., too few viable home ranges)?

### **1. Why is this question not addressed in the No Action Alternative or the Environmental Background Sections?**

If the population is endangered because the MGRS cannot reproduce fast enough or there are too few females, then there is some reason for this project. This question is not addressed in the EA.

If the barrier is lack of adequate habitat for food or shelter, then producing squirrels off-site and re-introducing them on-site is not a high priority. In fact, it can hurt the population as it removes the learning capabilities of young and releases "un-learned" squirrels back into an inadequate habitat (more below).

### **Is this the right moment for such a program?**

The EA also says that Benjamin Tuggle (actually it was Acting Director Larry Bell, not Benjamin Tuggle) concurred that it is "time to investigate a captive propagation program." He did not say implement such a program. He directed the MGRS Recovery Team "to determine that implementation of the pilot program may aid the recovery of the squirrel" and "whether a larger captive propagation effort ... may be an effective recovery tool to improve the species'

status.”

## **2. Will this aid in the recovery of the MGRS? How much?**

The EA does not state recovery goals in terms of qualities of habitat nor numbers of reproductive female squirrels — the two crucial milestones in recovery. Why not?

The EA does not state how the program will measure how much the returned squirrels might benefit recovery. It does not state by what criteria they would move from this pilot program to a larger scale program. In other words, the purpose and need have no indications or indicators of what success might look like. This was the directive from the Regional Office. Please add these criteria to various Alternatives.

The EA does not state how returning adult males (as opposed to reproductive females) differ in importance and the goals of the project. There is good evidence (not cited) that reproductive males are not the issue. In fact, removing adult males might provide more habitat for adult females, which could increase the population size more quickly without this captive breeding program.

## **3. Why use MGRS to develop (as the need and purpose states) protocols captive breeding, husbandry and release techniques? Do we need MGRS?**

Developing techniques of captive breeding and release of red squirrels is one purpose of this project and could be a separate project and EA. Aiding the recovery of the MGRS is another purpose. Returning captive squirrels to Mt. Graham is just one of many tasks required for recovery. Captive breeding and augmenting the population with captive squirrels should not be conflated in the Alternatives unless there are good reasons.

The argument in the EA is not very persuasive. At times, it says the MGRS is unique and, at times, it cites evidence that the MGRS is like other red squirrels. The need to capture this endangered subspecies is not made clear. The mitigation measure (red squirrels from the Mogollon plateau) seems persuasive for the pilot program. It requires much less disturbance of the endangered species (see Alternatives).

In addition, this EA must cite and incorporate other related EISs and NEPA documents. Does the MGRS Recovery Plan make the MGRS captive breeding plan a high priority? Does it address the issue of which subspecies is best to develop a captive breeding program? Does the Coronado National Forest Plan?

## **4. Will MGRS captive breeding help mitigate wildfires, insect outbreaks and other potential catastrophes?**

The Purpose and Need says the captive population “could serve as a buffer” in case of catastrophe. This is then contradicted within the text by citing Kaprowski and others that catastrophes have occurred on Mt. Graham in 1685 and other places and have led to small

pockets of reproducing MGRS and not extinction. NEPA case law warns against using hypothetical scenarios with a “could” unless backed up by strong evidence and probabilities.

Again, if this is to contribute to recovery, captive breeding/release will not be of use if there is no habitat left from wildfire or other calamities to return the captive animals. The question of carrying capacity remains central to the timely need and adoption of this program.

Please remove this purpose (“could serve as a buffer”) or demonstrate that the MGRS is so close to extinction that there is need for captive breeding “population” of eight females. There is a large literature on the subject and usually captive breeding sets in when there are very limited numbers of reproductives in existence. Is this true for the MGRS? There is no discussion of the number, the adult sex ratio, the “fledgling” success, etc. of the MGRS?

There is a need, according to NEPA, to cite and incorporate related plans and EISs. Does the MGRS Recovery Plan make captive breeding/release a high priority? Should the recovery plan spend funds on other aspects of recovery such as reforestation or removal of the Abert’s squirrel as a higher priority?

## ALTERNATIVES

In general, there is a need to add more alternatives and increase the points of concern. There is a need to give a better assessment of risks because certain aspects are simply unknown.

