Secretary of Defense
Secretary of the Navy
FY 2014 Environmental Award Nomination
Natural Resources – Large Installation
Marine Air Ground Task Force Training Command
Marine Corps Air Ground Combat Center

1. Introduction

Mission: The Marine Air Ground Task Force Training Command (MAGTFTC) at the Marine Corps Air Ground Combat Center (MCAGCC) manages the MAGTF Training Program and conducts service-level MAGTF combined arms training to enhance the combat readiness of the operating forces and support the Commandant of the Marine Corps' responsibilities to national security. MCAGCC provides and manages facilities, service and support to forces and families permanently assigned or participating in training aboard the Combat Center to ensure readiness of the MAGTF and ensure the welfare of personnel and families. Each year the MAGTFTC trains up to one-fourth of the entire Fleet Marine Force (FMF) prior to deployment, in support of ground combat operations during live-fire, combined arms exercises, and numerous other training exercises.

Population: The MCAGCC population of 19,885 is comprised of 11,313 active duty military and 8,572 family members. There are 2500 civilian personnel in both appropriated and non-appropriated fund activities. As a training center, MCAGCC trains approximately 45,000 Department of Defense personnel and foreign forces, and over 5,000 Marines through Marine Corps Communication and Electronics School (MCCES) each year.

Background: MCAGCC is located in the southern Mojave Desert approximately 50 miles northeast of the city of Palm Springs and four miles north of the city of Twentynine Palms in San Bernardino County. FY 2013 and FY 2014 saw major changes in the size and functionality of the Installation when, in December 2013, the Base expanded from 578,398 acres to 704,968 acres of Exclusive Military Use Area (EMUA). Also, 56,410 acres were identified as a Shared Use Area (SUA) that the Bureau of Land Management (BLM) manages for 10 months a year and the Marine Corps manages for training during the remaining two months. These changes were implemented by the National Defense Authorization Act (NDAA). Since 2007, many surveys and natural resource studies have been completed in the Land Acquisition study areas to ascertain effects of acquisition on previously non-military lands surrounding the base, if acquired for military use. FY2012 and FY2013 were pivotal in acquiring the Biological Opinion (BO) for the Land Acquisition EIS, contributing directly to selection of the modified, preferred alternative to support expanded military training. FY2013 and FY2014 were critical in acquiring funds to meet stipulations under this BO in advance of the commencement of military activities.

At 704,968 acres, MCAGCC is the largest live-fire training facility owned and operated by the Marine Corps. Located in the Mojave Desert, the area is characterized by northwest-southeast trending mountains separated by broad valleys. Included within this area are a number of topographic features that include dry lake beds and their associated shorelines, sand dunes,

alluvial fans, hills and mountains, lava flows and dry washes. These habitats are populated by numerous plants and animals, of which only one permanent resident of MCAGCC, the desert tortoise, is listed as threatened under the Endangered Species Act (ESA). There are, however, a number of species located within the base boundaries that have special status and may be considered for listing in the near future, requiring additional management.

The low, variable rainfall of deserts limits plant and animal production, and slows ecosystem recovery from disturbances.

2. Integrated Natural Resources Management Plan

MCAGCC has had an INRMP in place to guide survey and ecosystem management since 2002 and is currently operating under the third approved INRMP. The 2012-2016 INRMP was completed and signed by the California Department of Fish and Wildlife (CDFW) on May 30, 2013, by the US Fish and Wildlife Service (USFWS) on August 16, 2013, and the Commanding General of MAGTFTC/MCAGCC on October 15, 2013. However, with the base expansion from 578,398 acres to 704,968 acres, the development of a new INRMP for all of MCAGCC lands has been initiated with an expected completion date of October 2015, and signatures by March 2016, well in advance of the initiation of training activities in the newly-acquired training areas.

One of the significant goals of the current INRMP was to establish a current baseline for vertebrates. To achieve this goal, 1186 triangular belt transects were surveyed in 20 training areas of the main base. All vertebrate species found were recorded, as were observable military and non-military impacts. With current GIS data, the Natural Resources staff can now sufficiently monitor military impacts on the desert ecosystem and make management recommendations to protect habitat. This process was exemplified in FY13 when NREA noted population declines in the dense tortoise area of the Sand Hill Range Training Area (RTA), and requested that G-3/Range Management keep military maneuvers and training on existing roads and trails in this area. NREA and Range Management came to a mutually agreeable solution to have training and desert tortoise protection coexist.

