Report on the Small Mammals
of the
Vermilion Pass Burn

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INTRODUCTION

In early June, 1968 lightning from a late afternoon thunderstorm struck a snag in Marble Canyon in Kootenay National Park, British Columbia. The resulting fire, the Vermilion Pass Fire, spread quickly and in three days destroyed nearly 7,000 acres of climax spruce-fir forest in Banff and Kootenay National Parks. It was the purpose of this study to examine the status of the small mammals inhabiting the site of this fire at a point three years after its occurrence in the hope of producing the foundation for a continuing study of the development of small mammal community structure following a major fire.

DESIGN OF DATA COLLECTION

The small mammals of the Vermilion Pass area were studied by a simple trap, tag, release and recapture method. This program was designed to yield information on the species present, their numbers, their densities and their movements.

Both Sherman and Longworth live traps were placed in approximately equal numbers in a grid system with 10 metres between each trap. The traps were baited with a Burger-Bit and a mixture of peanut-butter and rolled oats. This combination was expected to cover a broad spectrum of food preferences. Each trap was covered with any available material in order to protect it from the sun. No bedding was provided.

The grids were located in situations that rather than being subjectively determined as typical were, rather, subjectively determined not to be atypical. To provide a degree of continuity, almost all grids were located so that they would include a microtopographical valley, sidehill and ridge top. The grids were measured with a steel tape and angles were "eyeballed." Detailed descriptions of the grid sites (e.g., vegetation cover, slope, soil, etc.) were not made as the degree of refinement inherent in these descriptions and that of the data collection were deemed to be incompatible.

Throughout the summer, 26 grids involving 536 traps were established. These grids were of two types. The first grid type was designed to provide the study with data on a comparatively large scale over the entire duration of the study. These grids were organized within three transects of 36-trap grids at 500 foot elevation differences. The first element of the two digit code for this grid type is a number referring to the transect number while the second refers to the grid number within that transect. Transect #1 was established within the unburned timber to examine the pristine situation. Transect #2 was located within the burn approximately 75 metres from the burn edge in order to sample the effect of edge on recolonization. Transect #3 was located in the middle of the burn to determine the situation where sources of colonizing animals were distant. The second grid type was instituted to examine particular situations not covered by the transects and to augment the data gathered on the transects. Due to limitations in the number of traps available, these grids were only 4x4 in dimension. The first element of their code is a letter.

Upon capture, each animal was individually marked by attaching to the ear a numbered fingerling fish tag. In addition, each was sexed, weighed with a spring balance and measured from nose tip to tail root with calipers. Special features were noted, such as pregnancy, nipple condition and testes condition.

DESCRIPTION OF STUDY AREAS

The trap grids and their descriptions are as follows:

1-1: a 6x6 grid in the wood at elevation 5250 on the SE side of the highway. It is located near the weather station at the S end of the burn. The underbrush and blowdown timber is very dense in this area.

1-2: a 6x6 grid in the woods at elevation 5750 above 1-1. Located approximately 25 metres from the burn edge. Similar to 1-1 but with less dense underbrush.

2-1: a 6x6 grid in the burn approximately 75 metres from the burn edge at elevation 5250. Located near 1-1. This area was burned quite hard and there is little regeneration.

2-2: a 6x6 grid in the burn at elevation 5750 near 1-2. Located approximately 50 metres from the burn edge. This area was burned fairly heavily but some twigs remain on the tree-tops.

3-1: a 6x6 grid in the burn at elevation 5250 on the SE side of the highway near the weather station on the midburn cutline. This area was burned very heavily and there is little regeneration.

3-2: a 6x6 grid in the burn at 5750 feet elevation approximately 75 metres from the midburn cutline. Although fairly heavily burnt there is quite a bit of regeneration by annual plants in this area.

3-3: a 6x6 grid in the burn at 6250 feet elevation approximately 100 metres from the midburn cutline. Heavily burnt with little regeneration.

A-1: a 4x4 grid on the lightly burned-stream-side flats near the weather station at elevation 5250 on the midburn cutline. This area is covered with tall grasses.

A-2: a 4x4 grid directly across the stream from A-1. Similar in appearance.

B-1: a 4x4 grid at elevation 5250 on the NW side of the highway in the burn. It is located across from the Stanley Glacier trail. A good deal of regeneration has occurred in this area.

B-2: a 4x4 grid at elevation 5750 above B-1. Very little topsoil remains on this area and there has been little regeneration. There is quite a bit of cover from burned brushpiles.

C-1: a 4x4 grid at elevation 6250 near a patch of unburned timber located 100 metres S of the midburn cutline. Heavily burnt with little regeneration.

C-2: a 4x4 grid in the 50 metre wide patch of unburned mentioned above. Very similar to area 2-2 in appearance.

D-1: a 4x4 grid at elevation 5750 on the SE side of the highway S of the Banff-Kootenay cutline.

D-2: a 4x4 grid at elevation 6250 above D-1. Similar in appearance to D-1.

E-1: a 4x4 grid in the burn at elevation 5750 above the gravel pit on the NW side of the highway. Located 50 metres from the burn edge. Heavily burnt but with some grass regeneration.

