

Protocol for Rabbit Survey

Last Update: 3/18/2017 by John Anderson

Responsible Investigator:	Bob Schooley	Period: Dec 2013 - present
	Brandon Bestelmeyer	Period: Nov 2006 – Nov 2013
	David Lightfoot	Period: Oct 1995 - Oct 2006
Compiled by Stephanie Richmond	Original edits by John Anderson	Original File: Rabsvpro.doc

I. General Information

Jackrabbits and desert cottontail rabbits are the most abundant non-domestic herbivores in the Chihuahuan Desert. We hypothesize that lagomorph populations were extremely low in desert grasslands prior to desertification because rabbits depend upon shrubs for water (bark and small stems) during the winter dry season. We further hypothesize that rabbit populations will crash when winters and early summers are especially dry. Long-term data must be collected to determine population densities of rabbits in various habitats in order to test these hypotheses.

The lagomorphs present in the Chihuahuan Desert play an important ecological role. They are significant generalist herbivores consuming creosote, grasses, yucca, prickly pear, etc. They are also a major prey item for predators (coyote, mountain lion). The two lagomorph species present in the Chihuahuan Desert are the black-tailed jackrabbit (*Lepus californicus*) and the desert cottontail (*Sylvilagus audubonii*). Both species are active day and night, but studies have shown both species to be most active at dusk.

Studies have shown that rodents are most active on new moon nights. However, this activity does not apply to lagomorphs. Studies have shown that lagomorphs are more active on full moon nights. Therefore, the surveys are conducted on full moon nights.

II. Procedure

A. Equipment

The equipment necessary to complete the lagomorph surveys is kept in Wooton Hall, Rm 163 in a black action-packer.

The equipment includes:

- 1) 3 spotlights (Brinkman Q-BEAM Max Million 1,000,000 Candlepower Spotlight)
- 2) 2 cigarette lighter adapters
- 3) 1 car battery adapter
- 4) rangefinder (Bushnell Yardage Pro Compact 800): with a range of 15m-720m
- 5) headlamp (requires 4 size D batteries)
- 6) clipboard with databook
- 7) spare parts: 2 battery clips, xenon gas replacement bulb, 2-conductor wire
- 8) 4 AAA batteries for rangefinder

B. Survey

1.) Schedule

The survey is conducted quarterly. The survey is performed at the end of January or the beginning of February, the end of April or beginning of May, the end of July or the beginning of August, and the end of October or the beginning of November. The dates are dependent upon the full moon. The survey should be conducted ± 3 days of the full moon.

2.) Full Moon

The full moon date and time may be determined by visiting the website: "Phases of the Moon" located at <http://aa.usno.navy.mil/data/docs/MoonPhase.php>. For a 1-year table of Nautical Twilight and Moon Rise times, visit "Sun or Moon Rise/Set Table for One Year: U.S. Cities and Towns" at http://aa.usno.navy.mil/data/docs/RS_OneYear.php. Enter year, city (Las Cruces), state, and select appropriate "Type of Table" (nautical twilight¹ or moonrise/moonset). Output instructions are at the bottom of the webpage.

3.) Notification

Be sure to call the following parties prior to conducting a survey. Make sure the Ranch Employees are notified (called) the day before you plan on conducting a survey. Let them know the date and approximate time and duration of the survey. If a survey must be done on a weekend, contact everyone the Friday before. This will ensure that the parties are aware of the survey and will not think that the LTER RAs are jacklighting, which is illegal. The parties can be reached at (please contact them by the "preferred" information):