Bobcat (top) and Sidewinder (bottom) are two of many species that endure the harsh desert clime.

Also under the INRMP, MCAGCC initiated a program to install guzzlers in the southeast mountains of the Base to support bighorn sheep populations in the area. The sheep population is experimental and their presence does not conflict with military training. The success of the program is that over the years we have seen more and more ewes and lambs in the region, indicating the growth and stability of the population. During the General Wildlife Inventory, sheep sign was noted in Sunshine Peak, Lavic Lake, and Maumee RTAs. Sheep sign was also

noted in Rainbow Canyon, a midway point between the southeast and northwest sectors of the Base, indicating that sheep are mobile across the Base. Eventually, it is hoped, the two population extremes will be able to sustain gene flow and vitality. To encourage this process, two wildlife guzzler systems were installed in the northwest portion of MCAGCC (Lavic Lake and Sunshine Peak). The effort was in coordination and cooperation with the Society for the Conservation of Bighorn Sheep, CDFW, and MCAGCC, and locations were selected from sheep sign identified during the wildlife survey.

MCAGCC's wildlife guzzlers help sustain gene flow and vitality of Bighorn Sheep on MCAGCC and adjacent lands, as the sheep move long distances. Panels show an ewe (left) and ram (right) at water guzzlers.

A Native Plant survey is currently under way to map plant colony locations so that the 15-year old plant survey can be updated. In the interim, delineator posts were placed in Emerson Lake and Lavic Lake RTAs to protect previously identified colonies of the rare crucifixion thorn.

Under the INRMP, two Conservation Law Enforcement Officers (CLEO) were also added to the NREA roster in 2008. Their importance to the conservation program has become more enhanced as CLEO patrols are a conservation measure under the Biological Opinion for the Land Acquisition Project (base expansion). CLEOs will also patrol outside the boundaries of the Installation in the Ord-Rodman Desert Wildlife Management Area (DWMA), the 600,000 acre main base, the 107,489 acre EMUA expansion, and the 56,439 acres of the SUA when in use by the USMC. The CLEO patrols on base have resulted in numerous warnings and the issuance of over 200 citations since the inception of the program. Most of these citations were for illegal trespass, however, a select few were for the collection of cultural items from historic mining camps. Additional law enforcement officers will be added over the next three years to ensure Marine Corps obligations are met as directed by the expansion BO.

3. Biological Opinions and Desert Tortoise Management

In 2002, MCAGCC negotiated the first BO with the USFWS that covered base-wide training and construction projects. This was a pioneering Programmatic BO in that it covered a wide range of training and construction activities with a number of conservation efforts that would allow activities to progress with limited but enforceable constraints, and not require consultation for each proposed activity. As MCAGCC's only listed species is the Desert Tortoise, the BO was written to facilitate the survival and recovery of this species. Conservation measures include: placing dense tortoise areas into Special Use Area status, wherein no off-road training is allowed; providing desert tortoise awareness briefs that annually alert up to 45,000 Marines to

the presence of tortoises in the training areas, with the result that annual take has been kept at the low level of one to two per year; and meeting the BO requirement to contribute to the recovery research of the species. MCAGCC has established an excellent track record in the management of the desert tortoise and other sensitive species located on the main base. During FY12 and FY13, MCAGCC negotiated a new BO (expansion BO) with the USFWS for the lands acquired for military training in both the EMUA and the SUA (over 160,000 additional acres of land).

Tortoise awareness briefs are simple, powerful measures to conserve desert tortoises, alerting up to 45,000 Marines (left) and others to be aware of desert tortoises they may affect. Through basic communications with NREA staff, tortoises like this yearing (both pictures) can be moved from harm's way, minimizing annual take of tortoises.

The expansion BO requires that MCAGCC monitor desert tortoise populations under its jurisdiction. To achieve this goal, the Tortoise Regional Estimate of Density (TRED), a survey design for high resolution density estimates, was employed. In combination with the TRED surveys, health assessments and habitat analyses were completed to provide a more complete picture of population numbers, health status, and habitat conditions. In FY13 and FY14, 292,800 acres in the northern, south-central and southwestern sectors of the base were surveyed to determine tortoise densities, incidence of disease, and habitat conditions. Combining surveys with health and habitat assessments is cost-effective and provided data that led to more meaningful interpretation for population changes. The TRED survey results indicated a decline in desert tortoise population on base, but these results are consistent with population declines across the Mojave Desert. Health Assessments indicate a low incidence of disease in MCAGCC's tortoise population, a significant finding for current management and future recovery efforts. Lastly, the habitat data is currently being analyzed and will contribute significantly in identifying threats to the species at large.