E-2: a 4x4 grid in the woods near E-1. Located 20 metres from the burn edge. Very dense underbrush.

F-1: a 4x4 grid situated on one of Dennis Dubé's vegetation study plots. This plot is located within the burn on the SE side of the highway approximately 150 metres S of the Banff-Kootenay border and 30 metres from the road. Refer to Dubé's work for a complete description of this area.

G-1: a 4x4 grid located adjacent to one of Pauline Otell's vegetation study plots. This plot is located directly above the highway on the large NW facing avalanche slope 200 metres N of the Stanley Glacier trail turnout. The exact location of the grid was sparsely covered with burnt timber until it was carried away in the large avalanche of January, 1971. This area is well covered with grasses and forbs.

G-2: a 4x4 grid located in the burnt timber directly N of grid G-1. There has been little regeneration on this area.

H-1, H-2, H-3, H-4: a complex of four 4x4 grids located in and immediately N of the deep gorge cut by Stanley Creek at the head of its hanging valley. This canyon is sufficiently deep to have caused the fire to leave the trees in it unharmed and to have created a shadow effect allowing a patch of timber N of it to escape destruction. H-1 was placed in the timber at the base of the canyon. H-2 is situated in the woods N of the canyon. H-3 is in the burn adjacent to H-2. H-4 was placed in the burned area at the base of the gorge where the incline of the walls was gradual enough to allow the fire access. Both H-1 and H-4 were placed as close as possible to the stream. The burn in this vicinity was very heavy and there is almost no regeneration. The forest is similar in appearance to 2-2.

I-1: a 4x4 grid situated within one of Dennis Dubé's vegetation plots. The area is located approximately one mile N of Storm Mountain Lodge and was burned around 40 years ago and the burned timber salvaged shortly thereafter. Refer to Dubé's work for a complete description.

I-2: a 4x4 grid located on Dennis Dubé's vegetation plot approximately ¼ mile S of the Marble Canyon Warden Station. This area was burned 250 years ago.

These plots may be considered to represent 5 major habitat types: pristine forest, forest pockets, successional forest, burn edges and the middle of the burn.

RESULTS

The gross quantitative results of the two months of work are presented in Table 1.

A total of 9288 traps were checked over the summer. Slightly fewer were checked in August than in July due to a greater emphasis on the smaller and more widely scattered 4x4 grids in August. Throughout the summer, 238 individuals were captured (exclusive of *Citellus* and *Tamiasciurus*) and individually marked. These 238 animals were captured a total of 550 times for an average return rate of 2.28 per animal.

The percentage of trap success rose dramatically from 4.27% in July to 8.08% in August. For the entire summer, the trap success was 5.92% with a range from 21.45% (B-2) to 0.0% (E-1 and H-3). The rate of trap death remained essentially constant through the summer at about 7%. Such a high rate of trap death is unfortunate and has undoubtedly biased the results to some degree.

Species Present

Throughout the study, individuals of 8 and possibly 9 species were captured. These species are:

1) *Clethrionomys gapperi* - the boreal redback vole
2) *Peromyscus maniculatus* - the white-footed deer mouse
3) *Microtus pennsylvanicus* - the meadow vole
4) *Citellus lateralis* - the golden-mantled ground squirrel
5) *Tamiasciurus hudsonicus* - the red squirrel
6) *Sorex cinereus* - the Cinereus shrew
7) *Zapus princips* - the western jumping mouse
8) *Eutamias amoenus* - the rufous tailed chipmunk (NORTH WESTERN ? CHIPMUNK)
9) *Eutamias minimus (?)* - the least chipmunk

Citellus and *Tamiasciurus* will not be treated in subsequent analyses as their large size lent considerable trap bias to their capture. *Sorex* likewise will not be treated as its small weight was unlikely to trip the treadle of most traps.

Only one specimen of *Zapus* was captured. This was in the tall streamside grass of area A-2. The other two streamside grids (H-1 and H-4) lacked the tall grass which is probably essential for the presence of this species.

The situation of *Eutamias* on the burn is unfortunately very confused. I had considered all chipmunks captured to be of the *E. amoenus* species. Upon subsequent investigation, however, I found it likely that while *E. amoenus* may be inhabiting low elevations, *E. minimus*, which is superficially identical to *E. amoenus*, may be inhabiting the higher elevations. The failure to capture any chipmunks at elevation 6250, however, (Table 2) indicates the probable absence of *E. minimus* on the burn. Subsequent studies should include a close look at this situation.

The presence of *Phenacomys* was not evident on the burn as reported by a Kootenay Park naturalist. However, *Phenacomys* and *Microtus* are difficult to distinguish under field conditions and I may have identified some specimens of *Phenacomys* as *Microtus*. The skulls of two animals were examined under a dissecting microscope and were definitely *Microtus* as evidenced by the morphology of the molariform teeth.

