

Balancing Tortoise Recovery and the U.S. Marine Corps Training Mission

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Threatened Agassiz's desert tortoise. Photo Credit: Beth Jackson/USFWS

The Marine Corps Air Ground Combat Center (Combat Center) encompasses a desert mosaic of mountains, bajadas, dry lakes, and ephemeral washes across more than 700,000 acres (283,280 hectares) in southern San Bernardino County, California. Still, this harsh, arid landscape is inhabited by a rich diversity of species, including the federally threatened Agassiz's desert tortoise (*Gopherus agassizii*).

The Combat Center's live-fire and maneuver training mission joins traditional methods and equipment with innovative technologies and training requirements designed to prepare Marines for the challenges of present and future operational environments. The presence of

the tortoise on the installation has created some unique challenges and opportunities for the Combat Center, as it strives to fulfill its mission, while supporting the species' recovery.

A biological opinion (BO) resulting from endangered species consultation with the U.S. Fish and Wildlife Service (USFWS) outlines a range of training activities that may impact the species, and provides conservation measures designed to reduce tortoise mortality and promote recovery. These measures include mandatory tortoise awareness briefings, which have proven to be a simple and powerful measure to help conserve desert tortoises. Each year, these briefs empower as many as 45,000 Marines to identify and protect tortoises. Dozens of tortoise sightings

are reported annually, with only two or three known mortalities resulting from training-related activities.

The Combat Center also monitors the health of resident tortoise populations, and contributes critical growth and survival information from its desert tortoise headstart program—a collaboration with the University of California, Los Angeles. Headstart programs provide support and protection for hatchlings and juvenile tortoises during the first several years of life to maximize survivorship within the harsh desert environment and among a diverse array of predators. These goals must be accomplished while providing native desert foods and refugia to prepare young tortoises for eventual release to the wild.

The headstart program is based at the Combat Center's Tortoise Research and Captive Rearing Site (TRACRS), which encompasses a series of enclosures offering natural habitat that is secure from predators. The site includes native plants for shade and food, and soil suitable for digging burrows that provide shelter from the extreme temperatures and aridity. An irrigation system allows biologists to stimulate the growth of native food plants that the tortoises eat to survive and grow.

The enclosures were designed with partially buried, erect walls of metal flashing that prevent tortoises from escaping, while preventing access by coyotes, kit foxes, and other digging predators. Meanwhile, fencing and bird netting excludes predatory rodents and ravens, which can peck through the soft shells of juvenile tortoises. While the enclosures are impenetrable for most predators, desert fire ants are able to easily pass through openings in the fence. Ants become predatory as their population density grows significantly in response to excessive irrigation. To combat the fire ants, the Combat Center avoids over irrigation, and provides ant bait that kills fire ants, reducing their densities below predatory levels.

There are as many as 24 individual pens within each enclosure that keep groups of tortoises separated, and prevent the possible spread of an upper respiratory disease, to which desert tortoises are extremely susceptible, that is a major factor in the species' decline. The individual pens also help researchers easily identify paternity and track growth rates, shell hardness, and annual survivorship.

The location and meticulous design of TRACRS has safeguarded the tortoises from extreme physical conditions, predators, and disease, resulting in remarkably high survivorship. With

an annual survival rate exceeding 90 percent, the headstart program may become a powerful tool in bolstering populations of the species. The tortoises remain in their pens for several years until their shells harden enough to resist predators. There are 475 headstart juveniles ranging from two to nine years old, with the 35 largest individuals released in September 2015.

The BO encourages judicious planning of new training facilities and the re-use of existing facilities to avoid or minimize disturbance to tortoises and their habitat. Also, by keeping desert tortoise mortality low, the programmatic BO allows the Combat Center to develop up to 150 acres (61 hectares) of desert tortoise habitat each year. This allows the Combat Center to more easily execute training and training facility projects – both small and large – without the administrative overhead of formal, interagency

consultation. For example, through careful planning, the Combat Center prioritized MV-22 "Osprey" maneuver zones in areas compatible with existing training operations and free of tortoises. This allowed the Combat Center to incorporate the MV-22 into training within just four months of initial consideration.

The success of the base-wide BO has been critical in the Combat Center's recent expansion to support large, service-level training exercises. The Marine Corps and the USFWS used fundamental survey, population, habitat, disease, and impact data to develop the BO analysis for the expansion. The expansion BO is also programmatic, and includes many conservation measures that have reduced impacts to the desert tortoise under the base-wide BO.

The expansion BO poses sound requirements for the translocation of

Tortoise awareness briefs are a simple and powerful measure to help conserve desert tortoises, alerting up to 45,000 Marines and others each year to help minimize incidental take. These Marines detected this juvenile tortoise (below and inset) and helped Natural Resources and Environmental Affairs Division staff move it from harm. Photo credit: Marine Corps Air Ground Combat Center





At the Combat Center's headstart facility, gravid (pregnant) tortoises can nest during May or June, with their nests and hatchlings protected from predators. Photos credit: Marine Corps Air Ground Combat Center



Researchers measure tortoise density, assess their health, and evaluate habitat quality to support the Combat Center's translocation efforts. Similar data collected under the Combat Center's basewide BO serve as useful reference information for translocation efforts and the species. Photos credit: Marine Corps Air Ground Combat Center

desert tortoises in spring 2016 from areas that will be heavily impacted by training activities within the expansion area. The Combat Center has made a long-term commitment to evaluate the success of these translocation efforts.

The first five years after translocation will include intense movement and mortality evaluations of translocated tortoises, with subsequent, reduced levels of analysis for 30 years after the translocation. The Combat Center has

constructed a series of new pens at TRACRS to hold translocated desert tortoises until they are large enough to wear radio transmitters.

The programmatic approach promotes recovery of the Agassiz's desert tortoise, while supporting the evolving deployment of maneuver and live-fire training requirements. The flexibility of the approach minimizes impacts to the species and reduces the regulatory burden on the Marine Corps by minimizing the need for USFWS consultation on future training and training facility projects. This allows the Combat Center to efficiently meet evolving training demands while conserving the tortoise and advancing recovery research. Marines are familiar with adapting to overcome challenges, and the Combat Center's programmatic BO have been, and will continue to be, instrumental in protecting desert tortoises while enabling world-class training.

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