NAME	PHONE #	POSITION	E-MAIL	FAX #
Michael Millward	Cell 208-390-7801	CDRRC ranch manager	millw2@nmsu.edu	
David Thatcher	Cell 649-4808 (cell preferred) Work 646-9405	JER ranch superintendent	dthatche@nmsu.edu	
Joe Ramirez	Cell 644-0147 (cell preferred) Work 646-9400	JER chief mechanic	eljoeram@nmsu.edu	
LC security Service	<unknown>	Monitors Chihuahua Desert Nature Park	pete@lcsecurityservices.com (preferred)	<unknown>
Sgt. Ray Aaltonen or Richard McDonald	532-2100	State Game & Fish	<unknown>	522-8382 (preferred)
US Border Patrol - Las Cruces Station	528-6600	US Border Patrol	<unknown>	527-6897 (preferred)
Dispatcher	646-3312	NMSU Police Patrol	<unknown>	646-8250 (preferred)
Captain Richard Pachco	Work:525-7550 NASA forward gate: 525-7532	NASA Security Officer	Richard.pachco@nasa.gov (preferred)	<N/A>

The NMSU Police Patrol and NM State Game and Fish have also requested that a fax with the relevant information be faxed the day of the survey. Call the appropriate offices after you have sent the faxes so you can make sure they received them. A generic fax form is located at Q:/Study/Smesrabs/faxnotification.docx. E-mail Captain Pachco with the relevant information so he can forward it to the appropriate NASA personnel.

4.) Protocol

In determining the appropriate start time for the survey, be sure to start after the end of nautical twilight. Also, allow enough time for the moon to rise over the mountains. After determining the appropriate start date and time and notifying the proper parties, the survey is ready to be conducted. The survey requires

¹ Nautical twilight is better than civil twilight at estimating when it will be dark enough to conduct the survey. See http://aa.usno.navy.mil/faq/docs/RST_defs.php for a full explanation of civil, nautical, and astronomical twilight. The short version is that the sun is below the horizon 6 degrees for civil twilight, 12 for nautical twilight, and 18 for astronomical twilight.

three people. Once on site (see below), connect both spotlights to the truck's power outlets within the cab. One person is in the truck cab driving and recording data (see below). The other two researchers are in the bed of the truck, standing behind the cab on the right and left sides of the truck bed. Each researcher in the truck bed waves the spotlight in a slow sweeping motion from the middle of the road to the appropriate side of the road (approximately a 90° sweep for each light). The driver also should keep an eye out for lagomorphs in or near the road while driving at about 10 to 12 mph. When a lagomorph is spotted (eyes shine pink in the spotlight), the researcher will notify the driver, who will then stop the vehicle and record the data (see below).

5.) Weather Conditions

It is best to conduct the survey ± 3 days of the full moon. However, the weather must be appropriate as well. The survey should be postponed if the cloud cover at the site is greater than 25% or the wind is greater than 10 mph. If the entire potential survey period is plagued by bad weather, it is better to do the survey just outside of the ± 3 days of the full moon window and have good weather than to conduct the survey within the window and have bad weather as described above. If necessary, the survey can be postponed until the next full moon; confirm this decision with the responsible investigator. Remember, though, it is best to do the survey within the full moon window, so check the weather forecast in advance. Also, be sure to note weather conditions (% cloud cover and estimated wind speed) on the datasheet as the survey is being conducted, especially at the start and end of each route, as well as any significant changes during the survey.

6.) Survey Routes

There are two roads that the survey is conducted on, one in a creosotebush habitat and the other in a grassland habitat.

For the **creosotebush route (Road 1)**, drive to the USDA Stone Pillars on Jornada Road and turn left (west). Begin the survey here. This road continues to the Biodiversity gate (entrance to CDRRC) located at the powerline crossing. Turn right here (north) and go through the gate. Continue north on this powerline road and veer right when the road forks. Continue past sites C-GRAV, Upper Trailer, C-SAND, and LTER Weather Station. The survey is complete for the creosote habitat when you reach the gate just north of the Weather Station.

The **grassland route (Road 3)** begins ¼ mile from the South Well cattleguard on the road going northwest just after crossing the cattleguard on the east side of South Well. There is a yucca on the right side of the road about 4 feet high that serves as the starting point. At the starting point there is also a 6-foot tall 8x8" wood post about 4 feet from the left side of the road immediately past a large mesquite. Follow this road until you cross Pasture 13 (fence is next to road on your left while crossing Pasture 13). Turn right (northeast) just before cattle guard (don't cross into Pasture 8C), and proceed along fenceline. You will need to pass through a large green gate and continue the survey on the same road on into Pasture 11A. Greg Okin's Scrape Site will be off on your right within a quarter mile after the green gate. The survey ends at the fork in the road (shortly before Jornada Road) encountered at about mile 6.3.

