

Chapter 11

Small Game Mammals

(cottontail rabbit, snowshoe hare, red, gray and fox squirrel)

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- I. INTRODUCTION – Cottontail rabbits, snowshoe hares, and red, gray and fox squirrels are designated small game in Wyoming [W.S. 23-1-101(a)(xi)]. Several states, especially in the eastern U.S., conduct surveys to monitor small game populations. However, the information has limited value for harvest management because hunting mortality has little or no impact on carryover of small game to the subsequent breeding season. The major reasons to collect population data are to provide status information to the public, forecast game abundance for fall hunting seasons, or conduct special studies. However, there is little biological justification for adjusting small game hunting seasons on the basis of population data.

This chapter provides life history information and traditional monitoring techniques for reference purposes. Several techniques may have utility for research, monitoring effects of development, evaluating habitat treatments including reclamation success, or to document trends for hunting forecasts. The Department has no plans to conduct small game surveys at a statewide level.

II. BACKGROUND, STATUS, AND NATURAL HISTORY –

- A. History in Wyoming – The cottontail rabbit was designated a game species in 1966 and hunting seasons were established thereafter. The first hunting seasons for snowshoe hares and tree squirrels were established in 1974.
- B. Current Status –
 1. Distribution –
 - a. Cottontail Rabbits – The eastern cottontail is confined to the southeast corner of Wyoming. Desert and Nuttall’s cottontails are distributed throughout the state, however Nuttall’s range probably does not coincide with the eastern cottontail, and the desert cottontail is not found along the Idaho-Wyoming border (Long 1965).
 - b. Snowshoe Hare – Snowshoe hares occupy higher-elevation, coniferous forests throughout mountain ranges of Western Wyoming, the Snowy Mountains and Big Horn Mountains (Long 1965).

- c. Red and Fox Squirrel – Red squirrels inhabit mountain spruce-fir and pine forests throughout the state (Long 1965). In recent history the range of the fox squirrel has expanded (through releases and dispersal) to include most deciduous riparian, agricultural, and urban habitats east of the Continental Divide in Wyoming (Long 1965, Wyoming Game and Fish Department 1999). An isolated population of gray squirrels inhabits the Sheridan areas. The species possibly exists in some other locations along the eastern edge of the state, but has not been documented in the Department's observation records.

C. Natural History Information –

1. Range of productivity –

- a. Cottontail Rabbit – Cottontails begin breeding at 3-6 months of age (Wyoming Game and Fish Department 1992). They typically produce about 3 litters per year, but can have up to 5. Each litter consists of 3-7 young (average 4).
- b. Snowshoe Hare – Snowshoe hares also begin breeding at 3-6 months of age. They produce 2-4 litters per year, averaging 2 litters and 3 young per litter (Wyoming Game and Fish Department 1992).
- c. Red and Fox Squirrel – Red and fox squirrels are able to breed at 6-9 months of age. Both species have 1 litter per year and 2-7 young per liter (Wyoming Game and Fish Department 1992).

2. Range of natural mortality –

- a. Cottontail Rabbit – Natural mortality of cottontails is very high (Eberhardt et al. 1978). Annual survival rates can be as low as 20%. Average life span is approximately 2 years. Mortality is highest during the juvenile age class, post-weaning.
- b. Snowshoe Hare – Natural mortality of snowshoe hares is also high, but varies markedly depending on environmental conditions and population cycles. Juveniles in their first year sustain highest mortality, ranging from 50% during periods of increasing populations to 90% during periods of decreasing populations (Dolbeer and Clark 1975, Meslow and Keith 1968). Annual mortality of adults ranges from 25-60% during increasing and decreasing population cycles, respectively.
- c. Red and Fox Squirrel – The literature contains relatively little information about natural mortality of squirrels. However, squirrel populations are known to sustain themselves under heavy hunting pressure. This capability is typical of species with high rates of recruitment and natural mortality. In winter, mortality probably varies depending on weather conditions. Since squirrels are arboreal and store

food caches, it is likely they are more susceptible to long cold spells than to heavy snow cover.

3. Food Habits – Consult Adams (1959), DeCalesta (1971), Hansen and Flinders (1969), Martin et al. (1951), Turkowski (1975), Yeager (1959), Zimmer (2004) and others). Diets of most small game are comparatively broad, enabling them to utilize a variety of food sources depending on season and availability. Common methods for conducting food habits studies include field observation and fecal analysis (Adams et al. 1962, Schemnitz 1980).