Table 2 indicates for each area and species, the number of individual captures and the total number of captures made. It shows that the only species present in the pristine forest is *Clethrionomys*, a stenotopic species usually restricted to dense forests. The burned area is strikingly different in composition. In the middle of the burn, the major species present are *Peromyscus* and *Eutamias*. Both are eurytopic species that border on omniverousness. The edge of the burn shows an interesting pattern; those areas adjacent to large tracts of pristine forest (2-1, 2-2, E-1) are inhabited (if at all) primarily by the forest dwelling *Clethrionomys* while those areas adjacent to small pockets of unburned timber are inhabited by the burn dwelling *Peromyscus*. This raises questions about the dynamics of colonization that will be discussed under a later heading.

Another interesting pattern is indicated by Table 2. It shows that the timbered areas exhibit much more of a tendency to be inhabited by a single species than do burned areas. The occurrence of individuals of the most common species expressed as a percentage of the individuals of all species might be considered to be a rough index of monospecific inhabitation of an area. Table 2 presents this index calculated for each area and averaged for each area type.

The question might be raised as to why such an obvious difference should occur. Three possible explanations occur to me:

1) any single area of the burn might constitute a greater diversity of ecological niches than does any single area of the forest.

2) the burn may be in a state of ecological flux with a highly unstable competitive structure. Due to Gause's exclusion principle, this situation would be expected to resolve itself in future years, with a concomitant increase in monospecific inhabitation.

3) it is unlikely that any small mammal has evolved specifically to exploit the burn niche. Burns are transitory and widely scattered phenomena and an animal ecologically specialized for burn exploitation would have to be highly mobile. To a certain extent, this is the case of the moose but it might be expected that any small mammal is insufficiently mobile to have evolved such a specialization.

Density

The original purpose for marking the animals was so that the numbers present on the study areas could be determined by a Lincoln index or one of its derivatives. This method was rendered unacceptable by the high rates of mortality and recruitment observed. An insufficient number of captures were made for application of Jolly's stochastic method so a method of analysis had to be developed.

In the method utilized, five types of individuals were defined on the basis of probability of recapture.

1) Type 1 - an animal captured 2 or more times with a time span of 2 or more days between first and last capture.

2) Type 2 - an individual captured once with 2 or more days of chance to be recaptured.

3) Type 3 - more than 1 capture within a time span of 2 days with 2 or more days of chance at recapture thereafter.

4) Type 4 - classified as a resident in the past but untrapped in 2 or more subsequent days of chance.

5) Type 5 - an animal captured with less than 2 days of chance of recapture thereafter.

Low and high estimates of the number of residents and of transients in an area were calculated as follows:

low number of residents = #1
high number of residents = #1 + #4 + #5
low number of transients = #2
high number of transients = #2 + #3

This method is somewhat arbitrary and is based on several assumptions. First, there must be no trap biases such as trap shyness, "trap-happiness," non-functional traps, lost tags, stolen bait, etc. And secondly, during each trapping period, every individual whose home range includes one or more traps is captured. On the basis of these objections, the estimated number of residents is probably consistently low while the estimated number of transients is too high. The method also has an unfortunate feature in that those animals captured directly prior to the final termination of trapping have no chance at recapture and are grouped as Type 5's with a resultant large value for the high estimation of August residents.

Table 3 presents estimations of the denisty of resident and transient mice in each area over the summer. It shows how densities vary between areas, between habitat types and through time. Table 4 indicates the average densities in each habitat type and the standard deviation between samples for both mice and chipmunks. Successional forest habitat was not included due to an inadequate sample size. It must be emphasized that these values are approximate.

Table 3 indicates that by far the greatest densities of mice occur in the pristine forest while the edge of the burn is the most sparsely populated. The least heterogeneity between areas of a habitat type is found in the pristine woods while the greatest is in the middle of the burn.

In order to test whether there were any statistically significant differences in the estimated densities of habitat types, a Student "t" test was utilized. One of the assumptions of a "t" test is that the two population variances are equal. Table 4 indicates that they may be quite distinct, therefore, an F test was performed to test the equality of the population variances. In all but 2 cases, there were no significant differences and a normal "t" statistic was calculated. In two cases in which the variances were significantly different (marked with an asterisk in Figure 1), a modified "t" value was calculated by a method mentioned by Snedecor and Cochrane (1967).

Figure 1 presents t values and whether they are significant over the .05 level of probability. It shows that significant differences in density estimates occur only between the pristine forest and the middle of the burn and between the pristine forest and the edge of the burn.

Juvenility and Transience in Mice

A juvenile individual was defined on the basis of weight. *Clethrionomys* and *Peromyscus* were considered to be juvenile if the average weight of all captures was less than 20 grams. A *Peromyscus* was defined as juvenile if it weighed less than an average of 18 grams. These limits result in a classification including sub-adults in the juvenile class. The definitions are, of course, arbitrary. Also, juveniles are probably less likely to be trapped than adults so the figures should be considered as being only comparative.

Table 5 contains data on juvenility and shows that the percentage of juveniles in the total number of individuals captured increased from July to August. It also shows that only in the middle of the burn are rates of juvenility high. This would indicate that the middle of the burn contains rapidly expanding mouse populations while those of other areas are more nearly static.

