

2. DESERT TORTOISE HANDLING

Mojave desert tortoises have been federally designated a threatened species and are protected by state and federal laws. Proper handling is required to comply with these laws and to insure safe and humane treatment of the tortoises. Proper handling includes attention to protocols to reduce the likelihood of infection or disease transmission. Tortoises are also vulnerable to overheating and death if improperly exposed to direct sunlight and high ambient temperatures. Desert tortoise surveys include collection of data on size, sex, and health status of encountered tortoises. This handling can cause fluid loss if tortoises void their bladders. To minimize impacts to tortoise health, the U.S. Fish and Wildlife Service (USFWS) as well as state wildlife agencies stipulate permit “Terms and conditions” that are the basis for the desert tortoise handling protocols for this project.

Objective 1: Compliance with state and federal desert tortoise handling protocols.

1. Each trainee will have a thorough understanding of the important elements of the USFWS desert tortoise recovery permit terms and conditions.
2. Each trainee will have a thorough understanding of the important elements of relevant state wildlife agency desert tortoise permit terms and conditions.
3. Each trainee will fully comply in letter and spirit with every element of the USFWS and the relevant state wildlife agency desert tortoise handling protocols (or permit terms and conditions). For example, strict adherence to temperature limitations is not enough; quick, efficient, shaded, 2-handed processing of desert tortoises during handling and data collection is imperative.

Objective 2: Accurately measure, mark, examine for general health, and identify the sex of tortoises

Metrics: Trainees will demonstrate understanding of USFWS and relevant state wildlife agency desert tortoise handling protocols (or permit terms and conditions), and will demonstrate ability to handle a tortoise without violating any of these protocols. Each trainee must implement correct approaches to avoid tortoise hyperthermia, avoid loss of fluids by the tortoise, and to avoid human transmission of disease or parasites between tortoises. Each trainee must properly handle, accurately measure length, accurately determine sex of live tortoises, and accurately report body condition score plus nasal appearance and discharge.

Key Facts

The Mojave population of the desert tortoise was listed as threatened under the Endangered Species Act in 1990; recent genetic work has resulted in this “population” being designated as a full species. Potential threats to the desert tortoise include habitat loss, degradation, and fragmentation, illegal collecting, vehicle impacts, and excessive predation of hatchlings and juveniles by ravens and other species. Mycoplasmosis and other identified and unidentified infections may play a role in population declines. Non-native annual plants and their effects on fire regimes have also been implicated.

The desert tortoise is found only in the deserts of Arizona, California, Nevada, and Utah. It is the largest reptile in the Mojave Desert, and is the state reptile for both California and Nevada. The desert tortoise is without question a flagship species, and possibly a keystone and indicator species, so its persistence and recovery is culturally and ecologically important.

Desert tortoises have a lifespan of 50 to 100 years. Adults can be as large as 380 mm long, and male tortoises tend to be larger than females. Males typically have a longer tail and longer upward curving gular horns than females, as well as larger chin glands and a concave plastron; females tend to have longer rear toe nails. Despite their long life spans and hardened exteriors, tortoises can be injured or die from improper handling. Anyone handling Mojave desert tortoises or conducting scientific research on them or their habitat must have appropriate state and federal permits.

Desert tortoises are herbivores that primarily feed upon annual grasses and flowering plants. They start to reproduce at 15 to 20 years of age, and females lay 1 to 6 eggs once or twice a year. Desert tortoises spend much of their time in underground burrows, buffered from extremes of the desert climate. They are found in habitats characterized by creosote bush, salt bush, cactus scrub, shadscale scrub, and Joshua tree woodlands, usually below 1280 m (4200 ft) elevation. Historically, reported local densities exceeded dozens of tortoises per square kilometer; however no known areas support this many tortoises today. Tortoises display seasonal activity patterns with most above-ground activity between March and May and then again in September and October; they are usually underground and inactive during the rest of the year, with occasional above-ground activity probably driven by temperature and precipitation.

A distinctive feature of tortoises is their shell. The dorsal (top) shell is the carapace and the ventral (bottom) shell is the plastron. Each section of the shell is called a scute (pronounced *scoot*). Individual scutes, or scute series, are identified by position and/or name. Notching is used on some projects to mark tortoises, so it is one form of marking you may use or encounter.