7.) Using the Rangefinder

To use the Bushnell 800 rangefinder, turn on the light, aim the laser in the direction of the rabbit. Focus on nearby vegetation or bare ground if the rabbit has already left the spot where it was first observed. See table below for information on the best kinds of vegetation to focus on. Press the button and record the given distance. When focusing on an object, be sure that no other objects are between you and the object you are focusing on because the rangefinder might measure from the wrong object. Conversely, ensure that you focus on a solid part of the object, which can be difficult at greater distances, because the laser can pass through the object you think you are focusing on and measure the distance to an object past the target object instead. Using two hands to stabilize the rangefinder helps greatly. For the informational brochure that came with the rangefinder, see

Q:\STUDY\Animal\SMESRABS\Equipment-Info\Bushnell800_rangefinder.info.

The rangefinder should be tested one time each year to ensure that the rangefinder is holding its factory calibration. To do this, complete a hardcopy of rangefindercalibrationdatasheet.xlsx located in the

directory above. Enter the data and save file as "rangefindertest_yyyy-mm-dd.xlsx. See rangefindertest_2012-03-01.xlsx for example. Take appropriate action if calibration is outside specs.

TABLE OF MOST APPROPRIATE VEGETATION TO FOCUS RANGEFINDER ON
(based on Bushnell 800 laser rangefinder calibration on 2012/3/01)

Distance (m)	Creosote	Mesquite (with leaves)	Yucca Caudex	Yucca Canopy	Subshrub	Grass	Bare Ground
15	Excellent	fair	good	excellent	excellent	excellent	excellent
25	Excellent	fair/good	excellent	excellent	(no info)	excellent	good
50	can't see	good	poor	good	fair	fair/good	fair
75	can't see	fair	poor	excellent	fair	poor	can't see

C. Data

The driver is responsible for recording the data in the databook. The following data are collected:

- 1.) Date: mm/dd/yy
- 2.) Road: **1** (creosotebush) or **3** (grassland)
- 3.) Species: **LECA** (*Lepus californicus*), **SYAU** (*Sylvilagus audubonii*), **UNKN** (unknown species) **START**, **GATE**, and **END** are to be entered in the species field as well.
- 4.) Mileage: (miles) Recorded from the trip odometer. **The trip odometer is zeroed out at the start of each road (route). Make a separate record entry with mileage and time when you reach a gate.** Record to nearest tenth of a mile.
- 5.) Distance: (meters) This is the perpendicular distance of the rabbit from the center of the road. It is helpful to pick a landmark near where the rabbit is first spotted that can be used to measure the distance with the rangefinder. Position the vehicle on the road at the point where it is perpendicular to where the rabbit is first spotted.
 - Position yourself in the bed of the truck so you are over the center of the road when measuring the distance with the rangefinder. Round to the nearest meter.
 - If a lagomorph is in the exact center of the road, record its distance as 0 m and direction as C.
 - Distances from 1-15 m are estimated when the truck is perpendicular to the lagomorph observed.
 - Distances further than 15 m are determined using the rangefinder while perpendicular to the lagomorph (or lagomorph position where it was first spotted) and positioned in the truck equivalent to the middle of the road.
- 6.) Direction: (R, L, or C) **R** if rabbit is on right side of road. **L** if rabbit is on left side of road. **C** if rabbit is in exact middle of road.
- 7.) Time: (military or 24-hour clock) Enter **survey start time, survey end time, gate time, and time rabbit was spotted.**
- 8.) Comments: Include brief weather comments at the start and end of each survey route, particularly percent cloud cover and estimated wind speed. Record moon phase (full moon); an early period of the study included surveys on nights of the new moon. If cloud cover is >25%, then the survey will have to be postponed. The moon must be out when conducting the survey. **ESPECIALLY NOTE WIND AND CLOUD CONDITIONS, AS THESE ARE MOST LIKELY TO AFFECT RESULTS.** Also, for the date, road, and species columns, use a downward arrow to indicate repeated data instead of writing out the actual information in each cell. This makes typing the data much easier for the data entry person. Don't leave these cells blank. All columns to the right of the species column should be written out for each observation.