Several instances of migration and temporary excursions from the home range were documented by captures of specific individuals on 2 areas. *Peromyscus* #426 was initially captured three times on grid A-1. He was then captured across the stream in A-2, next on A-1 and then once again on A-2. *Peromyscus* #427 was captured three times on A-1, then twice on 3-1 (a journey of 250 metres) and then once again on A-1. A male *Clethrionomys* apparently emigrated from H-1 up the slope to H-2.

Contemporary institutionalized ecological wisdom states that the greatest component of the transient population are usually sub-adults. If this were the case in the present situation, the percentage of juvenile transients would be expected to be greater than the total percentage of juvenile captures. Table 5 shows no consistent relationship between these two indices. The structure of the transient population appears to be identical to the structure of the population as a whole.

Dynamics of Colonization

By reference to Table 2 it may be observed that, in most cases, very few mice were captured in the burn during July. This may be due either to an initial trap-shyness or to very low population levels. It is therefore impossible to determine the nature of the permanent, over-wintering population of mice on the burn. It may either be non-existent or fairly large. In the continuation of this study, I would suggest that trapping begin as early as possible in June in order to clarify this situation.

It may only be surmised as to the location of the source of the *Peromyscus* and *Eutamias* populations inhabiting the middle of the burn. The roadside was lightly burned due to being hosed by fire-trucks during the height of the fire and doubtless is an important source. It is also likely that animals have descended from the unburned hanging valleys.

The most obvious colonizers of the burn would be the *Clethrionomys* from the pristine forest and unburned pockets. Table 2, however, indicates that they are virtually non-existent in the middle of the burn even in the vicinity of unburned pockets, yet they are virtually the only species inhabiting the burn edge. In terms of ecological adaptation this appears to be paradoxical.

This paradox man be resolved by the development of a theoretical model. Suppose that there is a small circular pocket of unburned timber inhabited by *Clethrionomys* surrounded by a large area of burn inhabited by *Peromyscus*. To avoid the introduction of calculus into the model, assume a small mouse-free area surrounding the pocket which is open to colonization by both *Clethrionomys* and *Peromyscus*. Assume that the species are identical in density, migrant output, aggressiveness, travel distance, etc. Given these conditions, it is obvious that *Peromyscus* will be capable of introducing more colonizers into the mouse-free zone since the length of the line separating the mouse-free zone from the area inhabited by *Peromyscus* is greater than that separating *Clethrionomys* from the colonizable area. We might term this capability the "colonizing force" and state that, all things being equal, the colonizing force is a function of the length of the abutment between the area of a colonizing population and the area to be colonized. As the size of a pocket increases, the separatory lines approach the parallel and the colonizing forces approach equality. It should be remembered that the mouse-free zone is a limit case; in actuality it exists only as a continuum in colonizing force.

Of course, the above conditions in equality are never realized and the concept of colonizing force must be considered not only in terms of abutment but also in terms of density and migrant output. Colonizing force may be defined as follows:

$$Fx = Dx \times Ox \times Bx$$

where Fx = colonizing force of species x, Dx = density of species x, Ox = proportion of population of species x that become migrants and Bx = length of line separating species x from the colonizable area.

Colonizing force must not be considered to be an expression of a population's ability to colonize an area but only to put individuals into the colonizable area. The ability to colonize an area also depends upon ecological adaptiveness of that species to the area, interspecific aggressiveness and probably other factors. The ability to colonize an area might be termed the "colonizing potential" and be defined as follows:

$$Px = (Dx \times Ox \times Bx) + Ex + Ax + Ux$$

where Px = colonizing potential of species x, Ex = ecological adaptation of species x to the colonized area, Ax = the interspecific aggressiveness of species x, and Ux = some unknown factors. In the case in question, *Peromyscus* are certainly more ecologically adapted to the burn than are *Clethrionomys* while *Clethrionomys* are probably more aggressive than *Peromyscus*.

Unfortunately, the model is far too rough for practical use but it does show how it is possible for *Clethrionomys* to colonize the edge of the burn while *Peromyscus* inhabits the areas abuting small unburned pockets.

RECOMMENDATIONS FOR FUTURE STUDY

It is perhaps inevitable that a researcher discovers inadequacies in his research and this has certainly been the case for the present study of small mammals in the Vermilion Pass Burn. It is my hope that the study will be continued over the next several years in order to monitor the development of the mammalian component of the evolving burn ecosystem.

In order that future workers might avoid the pitfalls I encountered, the following recommendations are submitted:

1) verify the species of all animals captured.
2) reduce trap death by inclusion of adequate bedding and by shielding the traps from sun and rain.
3) concentrate on a small number of areas and obtain large sample sizes over long time periods.
4) initiate the study at the earliest possible date in order to adequately monitor population increase.
5) quantitatively describe the trapping area for use in causality analysis.

The Vermilion Pass Burn is also inhabited by a sizeable population of moose. The relationship between moose and burns has long been realized but to my knowledge no data is available on the relationship of moose numbers to burn succession. Such a study would be of considerable interest to wildlife managers. I feel that the Vermilion Pass area would be an ideal location for such a long-term study.