Objective 1: Compliance with State and Federal Desert Tortoise Handling Protocols

Desert tortoise handling training is provided to ensure the safety and well-being of desert tortoises encountered during monitoring activities. Safe practices include basic techniques that reduce stress and likelihood of disease transmission to tortoises. These techniques also reflect terms and conditions of USFWS and state wildlife agency tortoise permits.

Once trained and approved in tortoise handling, you will be covered under a USFWS permit, and other required permits, to handle tortoises during this project. Beyond following the specific terms of these permits, you are responsible for following the guidance we provide to interact with tortoises without harming them. The brief description of proper tortoise handling procedures given here is only an overview.

Avoiding desert tortoise hyperthermia.

Tortoises have little effective physiological capacity to dissipate heat, so it is the handler's responsibility to guard against over-heating. Desert tortoises should not be exposed to direct sunlight. Keep them in the shade of a shrub or of your body. Remember that ground temperatures are much hotter than air temperatures, so minimize tortoise/ground contact when temperatures are hot. The critical maximum body temperature of desert tortoises is between 103⁰ F and 112⁰ F.

Avoiding transmission of diseases between tortoises.

You should handle a tortoise at all times as if it has a communicable disease. Do not allow tortoises to come into contact with your clothing or skin. Before touching a tortoise, put on a clean pair of non-porous disposable gloves (e.g. latex, vinyl, or similar material), and keep them on during the entire time you handle a tortoise. If your glove is torn during handling of a tortoise, replace it. Once used, gloves and any other disposable materials must be contained so as not to come into contact with disinfected materials, fresh gloves, equipment, or any other item that might come into contact with a tortoise. A fresh pair of gloves must be used for each tortoise. All non-disposable equipment that comes into contact with any part of a tortoise, or any instrument or item that has been in contact with a tortoise, must be treated with an approved disinfectant. Currently, trifectant or chlorhexidine diacetate are approved for use, prepared according to manufacturers' instructions. Like 30% bleach, these are broad-spectrum disinfectants, but compared to bleach they are less corrosive and their disinfecting strength is somewhat less compromised by exposure to organic material. Once mixed, solutions may be used for up to one week.

Avoiding loss of fluids by tortoises.

Special precautions should be taken to prevent or minimize the fluid loss that occurs if tortoises void their bladder during handling. Do not handle the tortoise more than necessary. For the basic distance sampling project, the most important information (distance from the transect centerline) does not require handling of tortoises. It is important to minimize risk to tortoises when they are handled in the course of data collection. Always use two hands when picking up a tortoise, and do not turn it on its back or move it rapidly. Sudden movements can cause the tortoise to void (urinate), which can result in dehydration and increases risk of death. Tortoises found in burrows should only be extracted if they are accessible without reaching more than a foot into the burrow (for instance, if they are basking near the mouth), and if they can be extracted without use of force. Refer to your permits for what to do should a tortoise void its bladder. When offering fluids using an oral syringe, remember to avoid touching the syringe to the tortoise. Instead, create a slow, steady flow that moves over the tortoise's nares and mouth. Offer fluids while positioning yourself away from the tortoise's line of sight; standing behind the tortoise and holding the syringe behind the tortoise's face is best. This may minimize the stress response from the tortoise and should avoid pushing material back into the nares. Offer at least a full [50 ml] syringe of fluids and as many as 2 more as long as the tortoise appears to be accepting fluids. Water offered to the tortoise should be kept separate from human drinking water. Discard the syringe if it touches the tortoise; do not disinfect.

Objective 2: Accurately Measure, Mark, Identify the Sex of Tortoises, and Report their Health Status

During this project you will collect information about tortoises detected on transects and encountered while on the way to and from transects. Related data will be collected for carcasses. See data sheets in Appendix I.