III. CENSUS – Although the Wyoming Game and Fish Department does not currently monitor small game populations, population trends can be assessed using data from the small and upland game harvest surveys (e.g. hunter harvest, success, and effort). Methods discussed in this chapter are not widely used by the Department, but potentially have some application for research, special projects and prey base monitoring.

A. Trend Counts – Various trend counts have been used to monitor small game, especially in the eastern United States (Boufford and Hein 1978, Flyger 1959, Kline 1965, Lord 1961, and Newman 1959). Trend counts have also been applied within some areas of Wyoming, however the Department has no plans to develop a statewide trend count.

1. Rationale – The purpose of trend counts is to detect changes in abundance that take place over time, or differences that exist between locations. Generally, population sizes are not estimated from trend data except in limited circumstances, provided a conversion ratio has been developed. Surface management agencies can incorporate trend data into land management plans to evaluate impacts of various surface management activities, and results of habitat manipulations. The Department may use trend data for some species management. For example, trend counts can indicate prey abundance for various avian and mammalian carnivores.

2. Application –

- a. Cottontail Rabbits – Spotlight trend counts are conducted along driving transects of at least 20 miles, typically in August and March. All observations of rabbits and the corresponding mileage readings are recorded on a data form. In Wyoming, personnel traditionally drive transects at 40 mph or less, beginning each 0.5 hour after sunset. However, researchers in other states recommend driving the routes at 20 mph. Kline (1965) determined cottontails were most active in late February and late July. Peaks of daily activity occur one hour before sunrise in February and one hour after sunset in July. Bearing this in mind, morning surveys could be evaluated in Wyoming. The width of coverage along transects should be standardized (e.g., the road and an equal distance on either side).
- b. Snowshoe Hare – An accepted method has not been developed to monitor population trends of snowshoe hares.

- c. Red and Fox Squirrels – Several techniques have been used to census squirrels (Boufford and Hein 1978, Fitzwater 1941, Flyger 1959, Kufeld 1964). The time-area count appears to be the most efficient (Kufeld, R. C. 1964).
 - 3. Analysis of Data – Summarize the number of observations per unit of survey effort, e.g., the number of rabbits seen per mile, or the number of squirrels heard per station.
 - 4. Disposition of Data – Send copies of census forms to the area biologist. This information should be entered in the Wildlife Observation System database. Also, summarize results in small game completion reports.
- B. Mark-recapture – Mark-recapture techniques could be used to estimate local populations of small game mammals in Wyoming (Dolbeer and Clark 1975, Edwards and Eberhardt 1967, Friley 1955, Keith et al. 1968, Nixon et al. 1967, Schemnitz 1980, Skalski et al. 1983). Also refer to Chapter 20 (Nongame Mammals) and Appendix VII (Marking Techniques).
- C. Road-kill Surveys – The Illinois Department of Natural Resources (IDNR) conducts road-kill surveys to monitor population trends of cottontails (Hubert 1988). Although road-kill surveys have not been implemented in Wyoming, they could potentially have some utility.
 - 1. Rationale – Lineal frequencies of road-killed rabbits are generally correlated with population densities. Therefore, road-kill surveys can provide an index to cottontail population trends.
 - 2. Application – Road-kill surveys should be conducted in June or July. The IDNR found results of June and July surveys were directly correlated with fall harvest of cottontails.
 - 3. Analysis of Data – Tally the number of road-killed animals seen per thousand driving miles.
 - 4. Disposition of Data – Summarize results of road-kill surveys in small game completion reports.

IV. HARVEST DATA –

- A. Harvest Survey – Small game harvest statistics are estimated annually from a hunter mail survey (Appendix III). Data from field check stations can also provide some useful harvest information.
 - 1. Rationale – When more costly, labor-intensive field surveys are impractical, harvest data are an excellent indication of small game population trends. Harvest data are

analyzed in the Department's program (job) completion reports and are also used to develop economic data for the Department's annual report.