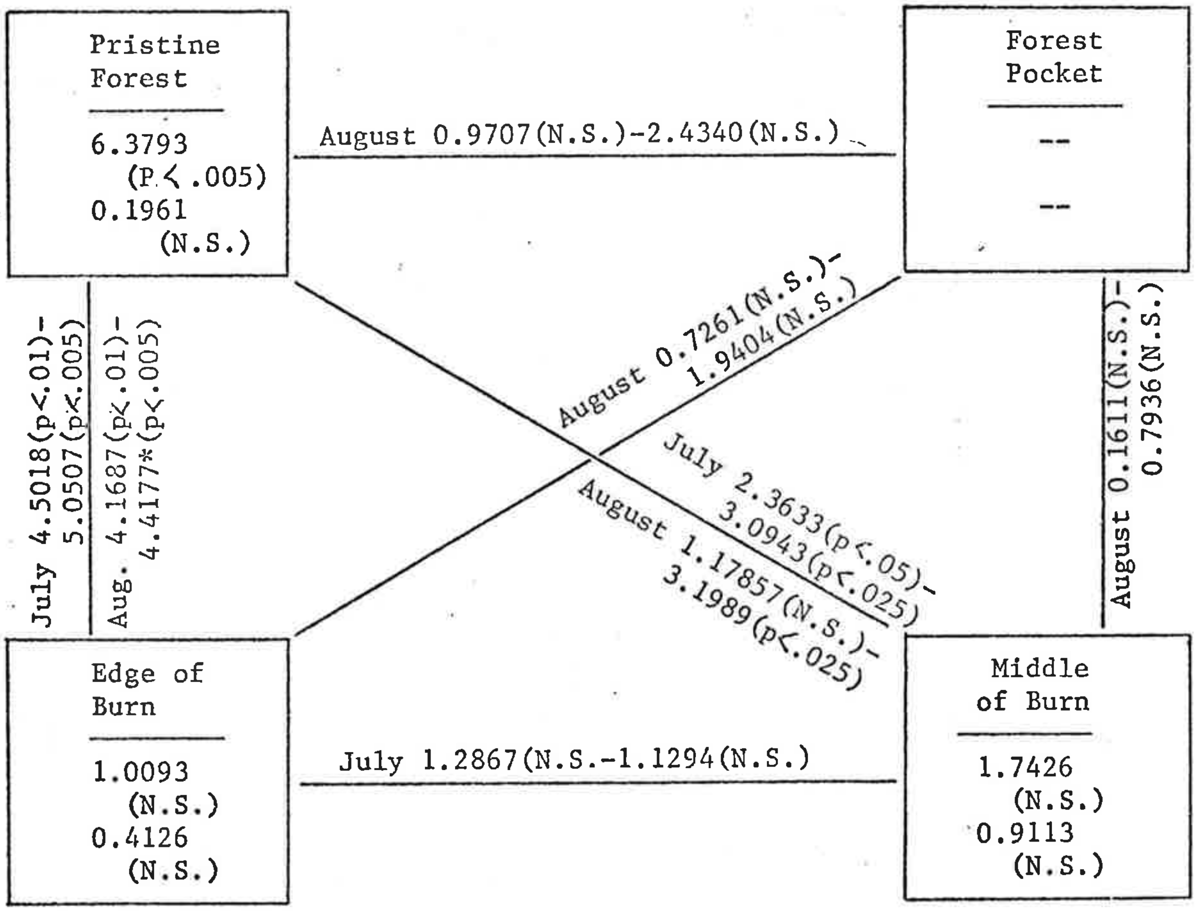
SUMMARY

The purpose of this study was to examine the status of the small mammals present on the site of the Vermilion Pass Fire at a time point three years after its occurrence. The study was conducted by live trapping, tagging and releasing animals on 26 grids representing five major habitat types. It was found that virtually the only species in the pristine forest was *Clethrionomys* while in the middle of the burn the major species were *Peromyscus* and *Eutamias*. Burn edges abutting large tracts of unburned timber were inhabited primarily by *Clethrionomys* while edges abutting small pockets of unburned timber were inhabited by *Peromyscus*. A model was developed to explain this phenomenon. The greatest density of mice was observed in the pristine forest and the area of lowest density was determined to be the burn edge. Several recommendations were made for future study.

Bibliography

Snedecor, G.W. and W.G. Cochrane, 1967, *Statistical Methods*, Iowa State University Press, Ames, Iowa.

Figure 1 - comparison of densities of mice between habitat type. The figures presented "t" values; the first refers to the low estimation of density and the second to the high estimation: t > .05 = N.S. The values within the boxes refer to comparison between months in one habitat type; the upper value is the high estimation and the lower is the low estimation.



* = a modified "t" statistic (see text)

TABLE 1: COMPILATION BY AREA OF TRAP DAYS, INDIVIDUALS CAPTURED, NUMBER OF CAPTURES, PERCENTAGE TRAP SUCCESS, TRAP DEATH AND PERCENTAGE TRAP DEATH.

