FIRE/FUR/MOOSE

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ABSTRACT

The Fire/Fur/Moose research program was started to gather data regarding the sequence and time-frame of vegetative and faunal succession which would occur in stands of black spruce destroyed by wildfire. During this first year of the program excessive vegetation data was gathered from one large, ten year old burn. From analysis of this large data base we were able to decide upon future sample sizes which should provide a reasonable amount of variation. From the small mammal trapping, we found a high density of shrews with an extremely low density of voles and no mice. The moose survey was conducted in January, somewhat later than planned, and the density was quite low. The non-stratification, strip transect technique provided sufficient precision to warrant staying with this technique for large burns. The winter track counts were not carried out and shall be done during the winter of 1992/93. We hope to complete from four to five burns during 1992/93.

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INTRODUCTION

The impact of fire on populations of furbearers and large game is a major concern to the people of the Northwest Territories who live within the treeline. Users have tried to manage fire and wildlife through the Department's Fire Policy by requesting the government to suppress all fires. Logistically and economically this is not always possible. From a wildlife management standpoint it may not always be desirable. In order to manage fire wisely we must consult and plan our strategies before the fires occur. For users to make choices they must have data regarding the time-frame and chronological sequence which the vegetation, prey species, furbearers and large game will follow. This project will attempt to gather that data by examining burns of increasing ages which occurred in black spruce stands and determining when and at what abundance different species of vegetation, small mammals, furbearers and large game return.

This report briefly summarizes the examination of the first large burn with the discussion focussing on the determination of sampling techniques and sample sizes.

METHODS

A portion of the large (1,900,00 ha) ten-year old burn east of Hay River which extends almost from Enterprise to Hay River to Polar Lake, known as HR49/81 (Fig. 1) was examined. The vegetation and small mammals were monitored in August 1991, while the moose survey occurred in January 1992.

1. **Vegetation:**

The study site within the burn was chosen because it was a black spruce stand before the fire. The standing and fallen dead trees were examined and found to be almost entirely black spruce. Using an existing cutline as a baseline, we randomly chose a starting point and direction for the transect lines. The abundance and species makeup of the regenerating vegetation was monitored by examining 42 @ $1m^2$ plots in which the percent cover of each species was recorded as well as the number of stems of each shrub and tree species (Fig. 2). Plots were measured 25m apart along the transect line. The vertical structure of the vegetation was recorded by counting the number of stems of shrubs and trees at ground level, 1.0m, 1.5m and at 2.0m.

When the edge of the burned black spruce stand was reached, we moved perpendicularly for 50m and then continued the transect line back to the baseline. Along

