

ROCKY MOUNTAIN GOAT TRAPPING AND TRANSPLANTS IN BRITISH COLUMBIA  
AND ALBERTA

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INTRODUCTION

The Rocky Mountain goat (Oreamnos americanus) of North America has been trapped and transplanted since the early 1920's (Burriss and McKnight 1973, Carl and Guiquet 1958, Richardson 1971, Johnson 1977). Early trapping procedures, transplant site type and mortality were often not recorded or were poorly described. Later operation (McDowell 1948, Lentfer 1955, Forr 1962) provided more information on trapping procedures and mortality. Recent programs (Quaedvlieg et al. 1973, Hebert 1967, Hebert and Cowan 1971, Rideout 1973, Richardson 1971) describe trapping procedures, site types, mortality and possible causes of mortality and handling procedures. It appears that only the most recent trapping programs utilized immobilizing drugs (Kuck 1977, Quaedvlieg et al. 1973, Rideout 1973, Schoen 1978, Stevens pers. comm. 1979) during capture operations.

A preliminary description of mountain goat transplants (in Samuel and McGregor 1977) occurred in 1977, but lacked site description, criteria for site selection and subsequent population change. Attempts should be made to obtain this information, in order to relate population dynamics information to physiographic, habitat and climatic conditions to predict suitable sites for transplants.

## ACKNOWLEDGEMENTS

All trapping operations in British Columbia and Alberta required a large amount of labour intensive assistance. We are thankful to those people who aided the various operations, learned about mountain goats and improved the trapping and transplant techniques.

## STUDY AREA

Trapping operations occurred in the alpine and subalpine regions of the Grande Mountain - Goat Cliffs area, north of Grande Cache, Alberta. The release site for these animals was Shunda Mt., in the Brazeau Range southeast of Nordegg and north of the North Saskatchewan River (Quaedvlieg et al. 1973). In British Columbia, mountain goats were trapped at various salt licks in the Rocky and Purcell Mountains of the East Kootenays, for purposes of marking and release (Hebert 1967). McLellan (1978) trapped goats at the Toby and Redding Creek licks in the Purcell mountains, east of Invermere and Kimberly, respectively, for purposes of transplanting to Mt. Thompson at Creston, B. C. All trapping sites in British Columbia were in the interior Douglas fir zone between 350 and 1,600 m. elevation.

## METHODS, RESULTS AND DISCUSSION

### TRAPPING

#### Alberta

Rocky Mountain goat trapping operations on the east slope of the Rocky Mountains in Alberta were conducted in alpine-subalpine areas of the Goat Cliffs (Table 1). Eight, unbaited clover traps (Clover 1956) were

Table 1. A Summary of Rocky Mountain Goat Trapping Operations in British Columbia and Alberta.

Criteria	Region			
	Rocky Mountain East Slope	Rocky Mountain Purcell Mountain 1965-67	Rocky Mountain 1978	Coast Mountain Alpine-subalpine
Zone	Alpine-subalpine	D. Fir	D. Fir	Alpine-subalpine
Goats Trapped	12	12	11	0
Trap Type	Clover	a) clover b) corral	a) clover b) corral	a) clover b) drop net (1980)
No. of Traps	8	a) 2 b) 3	a) 4 <sup>1</sup> b) 1	a) 1 b) 1
Goats Marked	Yes	Yes	No	Yes
Bait Used	No	No	No	Yes-start
Drive Trapped	Yes	No	No	No
Lick	No	Yes	Yes	No
Trails	Yes	Yes	Yes	No
Blindfolded	Yes	Yes	No	Yes
Transported	Yes	No	Yes <sup>2</sup>	No
Immobilization	Yes-M99	No	No	Yes-M99
Transplanted	Yes	No	Yes	No
Mortality	2	3	0	0
Autopsy	No	Yes	---	---
Cause of Mortality	a) drug b) trap injury, possible C.M.	W.M.D. C.M.	---	---
Selenium-Tocopherol	Yes	No	Yes	---

1. 2 clover traps hooked together at each site

2. Toby Creek Lick - 0.50 km  
Redding Creek Lick - 160 km

used to capture 12 goats. Traps were located in partially treed areas (Picea engelmannii, Abies lasiocarpa) on well used trails where goats crossed from one basin to another. Trap gates were tied up and animals allowed to pass freely through the traps for two weeks. Natural movement of goats along these trails allowed some goats to be trapped, however, drive trapping was more successful. Drive wings were constructed to enhance the hazing process. Adults were captured as individuals and immobilized with 2 mg. of etorphine hydrochloride (M99) (1 mg./cc.) using a CO<sub>2</sub> CapChur pistol. Kids were simply tied and blindfolded. Goats were transported (2-5 miles) by packing or with the use of a skid (car hood) to access roads. In most cases, blindfolds were used and rubber hose was placed on each horn for safety purposes.