Area	Trap ½ days before Aug. 2	Trap ½ days after Aug. 2	Total trap ½ days	# individuals captured	# captures before Aug. 2	# captures after Aug. 2	total captures	captures/100 ½ days before August 2	captures/100 ½ days after August 2	total captures per 100 ½ days	# deaths before August 2	# deaths after August 2	total # deaths	deaths/100 captures before August 2	deaths/100 captures after August 2	total deaths per 100 captures
1 - 1	466	254	720	34	58	43	101	12.44	16.92	14.02	3	3	6	5.17	6.97	5.94
1 - 2	290	238	528	24	21	41	62	7.24	17.22	11.74	3	2	5	14.28	4.87	8.06
2 - 1	684	180	864	15	8	19	27	1.16	10.55	3.12	1	3	4	12.50	15.78	14.81
2 - 2	432	252	684	11	6	15	21	1.38	5.95	3.07	1	0	1	16.66	0.00	4.76
3 - 1	756	-	756	16	49	-	49	6.48	-	6.48	4	1	5	8.16	-	8.16
3 - 2	648	288	936	5	3	8	11	0.46	2.77	1.17	0	2	2	0.00	25.00	18.18
3 - 3	648	288	936	6	3	8	11	0.46	2.77	1.17	1	4	5	33.33	50.00	45.45
A - 1	224	-	224	4	11	-	11	4.91	-	4.91	1	0	1	9.09	-	9.09
A - 2	224	-	224	5	11	-	11	4.91	-	4.91	1	0	1	9.09	-	9.09
B - 1	230	105	335	12	19	5	24	8.26	4.76	7.16	1	0	1	5.26	0.00	4.16
B - 2	128	105	233	26	30	20	50	23.43	19.04	21.45	0	0	0	0.00	0.00	0.00
C - 1	128	128	256	4	2	2	4	1.56	1.56	1.56	0	0	0	0.00	0.00	0.00
C - 2	128	128	256	6	3	8	11	2.34	6.25	4.29	1	3	4	33.33	37.50	36.36
D - 1	96	144	240	2	1	4	5	1.04	2.77	2.08	0	0	0	0.00	0.00	0.00
D - 2	48	144	192	4	0	12	12	0.00	8.33	6.25	0	0	0	0.00	0.00	0.00
E - 1	64	144	208	0	0	0	0	0.00	0.00	0.00	0	0	0	0.00	0.00	0.00
E - 2	64	135	199	9	0	18	18	0.00	13.33	9.04	0	1	1	0.00	5.55	5.55
F - 1	-	208	208	13	-	26	26	-	12.50	12.50	-	2	2	-	7.69	7.69
G - 1	-	240	240	8	-	23	23	-	9.58	9.58	-	0	0	-	0.00	0.00
G - 2	-	141	141	3	-	9	9	-	6.38	6.38	-	0	0	-	0.00	0.00
H - 1	-	144	144	7	-	24	24	-	16.66	16.66	-	1	1	-	4.16	4.16
H - 2	-	128	128	3	-	4	4	-	3.12	3.12	-	0	0	-	0.00	0.00
H - 3	-	98	98	0	-	0	0	-	0.00	0.00	-	0	0	-	0.00	0.00
H - 4	-	112	112	8	-	15	15	-	13.39	13.39	-	0	0	-	0.00	0.00
I - 1	-	304	304	10	-	20	20	-	6.57	6.57	-	0	0	-	0.00	0.00
I - 2	-	112	112	1	-	1	1	-	0.89	0.89	-	0	0	-	0.00	0.00
TOTALS	5268	4020	9288	238	255	325	550	4.27	8.08	5.92	17	22	39	7.55	6.76	7.09

TABLE 2: FOR EACH SAMPLING AREA AND SPECIES, THE NUMBER OF INDIVIDUALS CAPTURED AND THE NUMBER OF CAPTURES MADE ARE PRESENTED.

	Clethrionomys		Peromyscus		Microtus		Eutamias		Other		monospecific inhabitation index	
	individuals	captures	individuals	captures	individuals	captures	individuals	captures	individuals	captures		
Pristine Forest												
1 - 1	34	101	-	-	-	-	-	-	-	-	100.0	
1 - 2	23	60	-	-	1	2	-	-	-	-	95.3	98.6
E - 2	9	18	-	-	-	-	-	-	-	-	100.0	
Pockets												
C - 2	6	11	-	-	-	-	-	-	-	-	100.0	
H - 1	7	24	-	-	-	-	-	-	-	-	100.0	100.0
H - 2	3	4	-	-	-	-	-	-	-	-	100.0	
Successional Forest												
I - 1	8	18	-	2	2	-	-	-	-	-	80.0	90.9
I - 2	1	1	-	-	-	-	-	-	-	-	100.0	
Edge of Burn												
2 - 1	10	18	-	-	-	-	5	9	-	-	66.7	
2 - 2	10	20	1	1	-	-	-	-	-	-	90.9	
C - 1	-	-	2	2	1	1	1	1	-	-	50.0	73.8
E - 1	-	-	-	-	-	-	-	-	-	-	--	
H - 3	-	-	-	-	-	-	-	-	-	-	--	
H - 4	1	1	7	14	-	-	-	-	-	-	87.9	
Middle of Burn												
3 - 1	-	-	8	21	-	-	7	28	-	-	53.3	
3 - 2	-	-	2	6	-	-	3	5	-	-	60.0	
3 - 3	-	-	5	10	-	-	-	-	1	1	83.3	
A - 1	-	-	3	10	-	-	-	-	1	1	75.0	
A - 2	-	-	4	10	-	-	-	-	1	1	80.0	
B - 1	-	-	11	23	1	1	-	-	-	-	91.6	
B - 2	2	3	12	24	-	-	12	23	-	-	46.2	78.8
D - 1	-	-	-	-	-	-	2	5	-	-	100.0	
D - 2	-	-	4	12	-	-	-	-	-	-	100.0	
F - 1	-	-	9	22	1	1	3	4	-	-	87.5	
G - 1	-	-	7	23	-	-	1	1	-	-	87.5	
G - 2	-	-	3	9	-	-	-	-	-	-	100.0	