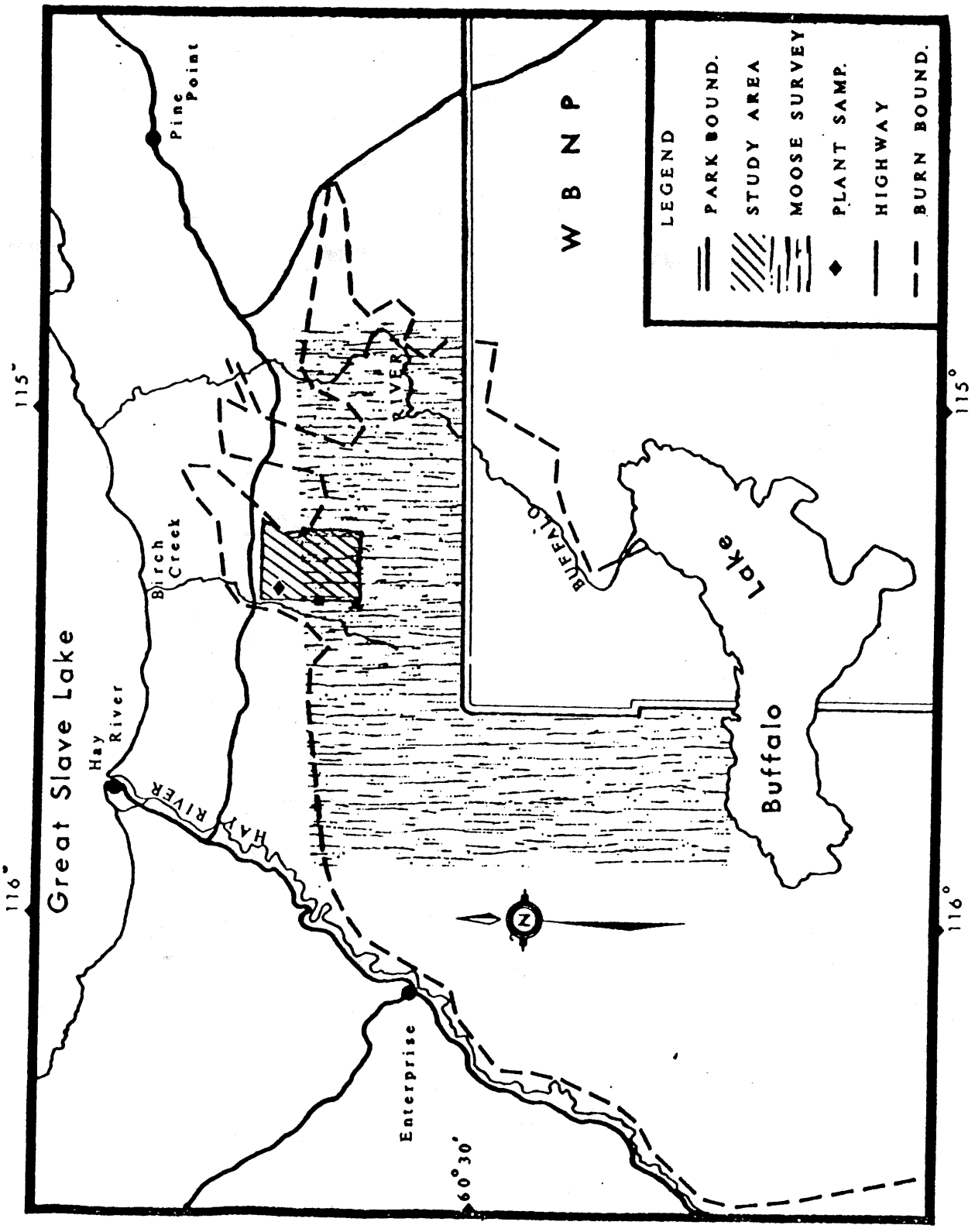

Figure 1. Map of the South Slave area which includes the large 1981 Hay River burn, HY49/81, and indicating the vegetation and small mammal area and the moose survey area.