Under the expansion BO, four new Special Use Areas were identified and an existing Special Use Area was upgraded to provide more protection; a translocation program was initiated to relocate tortoises from medium- and high-impact areas to Special Use Areas and BLM recipient areas; and an evaluation and long-term monitoring program was developed to access recipient area populations, evaluate habitat conditions, and quantify success of the tortoise relocation efforts. Long-term monitoring will involve the establishment of 10 permanent plots, each a square kilometer in size. Each plot will be subject to tortoise health assessments, population density monitoring and habitat quality evaluations for up to 30 years to obtain the long-term monitoring results required by the USFWS. Additionally, CLEO patrols of translocation areas,

adjacent wilderness areas, and Special Use Areas will be initiated, and a second holding and headstart facility will be constructed in one of the new Special Use Areas.

To prepare tortoises for translocation in MCAGCC's expansion area, we measure tortoise density, habitat quality, and tortoise health (left), and radiotrack them using transmitters applied to their shells (right).

To successfully translocate tortoises from the impact areas of the base expansion, we must identify suitable habitat in the Special Use Areas and adjacent BLM land. MCAGCC is accomplishing this via field-based assessments and geospatial modelling of climate refugia. The field assessments match elevation, vegetation and soil features to sites of known tortoise density, and search prospective recipient sites for these features. There should be many sites with suitable habitat since disease and predators have caused tortoise populations to decline without affecting the habitat. Some sites may provide quality habitat for the immediate translocation, but may not provide adequate habitat given projected temperature increases with regional climate change. By collaborating with habitat modelers, we are using tortoise locality data from MCAGCC and expansion area surveys, combined with weather and other environmental data, to map where tortoises should occur in the coming decades. The best locations for translocating tortoises are refugia that are suitable today and in the face of the coming decades of climate change. These habitat analyses will also contribute to species recovery by quantifying the environmental factors most critical to the desert tortoise.

4. Desert Tortoise Headstart Program

One of the major conservation measures identified in the 2002 BO was the requirement for MCAGCC to contribute to the recovery of the desert tortoise. To address this conservation measure, MCAGCC decided that the best strategy would be to develop a long-term headstart program. As identified in prior research efforts, a significant issue contributing to the demise of the desert tortoise populations is that hatchling tortoises were not surviving their first years because of increased predation, and therefore were not being recruited into the tortoise population. Predators include ravens, coyotes, free-roaming dogs, Mojave ground squirrels, and fire ants. Human population growth and development in the Mojave Desert has led to habitat fragmentation and destruction, the rise in numbers of ravens and other predators which are subsidized by human habitation, roads, and capital improvements along energy corridors. Disease is also a major factor in desert tortoise declines. Upper Respiratory Tract Disease (URTD) has infected significant numbers of tortoises, leading to high mortality rates.

Since tortoise headstarting research had been implemented at a reduced scale, and eventually abandoned, at Fort Irwin and Edwards Air Force Base, MCAGCC decided to establish a long-term research program that would prudently: allow the hatchlings to grow to an age and size wherein their shells were no longer vulnerable to most predators, release the juveniles to the wild, and monitor released animals long-term to determine survivability and reproductive competence. This program, at TRACRS (Tortoise Research and Captive Rearing Site), helps MCAGCC meet its obligations under the programmatic BO to contribute to the species' recovery while providing unprecedented research and educational opportunities. TRACRS is six acres in size and located in the Sand Hill RTA. The facility consists of four large enclosures constructed of protective fence and bird netting to keep predators from accessing the nests and hatchlings. In spring, pre-identified and transmittered adult, female tortoises are examined via ultrasound or X-rays to determine if they are gravid. If so, they are brought to TRACRS and placed in individual pens to lay their eggs. The females eat and drink within their irrigated pens, and after laying their clutch, are returned to their home located within the Range.

MCAGCC's headstart program for desert tortoises provides substantial information of juvenile tortoises (left), of which little is known in the wild. Simultaneously, juveniles are protected from predators that can easily prey upon the soft-shelled juveniles; the shell on the right was penetrated by a Common Raven.