The use of clover traps requires that netting be strengthened (Quaedvlieg et al. 1973, Hebert and Cowan 1971) and that trip devices and gates be efficient (Quaedvlieg et al. 1973, Rideout 1973) and effective. Unsuccessful trapping attempts elicit a learned avoidance response in goats which is passed on to associated groups and individuals.

Two adult females died during the trapping and holding procedures. One female died during transportation off the mountain while drugged with M99. A necropsy was not performed. The second animal appeared to injure its achilles tendon and it was concluded that she died from secondary infection and shock (Quaedvlieg et al. 1973). Since loss of control of the hind legs and especially the lower hind legs has been recorded (Hebert and Cowan 1971), during trapping it is possible that this animal succumbed to capture myopathy (C. M.) or white muscle disease (W. M. D.).

British Columbia - East Kootenay

Mountain goats were trapped at natural salt licks in southeastern B.C. during 1965-67 and in 1978. Clover and corral traps were placed on well used trails which passed through low elevation dense lodgepole pine (fire created) and Douglas fir forests above the lick. When goats leave alpine-subalpine areas to travel to natural salt licks, they use traditional trails exclusively (Hebert 1967) and often appear lost and confused if they lose the trail.

Corral traps were constructed of lodgepole pine logs, approximately 10-15 cm. in diameter and 6 metres in length. The logs were placed horizontally 30 cm. apart and attached to trees which served as corner posts. The shape of the trap was rectangular (usually much longer than wide) but varied with the position of trees as corner posts. Corral traps were built on steep slopes above the lick or were situated in areas where tree cover and ground vegetation was extremely dense, so that goats were either travelling rapidly prior to entering the trap or the trap was better concealed where they were travelling more slowly. Trap gates were triggered by the goats and were braced with supports so that they could not be pushed open. Traps were lined with chicken wire for additional support between logs and so that light could enter between the logs on the down side of the trap. Wings 10 to 20 meters in length were constructed adjacent to the gate. All parts of the trap were camouflaged with conifer branches, deciduous shrubs and goat hair.

Clover traps were situated in densely vegetated areas, without wings, so that they were as inconspicuous as possible. If possible, they were placed at sites where dense lodgepole pine or Douglas fir provided natural direction into the trap (wings) and concealed the sides of the trap. In 1978, rough wings consisting of blowdown trees and brush were used to direct goats into the clover traps.

When goats climbed out of the corral trap, using the horizontal logs as steps, escaped from clover traps through weakened mesh or came back through the gate, they exhibited a learned avoidance response. In such cases, wings were lengthened at the corral traps and clover traps were moved 25 to 200 m. along the trail to new sites. The avoidance response at corral traps became sufficiently general that they became ineffective during that year. Use of baited corral traps in other areas (McDowell 1949, Lentfer 1955, Foss 1962) suggests that this avoidance response can be partially or wholly lost between years, with maintenance of trap success. When clover traps were resituated, trapping success was maintained immediately and the avoidance response became negligible. Traps could be moved as many times as there were suitable sites.

Records of goats moving up and down the trails were obtained using notched and split coniferous and deciduous branches to catch molting hair, to determine daily use and direction of movement. A one by three metre area of the trail was brushed each day to aid in determining use and direction of movement. These methods were sufficient to monitor use of the trail, changes in movement patterns due to avoidance and determined when traps had to be changed.

During 1965-67 goats were controlled by catching one front (or both) and one hind leg (or both) in nooses placed on the ground (Hebert 1967). Drugs were not used but all legs were tied and blindfolds were always used. Hose on the horns was found to be unnecessary. Goats were handled in a lateral or sternal recumbent position and once goats were down, little restraint was required.

In 1978, goats were not handled or immobilized. A carrying box with both ends open was placed next to the gate of the clover trap. A piece of plywood, slightly larger than the gate of the trap, with a hole

slightly smaller than the end of the carrying box, was placed between the trap and carrying box to insure that the goat could not escape between the two openings. The end of the carrying box farthest from the trap was covered with mesh, which let in enough light to allow goats to charge into the carrying box.

Ice was placed in the box to reduce heat stress and provide drinking water while in transport. Goats remained quiet and usually remained lying down throughout transport.