**1. No Action Alternative** states “The entire population of Mt. Graham red squirrels would remain at risk due to potential wildfires or other catastrophic events.” This is true for all the Alternatives and shows prejudice on part of the preparers. Please eliminate or explain how catastrophes would not occur under other alternatives.

No Action Alternative implies in this EA that other actions to help the recovery of the MGRS are not available. The EA needs to list other activities so readers can see if this project is the best project compared to others. In other words, the No Action Alternative is not passive. It is the giving of priorities to other actions. This is required by full disclosure aspects of NEPA and reference to related documents.

These include (and can be considered Alternatives):

### **1A. Translocation to West Peak with removal of Abert’s Squirrel.**

This alternative includes capture, but avoids hazards of transport and caging, returning inexperienced animals to the wild and creates new habitat (perhaps the crucial element for recovery). This alternative should include supplemental feeding for one winter’s midden (gathering Doug fir cones from the White Mountains) until establishment can take place. Advantages: cheaper, quicker expansion of habitat, two sub-populations where there are only one, less risk.

### **1B. Capture and release of juveniles in potential good habitat.**

This alternative avoids hazards and expense of captive breeding and release of inexperienced animals. The EA states that most juveniles are lost to predation while searching for new home ranges. This alternative addresses this issue by capturing juveniles and locating them in good/excellent habitat (see 1988 FS documentation of good and excellent habitat). It provides a means to determine if biologist's assessment of good/excellent habitat is accurate. It helps MGRS with range expansion (assuming there is good habitat).

### **1C. Removal of Males**

This controversial task would remove males in order to provide more habitat for reproductive females. It is based on the idea that one male can fertilize a few females. It is equivalent to capturing males and removing them from the population.

## **2. OTHER ALTERNATIVES**

### **3. Alternative B**

This alternative states: "No more than 10 percent of the population (based on the most recent mountain-wide census data) would be trapped in any one calendar year to populate this pilot program."

3a. Is this 10% of the adult reproductive population? 10% of the overall population? From the Spring or Fall survey? Why does the EA not say if the population is for Fall or Spring samplings?

SPMG has, over the last 20 years, tried to rectify the assessment of population size. AGFD also made a single attempt to rectify inaccuracies. The EA should not say "a random selection of middens to determine population size and trends of the population." It is not true. It is a stratified sample based on vegetation types, a parametric (vs. a non-parametric) statistical technique that reduces accuracy of the estimated mean, has not been verified by an actual census (UA trend data of actually occupied middens indicated that for spruce-fir, the FS surveys were not at all accurate), and lacks a rigorous habitat quality component (too few variables).

It is not clear from the EA if Fall "start-up" middens are included which also skews population size estimates. This connects to EA is its assessment of "10% of the population." Is this the conservative estimate? Should it be more conservative – only adult females? Much more is needed here.

3a. The 10% implies the overall population is 233 MGRS. If that is a Fall census it includes non-reproductive squirrels who will die before spring and gives a false sense of population viability. If that is the Spring sampling, then the number of reproductive females is probably around 100 given the skewed adult population ratios. In the worst case, taking 8 adult or first-year female squirrels from the population is reducing its reproductive potential by 8%. Do conservation biologists (no literature cited in EA) think that reducing a very endangered population by 8% of its female reproductive strength is a good practice?

3b. The MGRS is a boon-and-bust species. Is bust years or years of catastrophe, it may be necessary to stop capturing MGRS. Please discuss and provide a population estimate for Spring or Fall that would stop capturing.

3c. What season would capturing take place? It is not clear. SPMG assume that this is September through March in order to maximize capture of juveniles. Is this right? If not, please explain.

3d. What genetic markers will be used to determine if a squirrel will be released or kept? Is the science there yet? No literature cited. Will the released squirrels be collared and marked to see their survival rate after capture? It is hard to determine risks here. USFWS releases those MGRSs that are too much like other MGRSs with unknown impacts on the genetics of the “wild” population but keeps genetically diverse MGRS so that in can prevent in-breeding in captive population. Why isn’t genetic diversity in the wild population the priority?

3e. This Alternative brings us back to home ranges and carrying capacity: “sites would be selected so as to minimize impacts to the wild squirrel population.” There is no task listed with financing included in this program to determine home range quality or availability. Why not? The EA says, “These could include gaps within the current distribution of red squirrels....” Again, NEPA case law frowns on “coulds.” What will happen to determine “gaps” and home range qualities and how is it part of program?