2. Application –
 - a. harvest survey – Refer to Appendix III (Wildlife Harvest Survey). A harvest questionnaire is mailed to a sample of small and upland game license holders. Results are extrapolated to develop harvest estimates statewide and for small and upland game management areas (Attachment 1).
 - b. harvest field checks – Results from check stations and field checks can provide certain management information such as hunter success and participation, which may be useful at the regional level. Check station results can also be included in annual completion reports for small and upland game.
 3. Analysis of Data – Summarize hunter numbers, total days of hunting, effort (days/animal harvested), success (animals/hunter), and total harvest of each species within each management area and statewide.
 4. Disposition of Data – Biological Services compiles and distributes small game harvest reports by 1 June of each year.
- B. Age and Sex Determination – Annual reproductive success and recruitment can be estimated from age ratios of harvested animals. However, given the short life span of most small game and high reproductive potential under favorable conditions, information about age and sex composition is probably unnecessary for population management.
1. Field Aging and Sexing Techniques – Reliable field techniques for determining ages of small game mammals are not currently available. Sex can often be determined by examining external genitalia. Body size, weight, and (in the case of squirrels) tail pelage can be used to distinguish adults, juveniles, and sometimes yearlings (Keith et al. 1968, Kemp and Keith 1970, Petrides 1951).
 2. Field Checks and Check Stations – Small game harvest information should be collected as opportunity permits at big game check stations. The Department does not operate check stations specifically for monitoring small game harvest.
 3. Laboratory Aging Techniques – Several laboratory techniques are available to distinguish age and sex of lagomorphs and squirrels (Beale 1962, Bothma et al. 1972, Carson 1961, Edwards 1962, Fogl and Mosby 1978, Hale 1949, Kemp and Keith 1970, Petrides 1951, Rongstad 1966, Schemnitz 1980, and others). Accurately determining age requires examination of eye lens weight, cementum annuli, or epiphyseal closure of the humerus, radius, or ulna. Sullins et al. (1976) determined periosteal layers in mandibles of eastern and Nuttall's cottontails are present in adults and absent in young-of-the-year.

V. DISEASES AND PARASITES – Refer to Thorne et al. (1982) – Diseases of Wildlife in Wyoming.

VI. DISTRIBUTION AND MOVEMENT –

A. Incidental Observations –

1. Rationale – The general distribution of most small game has been well documented, however ranges of some species continue to expand in Wyoming. Specific habitat use and population densities have not been thoroughly investigated in some areas. The observation database does not include any documentation of gray squirrels.
2. Application – Record all observations of species outside currently recognized distributions, on Wildlife Observation forms (Appendix I). In addition, record unusual observations of behavior, habitat use or mortalities.
3. Analysis of Data – Plot distribution of small game onto Mylar overlays of 0.5 inch to 1.0 mile topographic base maps. Identify high, medium, and low-density areas of occupied habitat. GIS layers can also be developed from distribution data. Update small game range maps regularly.
4. Disposition of Data – Enter wildlife observation records in the Wildlife Observation System database. Summarize distribution information in small game completion reports.

VII. TRAPPING, MARKING, AND TRANSPLANTING –

A. Trapping – Night-lighting techniques can be used to capture cottontails (Labisky 1959). Lagomorphs and squirrels are also readily captured in live traps.

B. Marking –

1. Ear Tags – Numbered fish fin tags are suitable for marking ears of squirrels, rabbits, and hares. Adams (1959) used numbered tags of his own manufacture to mark snowshoe hares. O’Farrell (1965) and Rose (1977) attached No. 1005 Size 3 Monel metal “Jiffy” wing bands (National Band and Tag Co., Newport, KY) to the lower posterior edge of snowshoe hare ears. Some marking materials have drawbacks. Loose-fitting ear tags can tear out by snagging on shrubs or other vegetation. Metal tags can cause frostbite where they are attached.
2. Tattooing – Tattooing ears is one of the easiest and most permanent methods of marking rabbits (Keith et al. 1968). Even very young rabbits can be safely tattooed without possibility of losing the marking or causing further injury to the animal. Tattoos are weightless and inconspicuous to predators, but cannot be read unless the animal is in hand (Brady and Pelton 1976). Tattooing the inside of the ear is a

standard marking procedure for lagomorph field studies (Brady and Pelton 1976, Keith et al. 1968).

3. Toe Clipping – Toe clipping is one of the most permanent methods of marking small mammals for positive identification. Toes can be clipped off at the first joint with sharp scissors, in a sequence described by Layne (1954) (Fig. 1). Front toes are numbered 1 to 8. Hind toes are numbered in tens, from 10 to 100. Based on this numbering scheme, 143 individuals can be marked without removing more than 3 toes or more than one toe from any foot. The method is suitable for either squirrels and lagomorphs, and can supplement other forms of marking. Toe clipping is relatively painless to the animal and the wound heals quickly. Tracks of marked animals can often be distinguished in snow or dirt. Schemnitz (1980) provides an alternative method.
4. Fur Clipping – Layne (1954) described a method for marking squirrels by clipping patches of fur. The method also has some potential for marking lagomorphs. Outer (guard) hairs are removed to expose patches of darker, inner fur in specific patterns (Fig. 2). By clipping various combinations of up to two patches, animals can be labeled consecutively from 1 to 49. Up to 38 more individuals can be marked with additional combinations. This technique enables researchers to identify marked animals from a distance, however the animal's back must be fully visible to see all the clipped spots. The markings persist until the fur is molted.