By comparison, V. Stevens (pers. comm. 1979) has trapped 100+ goats at an artificial salt lick on Klahane Ridge in Olympic National Park. Goats are captured when they step into nooses placed around an artificially salted area. Noosing is usually done with the hind legs to avoid encountering the animal head on. Drugs are used (M99) infrequently and only with large males. Although there appears to be more struggling and exertion with this method than with conventional methods (clover), few, if any, instances of C.M. or W.M.D. have occurred. Two to three people are required to handle each animal.

Goats captured to determine seasonal and daily use of salt licks were marked (horns and body) with commercial spray paint and/or histological dyes (Hebert 1967). Those captured for transplant purposes in Alberta were marked with ear tags and/or radio collars (Quaedvlieg et al. 1973) while the goats transplanted in British Columbia were unmarked (McLellan 1978).

Three animals died during the 1965-67 trapping operations in British Columbia, an adult female and two kids. All were diagnosed as having white muscle disease (Hebert and Cowan 1971) or as it is more recently called, capture myopathy. The underlying causes of this syndrome are presently unknown. Trap related deaths have been relatively common throughout most of the range of the mountain goat. Descriptions of trap deaths from early

trapping operations in Idaho (Rogers pers. comm.) and Alaska (Alaska Department of Fish and Game) appeared to parallel those of C.M. or W.M.D. However, since few autopsies were performed, no pathology was undertaken and no tissue Selenium values were obtained, the cause of mountain goat trap mortality is still unclear. No trap related mortality occurred during the 1978 trapping program.

Experience from low elevation trapping suggested that permanent corral traps could be useful for a long term goat trapping operation but may become ineffective over a seasonal time period. Clover traps are most effective in these situations. Their effectiveness could be improved if the trap was three to six times the length, with a series of drop gates at each end and throughout the interior. It should be possible to obtain several animals of a group, an entire family group or parts of two or more family groups, in this manner. Separation of individuals with interior drop gates is necessary to avoid mortality when goats are crowded (Geist 1967). McLellan (1978) joined two clover traps, with a drop gate at each end and appeared to increase success over use of a single clover trap.

Trapping at natural salt licks can aid in the selection of males or females. Males utilize natural licks during May and June while females move to the licks in June and July (Hebert 1967, Singer 1977). Females with young molt later than males or females without young (Hebert 1967) and if trapped during the heat of late June, July or August could be more susceptible to heat prostration, especially at low elevations. M99 should probably not be used with unmolted or partially molted females trapped at low elevations in the summer because of its effect on the thermoregulatory centres (Hebert and McPetridge 1979).



## Coastal Mountains

Capturing mountain goats in the coastal mountains of southern British Columbia has been a difficult and expensive procedure. To date, salt blocks have been placed in the alpine regions of Hoodoo Creek (Knight Inlet, Hebert and Turnbull 1977) and use by goats is increasing (Spencer pers. comm.). The only reported salt lick in coastal British Columbia (Hebert and Turnbull 1977) (Heimer pers. comm. does not know of any in Alaska) is frequented by goats in June, July and August and it may be possible to use clover traps on the trail bordering the moraine which forms the lick. Immobilization from a helicopter in the alpine and subalpine, is likely in areas where granitic and dioritic formations are reduced and where dacitic and basaltic flows form a gentler landscape. The use of a large drop net at artificially salted areas may prove successful in these gentler alpine areas. The use of drop nets from a helicopter has not proven successful in Alaska (Schoen 1978) or in Montana (Rideout 1973) when used from the ground. However, Kuck (1977) trapped 4 and 6 goats in two trapping attempts with a drop net.

## TRANSPLANTS

There is limited description of the suitability of the majority of early transplant sites (Burris and McKnight 1973, Carl and Guiquet 1958, McDowell 1949). Even recent transplants lack site suitability descriptions (Richardson 1971, Durbin 1975) and often transplants fail. Prior to the transplant in Alberta (Quaedvlieg et al. 1973) many sites were examined for floristic composition, escape terrain, interspersions of types, exposure, etc. (Gates 1971,72). Similarly, the proposed mountain goat transplant to Vancouver Island included a floristic

composition, cover type, biomass estimate of the most apparent suitable areas (Doyle 1978). Comparison of site evaluation information with population change (rate of increase) of transplanted populations will eventually provide improvements in the predictability of success and selection of the most suitable sites.