Page 5 is the document Change Log

Change log:

- 11/19/2001 (John Anderson) Data sheets have been updated to include data recorder and data reader(s) names. Expanded explanation of required information has been added to bottom of data sheets.
- 11/20/2001 (John Anderson) As per Dave Lightfoot, "direction" = **C** when rabbit is sitting in exact middle of road, rather than leaving "direction" blank. "Species" = **UNKN** when rabbit identification is unsure or not known.
- 01/18/2002 (Dara Parker) Added table of best vegetation to focus rangefinder on, added information on file names and the new rangefinder.
- 11/21/2001 (Dara Parker) Changed driving speed from 20 mph to 10-12 mph. Updated the contact information of parties that need to be notified before a survey, moon phase website information, and use of rangefinder instructions.
- 01/11/2002 (Dara Parker) Added new rangefinder instructions and recommendations, as well as instituting a rangefinder test of calibration once per year in August. Use of the Bushnell 800 rangefinder began in January 2002. From October 1995 until November 2001 the Ranging 600 series TLR 75 rangefinder was used. The informational brochure that came with the Ranging rangefinder can be found at
Techs\Study\Smesrabs\equipmentinfo\oldrangefinderinstructionsA.tif and
..\oldrangefinderinstructionsB.tif. Note that with the Ranging rangefinder, distances were estimated from 1-10 meters while with the Bushnell rangefinder distances will be estimated from 1-15 meters.
- 01/28/2002 (Dara Parker) Added Weather Conditions section to the Protocol section, removed rangefinder information from Data section, minor formatting changes.
- 10/28/2002 (Dara Parker) Added contact information for NASA personnel as well as including the use of arrows in data recording.
- 05/23/2003 (Dara Parker) Added to contact information. No protocol changes were made.
- 03/05/2004 (Dara Parker) Updated contact information for NM State Game and Fish and NMSU Police, fixed some formatting.
- 01/13/2006 (John Anderson) Changed civil twilight references to nautical twilight references following comments by John Kuehner that civil twilight times were not very useful in determining when it would be dark enough to conduct the survey. Changed web reference URL to one year from one day calculations because the one day page only provides civilian twilight times. Added explanation of the different types of twilight times available.
- 03/03/2009 (John Anderson) Deleted contact reference to David Lightfoot in II.B.5.) Weather Conditions.
- 03/13/2009 (John Anderson) Updated responsible investigator information at top of protocol.
- 03/16/2009 (Stephanie Baker) Updated contact information for NASA and JER headquarters.
- 03/27/2009 (John Anderson) Corrected position titles for Eddie Garcia & Joe Ramirez.
- 05/06/2009 (Stephanie Baker) Changed NASA contact from Cosme Padilla (cosme.padilla-1@nasa.gov) to Leslie Richard
- 07/26/2010 (John Anderson) Reformatted page break.
- 10/05/2010 (John Anderson) Updated URL links to moon rise and sun set information in section II.B.2.
- 02/16/2011 (Andrea Campanella) Updated JER Ranch superintendent (added Dave Thatcher as new superintendent).
- 01/15/2014 (Roxanne Chepsongol) Updated NASA contact information
- 01/16/2014 (John Anderson) Added secondary start position marker (6-foot post) to start of Grassland Route as the 4 foot yucca may no longer be there.
- 10/12/2016 (Lisa Schauer) Added US Border Patrol – Las Cruces Station to necessary contacts and to the fax notification sheet. No protocol changes were made.
- 03/15/2017 (John Anderson) Updated links to 1-year tables of Nautical Twilight and Moon Rise times. Updated CDRRC ranch manager information under Notifications. Converted faxnotification.doc to faxnotification.docx. Made multiple edits to clarify and bring up to date; e.g., contact people, laser rangefinder model & range. No protocol changes were made.