VIII. SETTING SEASONS – The Department maintains liberal hunting seasons and bag limits for small game because hunting has little or no effect on populations. Population data are not needed to set hunting seasons. Harvest is regulated by the “law of diminishing returns.” During periods of lower populations, harvest success declines and hunters lose interest. The result is lower harvest rates, which protect the breeding stock during unfavorable environmental conditions. In addition, small game species have extremely high reproductive potentials, enabling them to recover rapidly from even very low densities when favorable conditions return. In some intensely hunted locations (generally urbanized states), lower limits are sometimes prescribed to distribute harvest opportunity more equitably among hunters. However, small game animals are not hunted intensively enough in Wyoming to warrant limit reductions for this purpose.

IX. DEPREDATION – Refer to The Handbook of Wildlife Depredation Techniques (Buhler et al. 1999); The Prevention and Control of Wildlife Damage (Hygnstrom et al. 1994); and Homeowner's Guide for Resolving Wildlife Conflicts – Habitat Extension Bulletin No. 45 (Wyoming Game and Fish Dept. undated).

- A. Depredation Problems – Cottontail rabbits periodically cause localized damage to standing crops, rangeland, ornamental plants, or stored foods. During severe food shortages, lagomorphs can damage or kill tree plantings by clipping stems and de-

barking trunks. In towns, the nesting or gnawing habits of squirrels can become intolerable to property owners. Both red and fox squirrels can damage tree branches, sometimes extensively, by eating buds or cutting branches to obtain cones, nuts or other seeds. In some instances, the animals must be removed by trapping, relocation or shooting to resolve these problems,. Chemical repellants, baiting, electric or other fencing, and squirrel-proof barriers (on tree trunks) are additional options for dealing with nuisance animals. Under Wyoming Statute (W.S. 23-3-115) the landowner can take and kill any gray, red and fox squirrel causing damage to private property. However, no similar provision allows a landowner to take cottontail rabbits.

- X. JOB COMPLETION REports – Job completion reports were compiled for small game from 1986-1992. Biological Services retains copies of these reports on file. The Department may or may not resume compilation of small game completion reports in the future. Annual harvest reports of small and upland game are still compiled.

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Ventral View

Fig. 1. Numbering scheme used to permanently mark small mammals by toe clipping. From Wildlife Management Techniques, 3rd Edition, The Wildlife Society (Giles 1971).

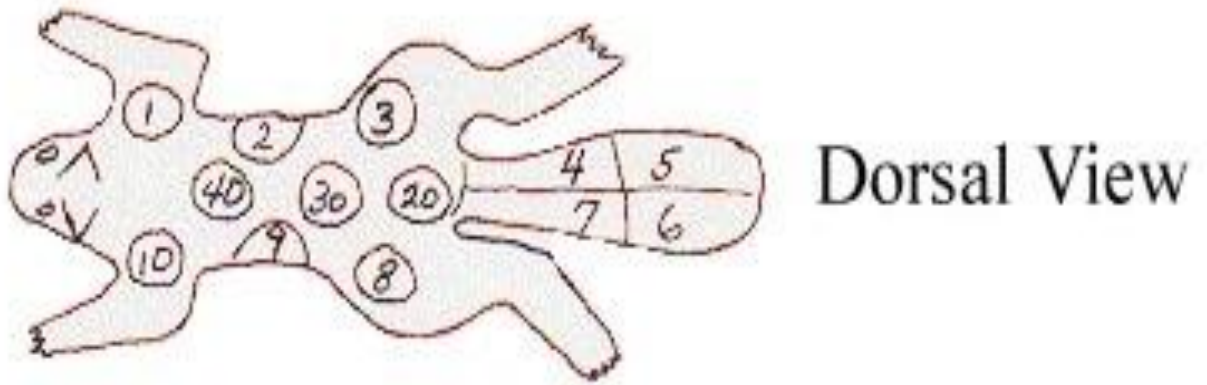


Fig. 2. Numbering scheme used to mark animals by fur clipping (Layne 1954).

Attachment 1

Small and Upland Game Management Areas