Possible criteria for selection of a transplant site or for comparison of sites are:

1. Previous history of goats in each area.
2. Physical description of the site.
  - a) aspect - proportion of each aspect.
  - b) elevation - range of elevation.
    - elevation of winter ranges.
  - c) escape terrain - amount and quality (bed rock structure).
  - d) slope.
3. Vegetative description.
  - a) biogeoclimatic zone
  - b) habitat types - community typing (species comp., height, cover)
  - c) species composition in relation to food habits.
  - d) forage to cover ratios.
  - e) yield.
  - f) forage availability.
  - g) spring greenup.
  - h) requirement of mature timber on winter range.
4. Climate
  - a) snow depths and density on winter range.
  - b) radiation.
  - c) wind blown slopes or snow free areas.
  - d) snow free days.

5. Juxtaposition of physical and vegetative criteria
6. Approximation of carrying capacity and number of goats based on yield and approximate intake.
7. Minimum number required for transplant, including age and sex makeup.
8. Discrete or connected range and possible emigration.
9. Species competition - sheep, deer, elk.
  - a) requirement overlap on the winter range.
  - b) summer range requirements.
10. Management objectives and population regulation.
  - a) hunting.
  - b) viewing.
  - c) research.

Mountain goat trapping and transplants have evolved from a relatively crude procedure to one which is more objective and quantifiable. The capture and handling of goats has been improved while mortality factors are better understood and compensated for during handling (heat prostration, trap structure to reduce injuries, drug related mortality, C.M. or W.M.D., etc.).

In addition to a qualitative assessment of the transplant site, a quantitative assessment using a variety of indices could be developed. Each criteria could be rated with a numerical value (ie. aspect 3, yield 5). Subsequently, sites could be compared solely on the basis of a total numerical value for each site. Weighting factors could be applied to individual criteria or criteria groups. Similarly, limiting factors could have minimum values below which they negated the total numerical value and would not allow a transplant. Quantitative assessment of the total amount of each criteria (total area of south exposure, seasonal yield,

seasonal radiation) could be used in place of index values.

There are a large variety of qualitative and quantitative methods that can be designed for site assessment. However, in order to determine validity of the method and improve predictability, animal population response (productivity, recruitment, rate of increase, etc.) must be measured in relation to the criteria selected and measured.

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## QUESTIONS - RESPONSES

Anonymous: What has been the incidence of goring in multiple captures?

Daryll Hebert: We haven't had any multiple captures. The only one that I know of was two that were transported, I think they were going to Calgary, one female gored a male 30 or 32 times, but I haven't had any multiple captures, and no losses of that type.

Anonymous: Nobody used a corral trap?

Daryll Hebert: Yes, I caught animals in the corral trap, but it was always singles. I still don't know why. There were incidences probably where there were more than one animal in the corral trap, but several of them climbed out over the top until I got that corrected. There was no damage that I know of; certainly no blood or any evidence that a goat was hurt while there was more than one in the corral trap.

Jerry Brown: Has anybody used rompun on goats?

Daryll Hebert: We've used rompun on sheep, but we haven't used it on goats; not yet. I don't know that we will; we'll probably use a mixture of rompun and M99 on our goats, not straight rompun; because I think we will be looking at as quick a "knock down" time as we can get in those fairly rough situations and we'll probably use M99.

Matt Kniesel: What characteristics would you look for as far as suitable wintering habitat in; like the Rocky Mountain areas?

Daryll Hebert: There are probably in the states, Lon (Kuck) and other people that have spent more time looking at the Rocky Mountain winter habitat than I have. My experience in the Kootenai's anyway has been that there were looking at mid-elevation sites again with canopies, mature canopies, fairly steep areas where canopies shed the snow, but still allow a lot of radiant energy and maximal snow displacement off that particular range. There is two things that I have done in here. One is to summarize our trapping information on one table. The other thing I did was list a series of transplant criteria that might be used, and the fellow from New Mexico (Randall E. Grunigen) attempted to weigh those types of criteria. I think that what weighting implies is that we know something about biology when we probably really don't because we are all sort of studying those aspects of it when we're weighting them. But, I think it's a good process and it's what has to be done regardless of how little we know about certain aspects of those criteria. I think the weighting has to be done and I think that will give us a better handle on what a winter range is and how important a winter range is. Once we've set up the framework of quantifying it the first time, we can work against it with anything that we do that either agrees with it or disagrees with it and probably improve that weighting. I think what I'm going to do now is go back and take these criteria and try and put some weights on them myself. It will be changed obviously over the next little while, but at least it will be a start.