The EA states: “Squirrels would only be released into the wild when the snow has melted, food resources are available, and sufficient time is available for the released squirrels to cache cones and fungi for the winter (May through August).” Again, how will it be determined if food is available? There are no published studies we know of that have ever determined in May, the food resources available for successful survival (of how many squirrels?) through the winter. Please explain and discuss methods. What criteria will be used when: “Not enough food resources are available this spring/summer, therefore no releases of captive squirrels as this time because it will lead to inexperienced squirrels starving or too much competition with other dispersing juveniles?”

3f. Is there a protocol to feed captive squirrels Doug fir, Corkbark fir, Engelmann spruce comes and introduce them to mushrooms? Is this part of soft release or part of captive breeding program? What evidence is there that this behavior is learned or innate? Is there a learning curve? Otherwise release is the equivalent of poor nutrition?

3g. There are no mitigation measures such as supplying a winter’s supply of cones from the White Mountains to make a “false midden” to help released animals through the first or second year?

#### ALTERNATIVE D

The problem with this alternative is conflating the two issues: Learning captive techniques with population recovery. The EA makes absolutely no attempt to show that (1) the crisis in the

MGRS demands an external breeding population of 16 squirrels; (2) the release of captive squirrels will help recovery of the population (the carrying capacity question). That any of the alternatives proposed “could serve as a buffer against catastrophes.”

#### ALTERNATIVE E

Again, this is a set up. The EA was set up to require that *both* captive breeding techniques *and* an ex-situ “population” be linked. They provide no evidence that they need to be linked. Alternative E can be considered part of the No Action Alternative for another EA. Again, No Action does not mean that other activities cannot occur and it is the requirement of the agency to connect this document to others such as actions in the Recovery Plan. No documentation for an “ex-situ” population on another mountain (at this time) was presented. Or not.

#### FURTHER NOTES

1. Pg 17: “a 1,750-ac Mt. Graham red squirrel Refugium surrounding the Hawk Peak-High Peak areas.” Please add that has been burned so that only XXX acres remain.
2. “**What are the economic impacts of developing a Mt. Graham red squirrel captive breeding pilot program?**” There are no costs or even lists of tasks in the EA. This is inadequate. There is no comparison of costs of alternatives, including other projects that might benefit recovery. Where are the economic impacts? We believe this omission alone requires another draft EA.
3. Page 25: “They state that adult red squirrels are easily kept in captivity, and despite their territoriality, can tolerate the presence of conspecifics in the same enclosure, provided that the amount of food is always slightly more than their needs.” Throughout the EA, the word territory is used to mean exclusive, defended piece of land. The evidence is that this is not true has been accumulating for many years since the early studies that did not actually follow the behavior of squirrels. This includes sharing home ranges and even core areas by mothers and young and adjacent red squirrels. SPMG readers felt that “home range” is preferable to “territory” as it does not imply exclusive, defended landscape.
4. Page 31: MGRS were hit by predators in the earlier supplemental feeding attempts. A mitigation measure is needed to prevent peanuts and peanut butter from increasing the chances of predation.
5. Page 33/34: The caption and text says 2006 but the Table does not list 2006.

TO: USFWS

RE: SUPPLEMENT COMMENTS: EA on Pilot Captive Breeding program for Mt Graham Red Squirrel

Date: Sept 28, 2010

FROM: Scientists for the Preservation of Mt Graham

CONTACT: Peter Warshall, Chairmen, 520-622-7301.

## SUPPLEMENTAL COMMENTS ON THE EA

### A. All EAs require a cover sheet (CEQ 1502.11)

This EA had no cover sheet with proposed action, type of document, lead agency, co-operating agencies, access to further information, and abstract, the date by which comments must be received (1506.10). A separate announcement does not obviate the need for this requirement. The web site does not contain this information.

### B. SUMMARY (1502.12)

The EA has no summary that contains the major conclusions, areas of controversy (including issues raised by public and agencies) and the issues to be resolved by choosing among alternatives.

C. Although no specific CEQA requirements, most EAs of this length have a Table of Contents with a List of Figures and List of Tables.

