

CENSUS TECHNIQUES AND PROCEDURES FOR POSSIBLE PREY SPECIES IN THE
CUMBERLAND ISLAND BOBCAT STUDY

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Objectives: The objectives of censusing some of the possible prey species of bobcats before and during the release of bobcats onto Cumberland Island are (1) to attempt to evaluate and compare abundances of different prey species in different cover types on the island, and relate these abundances to habitat preferences of the bobcats, and (2) to document whether the introduction of bobcats onto the island appears to substantially affect abundances of certain prey species, insofar as this can be inferred from the data collected. The possible prey species of interest in this study are white-tailed deer, nine-banded armadillos, feral hogs, eastern grey squirrels, eastern wild turkey, marsh rabbits, raccoons, and small rodents and shrews (the short-tailed shrew, least shrew, marsh rice rat, eastern harvest mouse, oldfield mouse, cotton mouse, hispid cotton rat, and black rat occur on Cumberland Island [Hillestad et al. 1975]). These species were chosen because of documented importance as traditional bobcat prey items, status as undesirable exotics, or high population levels on the island.

Census technique criteria: At present the study design calls for a census of all the previously-mentioned prey species at four-months intervals, in July, November, and March, beginning in July of 1988, for a two year period. It is desirable that all census

be capable of being carried out within a ten-day period, and that several census be run simultaneously. Thus, manpower and time limitations exclude the possibility of highly reliable population density estimates being made by such techniques as mark-recapture studies except for the small mammals. Techniques which generally produce less reliable population density estimates or are considered trend indicators rather than population estimators are more suited to the logistical constraints of this study for the other species. However, in many cases such techniques cannot be compared across seasons, only years.

The four cover types being considered are palmetto-dominated forest, non-palmetto dominated forest, dune-interdune areas, and the burn area on the north end of the island. Four has been selected as the maximum number of cover types that can be adequately sampled.

Procedures

Small Mammals: Small mammal densities in the four cover types are going to be determined seasonally by the use of the trapping web density estimation technique developed by Anderson et al. (1983). The analysis in this technique is not based on recaptures, but rather on the "removal" of captured animals from the population.

Wilson and Anderson (1985) evaluated the trapping web technique using computer simulations. They suggested that between eight and sixteen lines be used per web, and that the number of traps per line equal or exceed 15, requiring a minimum of 120 traps for an 8-line web and a minimum of 240 traps for a 16-line web. They considered the estimator to have generally low

bias under realistic conditions, but recommended caution in cases with capture probabilities less than .10, because of large negative biases; the field design should attempt to assure capture probabilities greater than .20. They suggested that when densities are low and capture probabilities are high, increasing the trap spacing to 6 meters or a combination of a 4.5 meter spacing for the inner four or five rings and 6 meter spacing for the outer rings may aid analysis. Jett and Nichols (1987) did a field comparison of nested grid and trapping web density estimators, and found that the two methods did not produce significantly different estimates, although the trapping web method was somewhat more precise.

Densities of small mammals on Cumberland Island are not known, but are assumed to be relatively low. Previous sampling on the island in January, 1988, averaged 15.1 small mammals per 250 trap-nights (J. Boone, pers. comm.). Assuming each trap web has 250 traps, this would suggest that at least four trapping occasions per web would be necessary to collect 60 animals (at least for the March collections, when rodent population levels should be lowest).

The present study design calls for two duplications to be run in each of the four cover types per sampling period, for a total of eight per sampling period. The traps to be used are baited killtraps. One mousetrap and one rattrap will be placed at each station. Traps will be set in the evening and checked in the morning to prevent removal of bait by insects and removal of mammals by predators (i.e. raccoons, vultures, crows, etc.). It

is supposed that four people will be available each sampling period to run trap webs.

To confine the trapping within the 10-day sampling period, it is not possible to run the trap webs for over four to five days. This should be sufficient. Consideration should be given to the idea of halting a trap web effort whenever a sufficient number of mammals have been caught, both to minimize the potential effect of trapping on the population and to free a person to do other census.

White-tailed deer: White-tailed deer are to be censused with the line-transect method using spotlight surveys. In the line-transect method, distances are measured to all observed individuals. The probability of detection is assumed to be measured somehow by the distance between the observer and the object when it is first detected. The distance to the object when it is first seen is recorded, and ideally the distance from the object to the transect line perpendicular to the transect line is measured, but this can be estimated from the angle of the line of the initial sighting from the transect line.

Ford (1987) developed procedures and routes for conducting spotlight surveys on Cumberland Island. According to Ford surveys should begin 35-40 minutes after sunset or whenever the spotlight beams first become effective, and surveys should not be conducted during a full moon. He suggests vehicles should travel from 3-5 mph due to rough roads and dense vegetation. Data on deer angle when spotted, distance from truck when spotted, and if possible sex and age information will be taken. Surveys will be

conducted using two teams and routes as recommended by Ford. He suggested that the surveys be undertaken for at least four and if possible six consecutive nights under similar weather conditions.

Road spotlighting will not sample all cover types, but is the only feasible method for censusing deer on Cumberland. The deer density estimation will be on an island-wide rather than a cover type basis. Ford warns that since the spotlight routes do not traverse major habitat types proportionate to their distribution on the island, spotlight census data should not be used to estimate the specific size of the deer herd. Although the spotlight count data is often used as a trend indicator, previous estimates on Cumberland have not been sensitive enough to indicate anything but the most gross changes in population size [Ford 1987, R. Warren, pers. comm]. In addition, there is no way of sampling the interdune meadow habitat with vehicles, although scat counts in March, 1983, indicated that this habitat type received significantly higher use by deer than other habitat types encountered in an east to west transect line across the island [Simon et al. 1984]. A radiotelemetry study presently being done on the island may provide information as to which cover types the deer on Cumberland may prefer.