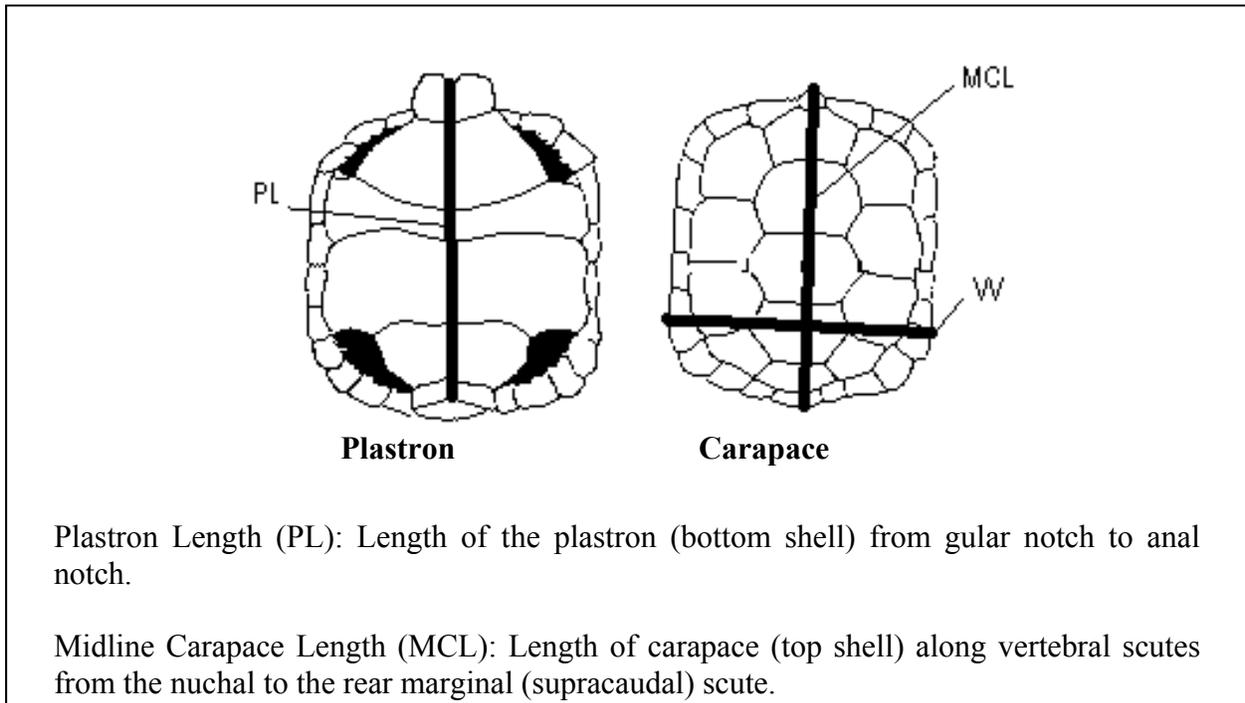
Measuring tortoise length

Of the measurements illustrated in Figure 2-1, you will measure only midline carapace length (MCL) on all accessible live tortoises. Using calipers, MCL is measured in millimeters from the

most anterior scute (i.e. the nuchal; where the head emerges) in a straight line along the carapace to the most posterior scute (i.e. the supracaudal or pygal scute; where the tail emerges).

If a tortoise cannot be removed from a burrow, it is nonetheless important to record whether unhandled tortoises are at least 180 mm MCL (“adult”) or are sub-adults. These size categories are used for density analysis, so every effort should be made to determine whether the tortoise is larger than 180 mm.

Figure 2-1. Typical measures of the dimensions of desert tortoises.



Determining sex of a tortoise

Determining the sex of a tortoise smaller than 180 mm MCL is generally difficult. Tortoises larger than this can usually be sexed using the following guidelines, with the most reliable characteristics listed first. The easiest way to identify males is to look for a concave plastron (females have minimal or no plastron concavity). Remember, never turn a tortoise onto its back. The second most obvious characteristic is that males have longer, more curved gulars than females. A third telling characteristic is their tail. Males have long, broad, conical shaped tails, while the female tail may be just a nub at the end of the cloaca. If you are still not sure of the sex, look for chin glands – males have large well-developed chin glands that sometimes leak fluid at this time of year. When in doubt, record sex as “unknown.”

Reporting information about tortoise health

Although there are various metrics to describe tortoise health, many of these require blood sampling or other procedures that may cause a stress response in the tortoise. Because our project does not otherwise require such procedures, we are only collecting visual information to describe general health condition.