### D. PURPOSE AND NEED (1502.13)

D1. The purpose and need should tell WHO wants to do WHAT; WHERE, HOW and WHEN they want to do it and WHY (objectives).

This EA does not give adequate information on who will do what (will USFWS team do capturing? Koprowski and team? What zoo program will house the MGRSs for how long? etc.). It does not say where (zoo? Columbine? Captures anywhere in mapped area?). Most important it does not give a clear picture of WHEN these events will take place and for how long the pilot program will be operative before it is declared useful to population viability or not. As stated in earlier comments, the technical learning of captive breeding and need for a ex-situ buffer population are unnecessarily linked. There is no good explanation of WHY?

D2. CEQA requires the EA to list and explain other EAs/EISs that influence the scope of this EA.

This is perhaps the most urgent reason for a second draft. The EIS on the Recovery Plan is not cited and the alternative tasks for improved population viability are not incorporated into this EA. The prospect of an EIS on the expired telescope permits is also not mentioned but would

influence the return criteria for captive bred squirrels. The PERP project is not mentioned and the CNFP EIS is not mentioned. Trail and ORV usage would impact any areas considered of good or excellent quality for returned squirrels.

D3. The EA should list the decisions that must be made and identify all agencies involved in the NEPA analysis and issuance of permits and licenses and other authorizations.

The permits, licenses, and MOUs required are not summarized. This should include USFWS licenses to capture, breed and house an experimental “population” and, perhaps, any MOU with Native American nations.

D4. Was there scoping for this EA? If not, the EA needs to say that no scoping took place. If there was scoping, then the EA must summarize questions and address them in an Appendix.

D5. Unclear tiering or phasing (1502.20 and 1508.28).

The EA seems to have three phases. Phase I is learning captive breeding with 8 or 16 red squirrels (not necessarily MGRS). This EA pertains to Phase I. If Phase I is successful, then captive breeding of MGRS would follow. The EA combines these two phases which is not necessary. Phase III is re-introduction of MGRS onto Mt. Graham (or other locations) and monitoring for success. A Phase IV is implied. After the “pilot program” the captive breeding program would be augmented with more MGRS. Please explain if additional EAs will be required for any of Phase III or IV.

Please explain the linkages of each phase to the Recovery Plan and its NEPA documents. Please explain how this modifies the previous NEPA documents.

D5. The EA fails to explicitly identify “significant issues” as if there were none (1500.4 and 1501.7). If this is the feeling of the preparers, then it must be stated clearly.

D6. Here and under Environmental Consequences, the EA should mention what indicators (quantifications) the preparers propose to measure environmental/population and “success” indicators for captive breeding that would allow the pilot program to proceed.

## E. ALTERNATIVES

E1. 1502.14 states that alternatives must be sharply defined as to their consequences. This is not clearly done because this EA does not include the Recovery Plan objectives and tasks as potential alternatives to increase the population viability of the MGRS.

The EA also does not clearly define goals of each alternative. Is the Phase I goal (1) to see how long a red squirrel can survive in captivity and compare this to data from the wild? (2) to see if breeding can be arranged and how many young will be produced per litter? (3) to determine causes of mortality in zoo situations and try to correct them? (4) to determine how many juveniles can be sent back to the “wild” each year? (5) to teach captive red squirrels to eat wild

foods in preparation for return to the “wild?” (6) to study genetic diversity in squirrels?

Phase III (as defined above) is even more ambiguous in the alternatives. (1) Is the goal to see how many months or years a returned-MGRS will survive in the “wild?” (2) To determine if biologists can choose good or excellent habitat qualities to insure survival? (3) To augment the population because it is not reproducing fast enough and there is unoccupied habitat and so help recovery? No discussion or indicators are supplied to the reader. How does the reader know if objectives can be attained?

E2. No Action Alternatives are three types: (1) not doing anything; (2) continue present management activities with no modifications; and (3) defer the proposed action.

This EA chooses to say the No Action alternative is the “do nothing.” This is inaccurate because it actually should say under its “no action” alternative, the present management activities under the Recovery Plan will continue. It does not address the No Action possibility of deferring the proposed action (eg, until the new Recovery Plan or CNFP has been completed or until Phase I results have been understood).

E3. NEPA requires that the preparers explain a reasonable range of alternatives to accomplish goals.