TABLE 3: DENSITY OF RESIDENT AND TRANSIENT MICE PER HECTARE AS A FUNCTION OF AREA AND DATE OF SAMPLING. UPPER FIGURE REPRESENTS RESIDENTS WHILE THE LOWER PARENTHETICAL FIGURE REFERS TO TRANSIENTS.

			July 15		July 31 Aug. 1		Aug. 15		Aug. 31
Pristine Forest	1 - 1		36 (16-20)	48-52 (8)					32-76 (0-8)
	1 - 2				28-40 (4)				40-72 (12)
	E - 2					0* (0)	44-78 (22)		
Forest Pockets	C - 2				11 (0)				11-55 (0)
	H - 1							55-66 (0-11)	
	H - 2							0-33 (0)	
Successional Forest	I - 1								33-55 (22-44)
	I - 2								0-11* (0)
Edge of Burn	2 - 1		0 (0)		16-20 (0)				4-24 (4)
	2 - 2				8-12 (4)				8-16 (16)
	C - 1				0 (22)				0 (11)
	E - 1					0* (0)			
	H - 3							0 (0)	
	H - 4							33-66 (11)	
Middle of Burn	3 - 1		4 (0-8)		12-16 (0-4)				
	3 - 2		1 (0)		0-4 (0)			8 (0)	
	3 - 3		1 (0)		0-4 (0)			8-24 (0)	
	A - 1		22 (11)			22 (0-11)			
	A - 2		11 (0-11)			11-22 (0-11)			
	B - 1				55 (22-33)				22-66 (22)
	B - 2				55 (33)				55-121 (0)
	D - 1					0 (0)	0 (0)		
	D - 2					0 (0)	44 (0)		
	F - 1						66-99 (11)		
	G - 1						66-77 (0)		
	G - 2						22-33 (0)		

TABLE 4: DENSITY OF MICE AND CHIPMUNKS. EXPRESSED AS NUMBER PER HECTARE. CALCULATED AS THE AVERAGE OF THE SAMPLE GRIDS.

	density; mice/ hectare	standard deviation	density; chipmunks/ hectare	standard deviation
Pristine Forest				
July	37.3-42.7	10.1-8.3	0	---
August	38.7-75.3	6.1-3.1	0	---
Forest Pocket				
July	---	---	0	---
August	22.0-51.3	29.1-16.8	0	---
Successional Forest				
July*	---	---	---	---
August*	---	---	---	---
Edge of Burn				
July	6.0-8.0	7.7-9.8	0	---
August	9.0-21.2	13.8-27.1	0-3.3	---
Middle of Burn				
July	16.1-17.3	21.7-21.0	6.4-7.2	13.9-14.5
August	24.9-39.7	24.7-39.7	2.8-6.5	6.6-9.5

* biased data

Table 5: NUMERICAL RATIO AND PERCENTAGE OF JUVENILES IN TOTAL CAPTURE AND IN THE TRANSIENT POPULATIONS. EACH TRANSIENT VALUE IS THE AVERAGE OF THE HIGH AND LOW ESTIMATES OF THE INDIVIDUAL TRANSIENTS PASSING THROUGH THAT AREA.

	ratio juveniles to total capture before August 2	ratio juveniles to total capture after August 2	ratio juvenile transients to total transients before August 2	ratio juvenile transients to total transients after August 2
Pristine Forest				
1 - 1	5/22	12/17	1/6.5	1/1
1 - 2	4/11	13/19	0/1	3/3
E - 2	0/0	5.5/9	0/0	1/2
mean	*27.3%*	*67.8%*	*13.4%*	*83.2%*
Forest Pocket				
C - 2	0/1	3/5	0/0	0/0
H - 1	---	2/1	---	.5/.5
H - 2	---	1.5/3	---	0/0
mean	*0.0%*	*43.3%*	*0.0%*	*100.0%*
Successional Forest				
I - 1	---	5.5/9	---	3.5/3
I - 2	---	0/1	---	0/0
mean	---	*55.0%*	---	*116%*
Edge of Burn				
2 - 1	2/5	6/8	0/0	1/1
2 - 2	1/4	2/8	0/1	0/4
C - 1	1/2	0/1	1/2	0/1
H - 4	---	5/8	---	0/1
mean	*36.3%*	*52.0%*	*33.3%*	*14.3%*
Middle of Burn				
3 - 1	6/7	---	1/1	---
3 - 2	0/1	1/2	0/0	0/0
3 - 3	0/1	4/4	0/0	0/0
A - 1	1/3	---	1/1	0/0
A - 2	2/2	1/2	---	---
B - 1	7/9	4/4	2.5/2.5	2/2
B - 2	5/8	8/11	1/3	0/0
D - 2	0/0	2/4	0/0	0/0
F - 1	---	8/10	---	---
G - 1	---	6/7	---	---
G - 2	---	2/3	---	---
mean	*67.8%*	*80.0%*	*73.3%*	*100.0%*
TOTAL MEAN	45.91%	64.41%	41.7%	64.9%