Specifically, you will examine the tortoise (soft tissue as well as the shell) and report whether they have no ticks, 1-10 ticks, or more than this. You will also examine the condition and discharge from their nares, which provides insight into current and chronic respiratory condition. Finally, you will examine muscle development and fat storage on the head and forelimbs to describe the overall health of the tortoise. *Remember that even if an individual tortoise does not exhibit signs of illness, many diseases develop over time such that clinical signs will not be apparent. Other diseases express themselves periodically, or will not be apparent based on the characteristics you are reporting. Do not at any time assume that you can relax any protocols for avoiding disease and parasite transmission.*

The material described in this section is from: USFWS. 2011. Health Assessment Procedures for the Desert Tortoise (*Gopherus agassizii*): A Handbook Pertinent to Translocation. Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Reno, Nevada. This report can be found at: http://www.fws.gov/nevada/desert_tortoise/dt_assessments.html.

Body condition scoring

Body condition scoring (BCS) was developed for domestic animals to estimate the average body condition of animals in a herd of livestock. This system results in a relative score based on an evaluation of muscle mass and fat deposits in relation to skeletal features. The San Diego Zoo has adapted this concept to the desert tortoise. Because tortoises can vary considerably in hydration state, length-corrected weight alone is not a good indicator of body condition. The BCS evaluates characteristics that reflect the way a tortoise's body condition will change with life stage, season of the year, drought, food availability, and disease.

BCS is a score that ranges from one to nine. Assigning a BCS is a two-step process. The numbers are divided into 3 groups (during training, a veterinarian will use pictures to illustrate the specific scores):

- Under condition (scores 1-3): Because the digestive tract is relatively empty, the tortoise feels light for its size. Muscle mass on the arms is not convex (may be concave), and the muscle mass on top of the head slight enough that it is flush with the skull or concave; the sagittal crest may be visible.
- Good condition (scores 4-6): The tortoise has been eating, although it may be slightly lighter or heavier than expected. Muscle mass on top of the head is convex to prominent. Muscle mass along the front of the forelimb is flat or convex.
- Over-condition (scores 7-9): The tortoise feels much heavier than expected. Muscle mass on top of head and front of forelimbs is prominent. Subcutaneous fat deposition is apparent.

Nares condition and discharge

Discharge from nares may provide evidence of disease to the respiratory system. You will consider discharge from both nares and report the most severe version that is expressed.

None – No discharge present.

Serous - Clear, watery discharge present. Also report the amount:

1. Mild - Moisture present around nares.
2. Moderate - Discharge coming out of the nares, but not running far from the nares themselves.
3. Severe - Discharge coming from nares that is running down the beak.

Mucous – Cloudy, thick discharge present. Also report the amount:

1. Mild - Moisture present around nares.
2. Moderate - Discharge coming out of the nares, but not running far from the nares themselves.
3. Severe - Discharge coming from nares that is running down the beak.

With chronic illness, the form of the nares themselves will be affected. Considering both nares together, you will determine whether their appearance is:

Normal – Usual shape and/or size.

Asymmetrical - One naris is larger and/or wider than the other.

Eroded - Loss of scales and skin around either naris opening.

Occluded – Plugged or reduced size of either naris opening.