This appears controversial. Does removing 8-16 MGRS accomplish objective of “buffering” the population from an alleged crash in population? Is it reasonable to assume that a crash of such a magnitude (not stated) will occur soon? Are there other alternatives to better buffer the population from short-term and long-term collapse as described in the Recovery Plan and other letters and documents?

E4. CEQA requires the preparers to state which alternatives were eliminated and why.

The EA describes the elimination of two alternatives because they are not linked to both arbitrarily linked Phases of the agency’s objectives. This is inadequate because the Phasing and tiering and the time table have not been adequately described. For instance, the benefits of utilization of White Mt. squirrels for Phase I and MGRS for a Phase II and the consequences have not been described here or in an appendix. Does the proposed time table (not given) hurt recovery?

The EA does not say if this pilot program eliminates or replaces other alternatives in the Recovery Plan or changes the priority of tasks set out to sustain the habitat and population.

E5. CEQA requires adequate comparison of alternatives.

First, this EA does not set out clear indicators for judging between alternatives. Some criteria are common to all alternatives. No alternative, for instance, will prevent catastrophic habitat loss and no alternative increases habitat for existing or returned squirrels. All alternatives have incomplete or unavailable information, which should be clearly explained here or in

Environmental Consequences. All alternatives apparently use the same techniques of capture and will be performed in the same seasons.

Second, this EA needs a table with all alternatives and consequences. The Phase I alternatives might be: eight non-MGRS squirrels in captive breeding; 16 non-MGRS squirrels in captive breeding; eight MGRS in captive breeding; 16 MGRS in captive breeding. Phase III alternatives might include: return of captive juveniles to Mt. Graham; return of juveniles to Mt. Graham with removal of Abert's squirrel; return of captive juveniles to West Peak with elimination of Abert's squirrels; return of juvenile squirrels to some other mountain. Phase III might also consider these alternatives: return of adults (not juveniles); and return of females only (no males).

It is not clear if alternatives vary in housing and care and risk to the captive squirrels. There is no description of alternative (indoor/outdoor; air conditioned; isolation; food supplies; intensive vet care or not; size of cage; holding time) of this aspect of Phase I. The EA needs to make this explicit to the public.

## F. ENVIRONMENTAL CONSEQUENCES

There are perhaps two major areas of concern: impacts or none on the population and cultural resources (violation of Native American cultural beliefs). We have no comments or knowledge on Native American beliefs.

F1. To determine if this project will make a meaningful contribution to existence and recovery of the MGRS (as indicated in first sent comments), an appendix on the judging of population size, viability (chances of extinction), and trend analysis should be included in Appendix or by references to be able to judge the population consequences of this program. Note that there are really no environmental/habitat benefits to this program and that should be stated.

F2. Each Phase I alternative should be judged by direct and indirect impacts of removing squirrels: from overall population; from the population of the MGRS vs. White Mts; for genetic consequences of removing squirrels for genetic pool; for population consequences of removing specific ratios of females vs. males and housing and alternative care.

F3. Each Phase III alternative should be compared with other suggested tasks listed in the Recovery Plan as to population and environmental benefits or detriments. Comparative benefits for financial costs of each project should be estimated.

F4. All tasks should be broken out to give time-tables and comparative costs. The short-term, long-term and cumulative impacts should be described, if at all possible. Any irreversible (irretrievable) need to be described, if there are any.

F5. Are there mitigations (1508.20) that would change the choice of alternatives? For capture? For transport? For housing and care? For saving forest for eventual return? Are using White Mt. squirrels a mitigation or a separate alternative?

F6. Incomplete and unavailable information (1502.22)

There is much incomplete information about the population consequences of this pilot project. NEPA requires that these uncertainties be explicitly stated, their relevance stated, and the document state whether this is from unavailable or never accomplished fieldwork. It is often possible to use models to state the relevance such as impact of removal of 8 or 16 MGRS on population viability or the number of adults in the overall population that would trigger the need to start a zoo captive breeding program.

For instance, if a model or literature shows that there is little chance of population extinction in the next ten years, the utilization of White Mt. squirrels for learning captive breeding becomes a more understandable alternative: no interference with an endangered species, yet knowledge gained for Phase II and III.

This issue pertains to the CEQA definition of “significant” impact. The term is conspicuously absent from this EA.