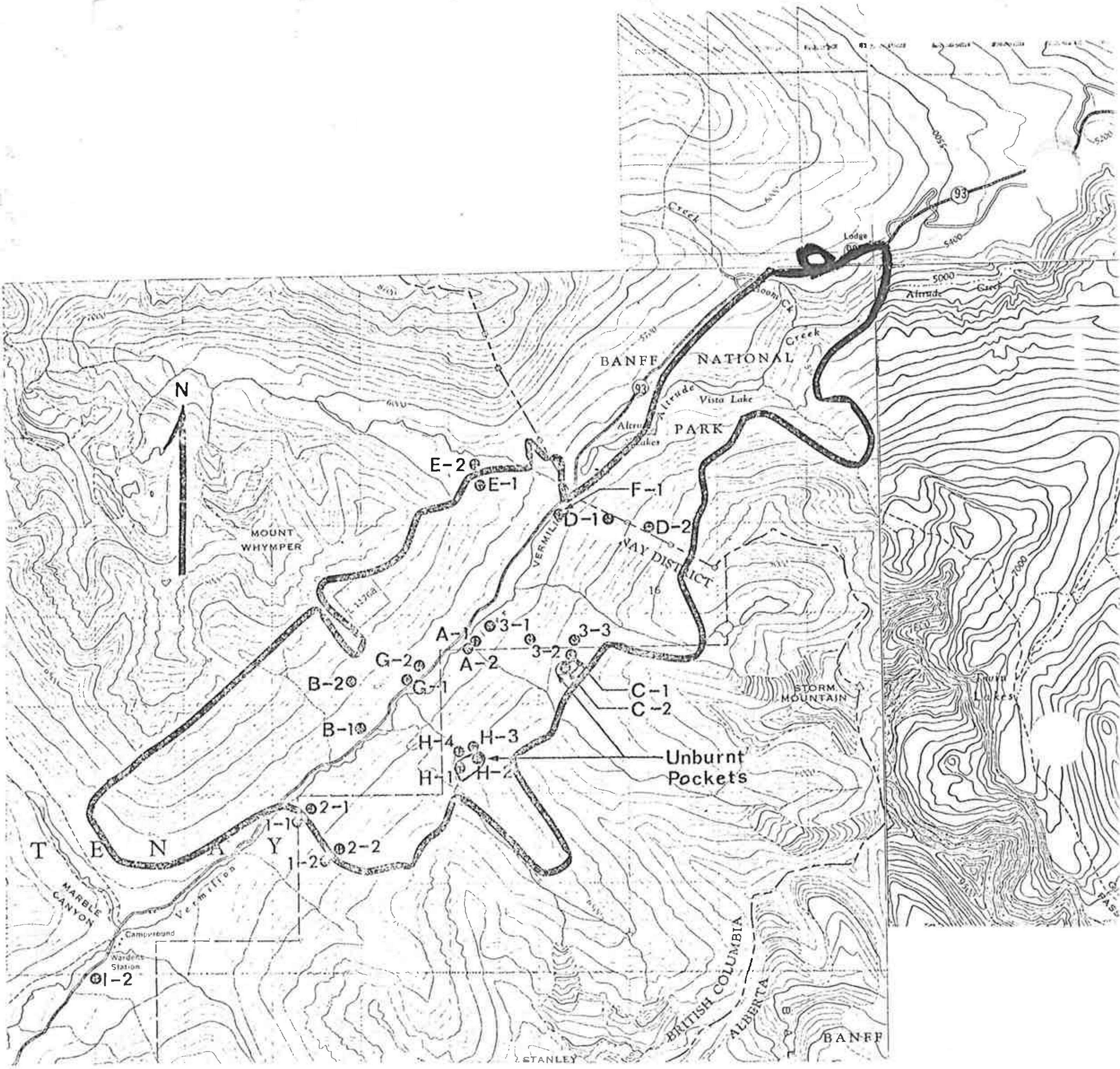


Figure 2. A map showing the approximate location of each study grid and the boundary of the burn. This map is a composite of parts of maps 82 N/1 E, 82 N/8 E, 82 O/4 W, and 82 O/5 W in the 1:50,000 series, Surveys and Mapping Branch, Department of Mines and Technical Surveys. The scale is approximately 22 mm = 1 mile.