Ticks

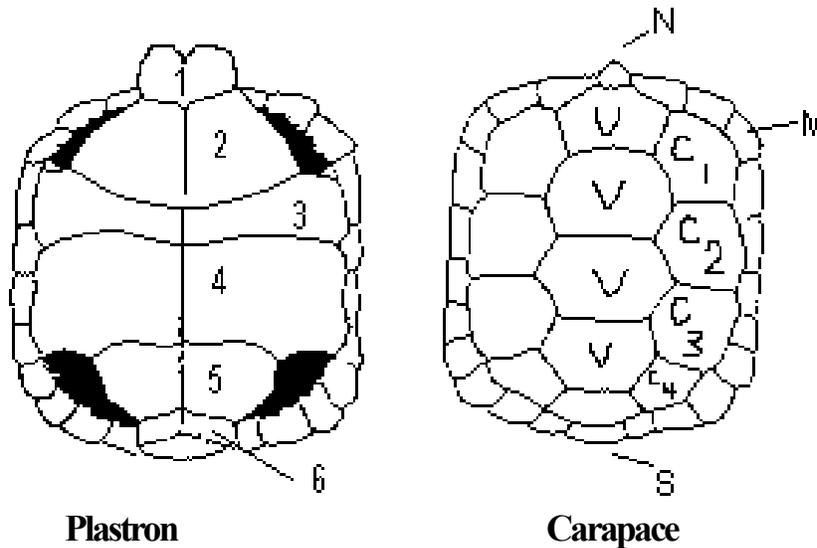
Ticks will attach themselves on soft tissue, including skin of the limbs, vent, and tail. They are often associated with soft tissues associated with the beak, eyes, and nares. Also examine the shell for possible attachment in the seams between scutes of the carapace and plastron, or on the scutes themselves.

Marking a tortoise

Paper tags will be affixed to a scute of each unmarked tortoise. Minimize the abrasion the tag will be subjected to; select a scute with a natural depression, considering first any of the costals, then the vertebrales (if the depression is quite deep- vertebrales endure a lot of scraping). Because tortoises are often relocated head-down in burrows, using the 4th right or left costal scute will increase the likelihood the tag will be read. When affixing the tag, under no circumstances should epoxy touch the margins of the scutes, where growth must occur. Subadult tortoises with scutes that are too small to safely affix tags should not be marked.

In addition to recording information for the new tag you attach, you will be asked about markings or tags that are already present on each tortoise. Floy© tags were used by range-wide monitoring crews in 2005 and 2007, and paper tags were used since 2008. Besides the use of tags, many researchers mark tortoises by notching the marginal scutes (Figs. 2-2 and 2-3).

Figure 2-2. Tortoise Scute Identification. Individual scutes, or scute series, of the plastron (lower shell) and carapace (upper shell) of desert tortoises. As illustrated for costals, individual scutes are identified by counting from anterior to posterior; marginals are also identified as left (L) or right (R) from the tortoise’s perspective.



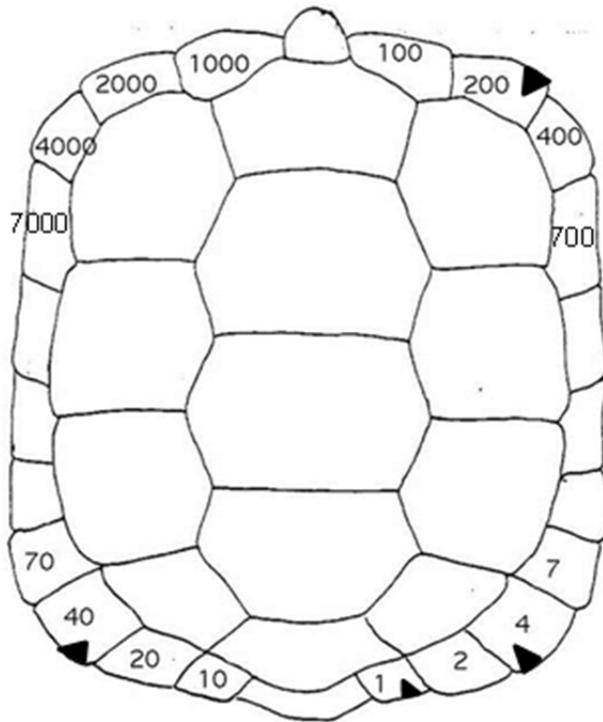
- 1 – gular horn
- 2 – humeral
- 3 – pectoral
- 4 – abdominal
- 5 – femoral
- 6 – anal

- C – Costal scute
- V – Vertebral scute
- M – Marginal scute
- N – Nuchal scute
- S – Supracaudal scute

The notching system used for most current translocation projects is the “highly modified Honegger system,” illustrated below. When you are not notching, do not assume you know the system used on a particular project – there are many of these systems! Simply report the side and marginal number(s) with notching: e.g., L9 / R2,9,11 is the accurate report of notches in Fig. 2-3.