Genetic studies are conducted on hatchlings to determine, among other factors, the paternity of the hatchlings. We found that most clutches have more than one father. This is significant because, for a number of years, scientists thought that conserving females was more important than conserving males. However, since most clutches have more than one father, conserving male tortoises is very important to maintain the genetic health and diversity within the species which indicates that both sexes require equal protection. Another hypothesis that we wished to test was to determine whether URTD-infected females passed the disease to their eggs and hatchlings. We abandoned this study because most tortoises at MCAGCC are disease free and insufficient numbers of diseased females were available to perform this study. The low disease incidence among tortoises at MCAGCC is important as tortoises located on some public lands tend to have much higher disease rates. To repopulate suitable, but tortoise-depleted habitats, it will be necessary to have healthy animals for re-introduction. The sex ratios of headstart hatchlings were also measured. As incubation temperature is crucial in determining the sex of individuals, we wanted to verify that both sexes were adequately represented in the hatchling population. The studies at TRACRS indicated that offspring sex ratios vary naturally among years, and that the TRACRS hatchlings have a normal distribution of males and females.

The TRACRS program was established in 2006 and currently there are 474 juveniles in the facility. Some hatchlings have perished since the facility was established but the very high survivorship (95%) demonstrates that active management effectively protects the hatchlings at

TRACRS. In fact, the Mojave National Preserve based the design and protocols of their headstart program on MCAGCC's model. The Preserve staff met with MCAGCC personnel to discuss pen design, water and food supplementation, native diets, disease studies, growth rate analyses, mortality factors and release sizes to assist them in developing their program and facility. Headstarting desert tortoises began at Fort Irwin and was later implemented at Edwards Air Force Base. These facilities advanced headstarting science, including identifying many predators such as desert fire ants, and via correspondence and conference presentations, shared their discoveries with MCAGCC and the tortoise community. MCAGCC has used these findings to hone the design of TRACRS. MCAGCC made considerable effort to ensure the hatchlings and juveniles were safe from predators and received good nutrition by watering native plants during times of drought so that quality food was available; we also control fire ant densities within the pens. MCAGCC in turn shared headstart information with the USFWS, CDFW, Fort Irwin, Edwards AFB, Mojave National Preserve, Desert Tortoise Conservation Center (Las Vegas), and the interested public through frequent data exchanges, often at meetings of the Desert Managers Group and at symposia of the Desert Tortoise Council. The headstart program has placed MCAGCC in a very public, positive, and proactive stewardship role for desert tortoises. In turn, this role has highlighted the Marine Corps' training mission and its positive role in conserving the species. Lastly, TRACRS has helped the Marine Corps make a positive contribution towards the recovery of the desert tortoise.

5. Education and Community Relations

Through FY13 & FY14, MCAGCC continued to contribute to natural resources education and conservation programs on the Installation, in the region, and beyond. Each year our natural resources staff share desert tortoise, vegetation and ecosystem management successes and materials at MCAGCC's Earth Week celebrations on the Installation and at the regional Earth Day celebrations in Yucca Valley. This outreach also reinforces the message that MCAGCC is an important environmental steward and resource in the community. Each year we have presented natural resources education and conservation steps to students and families on the Installation, through a Summer Reading Series, Curation Facility Tours, and by sponsoring Conservation Badge projects for Eagle Scouts, and off installation, ranging from Science Day exhibits and Science Fair judging at local elementary schools, to tortoise surveys and health assessments at the local community college, Copper Mountain College. Beyond the local efforts, we collaborate with the University of California Los Angeles in tortoise headstarting and genetics efforts, the University of California Riverside in species habitat and climate change modelling, and the University of Toronto in tortoise genetic and genomic analyses. We also share management and conservation expertise and information at the Desert Managers Group, of which MCAGCC is a charter member among other federal, state and regional county agencies, with the Desert Tortoise Council (a combination of interested agencies, universities and students), and with specific agencies (e.g., the USFWS, CDFW, National Park Service & DoD) experiencing similar natural resources concerns in the desert southwest. There are mutual benefits to all participants as information sharing facilitates adaptive management of natural resources, reduces inefficient practices and expenditures, and advances cohesion to mission sustainment while conserving the fragile desert ecosystem.