One possible difficulty with the spotlight surveys is that intensive hunting with spotlights in the past two years has made deer on Cumberland wary of spotlights, and they may flush before being shined.

Raccoons: Raccoons will be censused at the same time and in the same way as the white-tailed deer. Raccoon activity generally

peaks in the early evening hours, after sunset, so the timing of the spotlight census is appropriate for raccoons [MacClintock]. Some coastal marsh raccoons time their activity patterns to the tide rather than to the onset of darkness, which may influence the comparison of the survey results across years and seasons [MacClintock]. This density estimate will also be island-wide rather than by cover types, since the method precludes equal sampling in the four cover types, and will be more valuable as a trend indicator than as a actual density estimate. A study of the relative abundance of raccoons in different forest types as a function of population density on St. Catherines Island, Ga. may give some indication of differences in density in different cover types in a situation similar to Cumberland [Hudson 1978].

Spotlighting deer and raccoons is estimated to take 5 hours per night per team. Each team will consist of at least 3 people. Therefore 6 people must be available for 4-6 consecutive nights (subject to weather considerations). Skills required include identification of animals and sexing/aging of deer under night spotlighting conditions, use of the Q-beam, use of a rangefinder, and use of a hand-held compass. One person from each team will act as recorder and driver.

Armadillios: Armadillios were first recorded on the island in 1973, and have now become ubiquitous. Armadillios are going to be censused by walking line transects crossing through oak-palmetto, open woodland, and interdune cover types.

Chosing an appropriate time to conduct surveys for armadillios is more difficult than for most mammalian species.

Nine-banded armadillo activity varies according to temperature and weather conditions, rather than the day-night cycle [Layne and Glover 1985, M. Nelson pers. comm.]. Layne and Glover (1985) found that in Florida peak activity tended to occur in the 20-25 C range throughout the year, with activity compressed into a shorter time span in winter. In addition, times of peak activity seem to differ somewhat by sex and age. Layne and Glover (1985) found that young individuals and adult females apparently were more active and more diurnal than adult males in cold weather. Times for armadillo surveys will have to be chosen independently in each sampling period, based on temperatures and long-term weather forecasts. If possible, a few days of observation will be conducted before the surveys are done, in order to determine the current time of peak activity.

Brennan and Block (1986) used walking transects in a similar manner to estimate densities of mountain quail. They had a two-person team make the counts. After selecting random starting points, transects were placed along abandoned skid trails, haul roads, fire breaks, and other linear openings to assure that quail located on the transect line would be detected (this fulfills one of the assumptions of the line-transect method). It also allowed potential observer effects to be minimized. Sighting distances were recorded with a rangefinder and angles of sighting were measured with hand-held compasses. Calling birds were counted by the same methods, using an object considered to be in the same location as the bird to estimate measurements. Starting and ending points were altered to avoid temporal sampling bias.

A similar method should be used with the armadillos. It will not be possible to randomly select starting and ending points along the transects because all cover types need to be sampled: however, beginning and ending points can be alternated to avoid temporal bias. The assumptions of the line-transect method are: (1) all objects on the transect line have a probability equal to 1 of being detected, (2) objects are fixed in their initial position, (3) all sighting angles and distance measures are exact, and (4) all sightings are independent events. Behaviorally armadillos should meet these assumptions very well.

It is estimated that these transects will take 2-3 hours each. Each transect will be walked four times. Therefore 2 people must be available for 12 days (subject to weather conditions) at times suitable for armadillo transects. Skills required include sighting animals in the woods, use of a rangefinder, use of a hand-held compass, and the ability to remain quiet in the woods.

Turkeys: Turkeys will be surveyed by the same method and on the same transects as the armadillos. Turkeys often move in groups, so assumption 4 of the line-transect method may be violated. Ratti et al. (1983) dealt with the special consideration necessary to estimate the density of galliform birds that aggregate in clusters. Turkey counts will be done in the early morning, concurrently with squirrel. The breeding activities of the turkeys in March may bias the March estimate.

Personnel and skill requirements for the early morning transects will be the same as for armadillo transects. Since

there will probably be two people available for the entire month covering the sampling period, it is recommended that these people do the walking transects at their convenience, and that walking transects not be combined with a spotlighting/trap web effort unless necessary.

Squirrel: Squirrel estimates will be done with the same line-transect method described for armadillos and turkeys. Squirrel counts will be done concurrently with turkey counts. Bouffard and Hein (1978) got their highest counts of grey squirrels in an evaluation of the time-area count method between 0800 and 1000 h throughout the year in Pennsylvania. Squirrels should meet the assumptions of the line-transect method satisfactorily.

Marsh rabbits: Marsh rabbit abundances will be indexed by pellet-group counts conducted in conjunction with the trap-web efforts in addition to walking transects. On the evening the trap web is initially baited, all marsh rabbit pellets will be removed from a circle with a 3-foot radius around all trap stations on the due north, due south, due east, and due west lines. Each morning when the trap webs are checked, each station plot will be checked for the presence of fresh pellets.

Hogs: Counts of hog rooting sign along the permanent transects will be used as an index to feral hog density. Hogs are not known to occur south of Stafford field.

Potential problems: Visibility off the trails in the palmetto-dominated cover is often close to nil. Densities from transect

counts in this cover type may be underestimates relative to the
results of estimates in other cover types.