When notching, remember that bone seams are generally offset from scute seams, so avoid notching directly in the middle of the scute. Also avoid creating fragile, narrow, breakable scute fragments by notching close to the scute seam. Notches should be as large and defined as possible without marking the underlying bone. Once you have finished all notches, it is good practice to revisit each one with an eye on optimizing the size of the notch.

Figure 2-3. The Highly Modified Honegger notching system. The illustrated notching pattern corresponds to the number “245,” and when encountered would be reported as “L9 / R2,9,11”



Carcasses

Only report carcasses if at least half of the shell is present, or if a smaller part of the carcass is available but identifying marks are present. Record MCL and sex of carcasses only if you are able to determine these measures accurately. If the carcass/carapace is not sufficiently intact to measure MCL, it is “disarticulated.” Other projects may have a different operational definition for this term. Some projects also request information on “Carcass class”:

Carcass Classes

1. fresh or putrid
2. normal color, scutes attached
3. scutes peeling off bone
4. shell bone falling apart and scute rings peeling
5. disarticulated, scattered

Approaching and collecting data on desert tortoises

The order of the following steps is meaningful and is designed to 1) start at a distance and move closer, 2) move from least to most disruptive of the tortoise, and 3) minimize actual handling time. If you are working in a two-person team, establish which person will handle the tortoise and contaminated materials and which will handle uncontaminated materials and record data.

- Always use your “field voice” when out in the field
- When a tortoise is located
 - Observe the tortoise and its surroundings
 - Put away non-handling equipment
 - Place pack several meters away from tortoise (out of tortoise sight)
 - Identify an area for processing the tortoise
 - Shade of vegetation preferable or use your own body
 - Several meters away from burrow entrance if nearby
 - Place thermometer in the shade approximately 10 cm above where the tortoise will be handled to ensure suitable temperatures
 - Observe whether the tortoise has an existing tag and/or has been notched
 - Make basic observations of body condition score
 - Finish recording any distance data prior to handling tortoise
 - Remove needed handling gear from the pack; place in the processing area
 - Place tape and calipers on the ground at the processing area
 - If an existing tag is present, use a small amount of non-drinking water to clear dust and read the tag number.
 - At the backpack, cut out the paper tag and mix the epoxy on cardstock.
 - Record all relevant fields, such as transmitter or ID tag number, prior to attaching it to the tortoise and handling.
- If temperatures are suitable for handling, move the tortoise to the processing area
 - Put on latex gloves
 - Approach and pick up the tortoise from behind using 2 hands, one on either side of the shell.
 - Keep the tortoise close to the ground and in correct orientation.
 - Keep all clean equipment on the left side of the tortoise
 - Place the measuring tape on the ground to the left of the tortoise
 - Do not place equipment under the tortoise
 - Do not place gear where the tortoise might step on it.
- Apply ID tag if necessary
- Hold calipers near the tips to move them to the correct measuring position.
- Read MCL by placing calipers on the ground next to but not touching the tape.
- If needed and with the tortoise close to the ground, lift and tilt the tortoise slightly to view plastron and tail for sex determination
- Observe tortoise for any health abnormalities (if indicated) and to better assess body condition score. Count ticks (if indicated)
- Notch and apply transmitters to shells (if indicated)
 - Handle only parts of non-disposable gear that can be disinfected
- Continue to place all contaminated items to the right of the tortoise while working.
- Do not return tortoise to its original location

- Pick up cardstock, Q-tips, and other contaminated disposable items in one hand.
 - Turn this glove inside out as it is removed in order to contain the trash
- Remove other glove, taking care to not contaminate skin, then place both gloves in the disposal bag taking care to not contaminate the outside of the bag.
- Finish recording all data gathered if working alone.
- Open disinfecting solution and apply liberally to equipment or to the cloth/toothbrush used for cleaning
- Apply a new pair of gloves and use the cloth or toothbrush to remove any dirt and debris from contaminated items
 - Completely cover all contaminated areas with liberal amounts of disinfectant solution and allow to air dry.
 - Place items in the sun to allow for further UV disinfection
- Survey area for any trash or equipment left on the ground prior to leaving
- Remove gloves and place them in the trash bag.
- Place the cleaned equipment and trash bag back in the pack
 - Use standard separate locations in pack