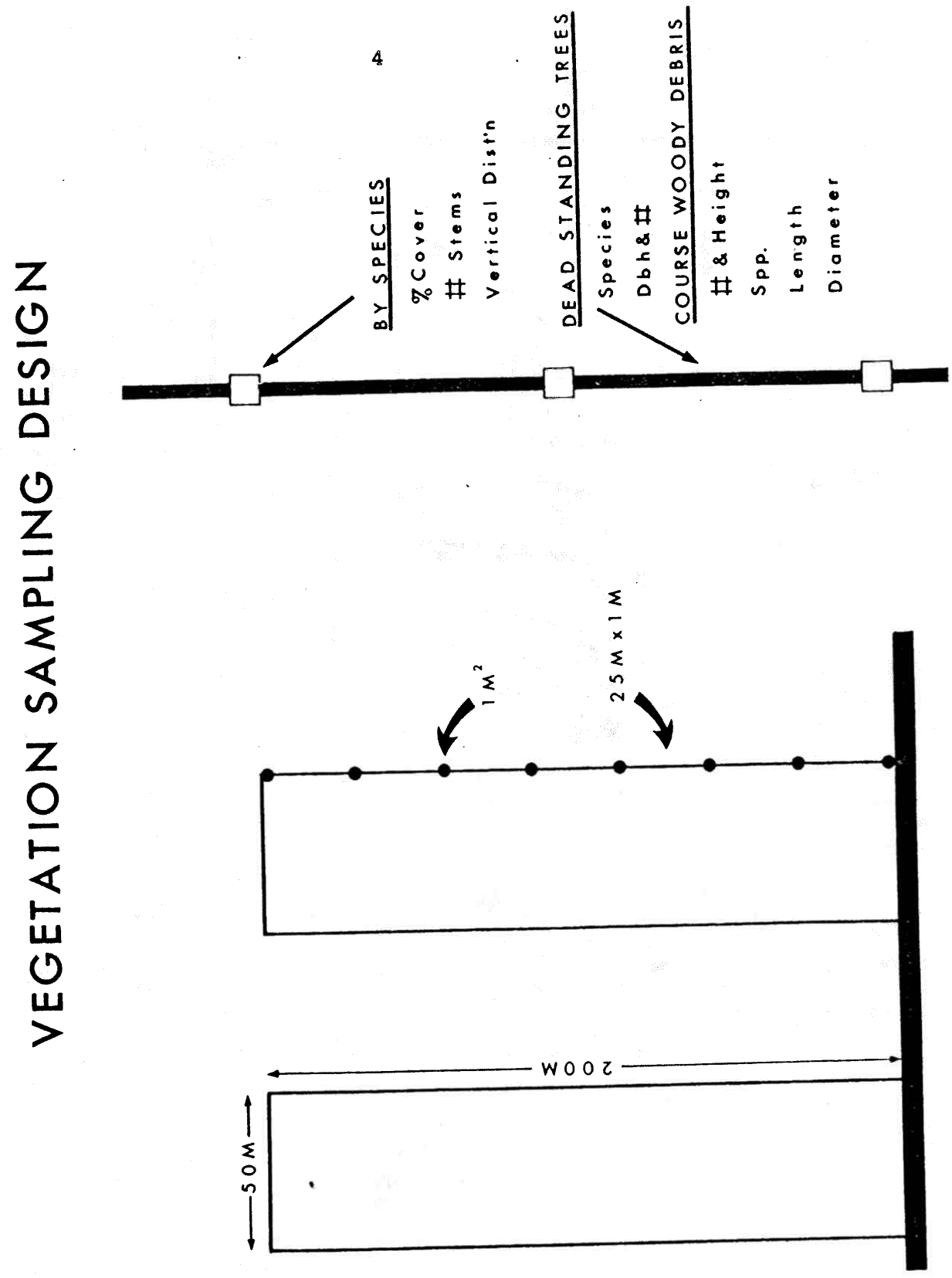

Figure 2. The design of the vegetation sampling grid.

the transect line between the plots we measured the thickness, distance above ground and estimated the length of all intersecting coarse woody debris (CWD). The diameter at breast height (DBH) of all standing dead trees within 50cm of each side of the transect line was also measured.

2. **Small Mammal Snap-trapping:**

In the same study area we conducted three nights of snap-trapping with 300 traps each night (900 Trap-nights {TN}) in order to gather an index of small mammal abundance and to determine which species had colonized the burn. We randomly chose a starting point along the baseline and established six parallel lines 50m apart (Fig. 3). Along each line there were 10 stations 15m apart and at each station two Victor and one Museum Special traps were set, using peanut butter as bait. If the lines crossed wet bogs within the burn, we stratified those out and did not set traps in them. The traps were checked each morning and any dead animals removed and the trap reset.

3. **Moose Survey:**

On January 12, 1992 we flew 25 transects of 15.2km each in a Cessna 185 at a speed of 90 knots and an altitude of 400 feet. Our transect width was 470m on each side of the fixed-wing aircraft or 940m for the strip. Our transects were 3km apart, resulting in a

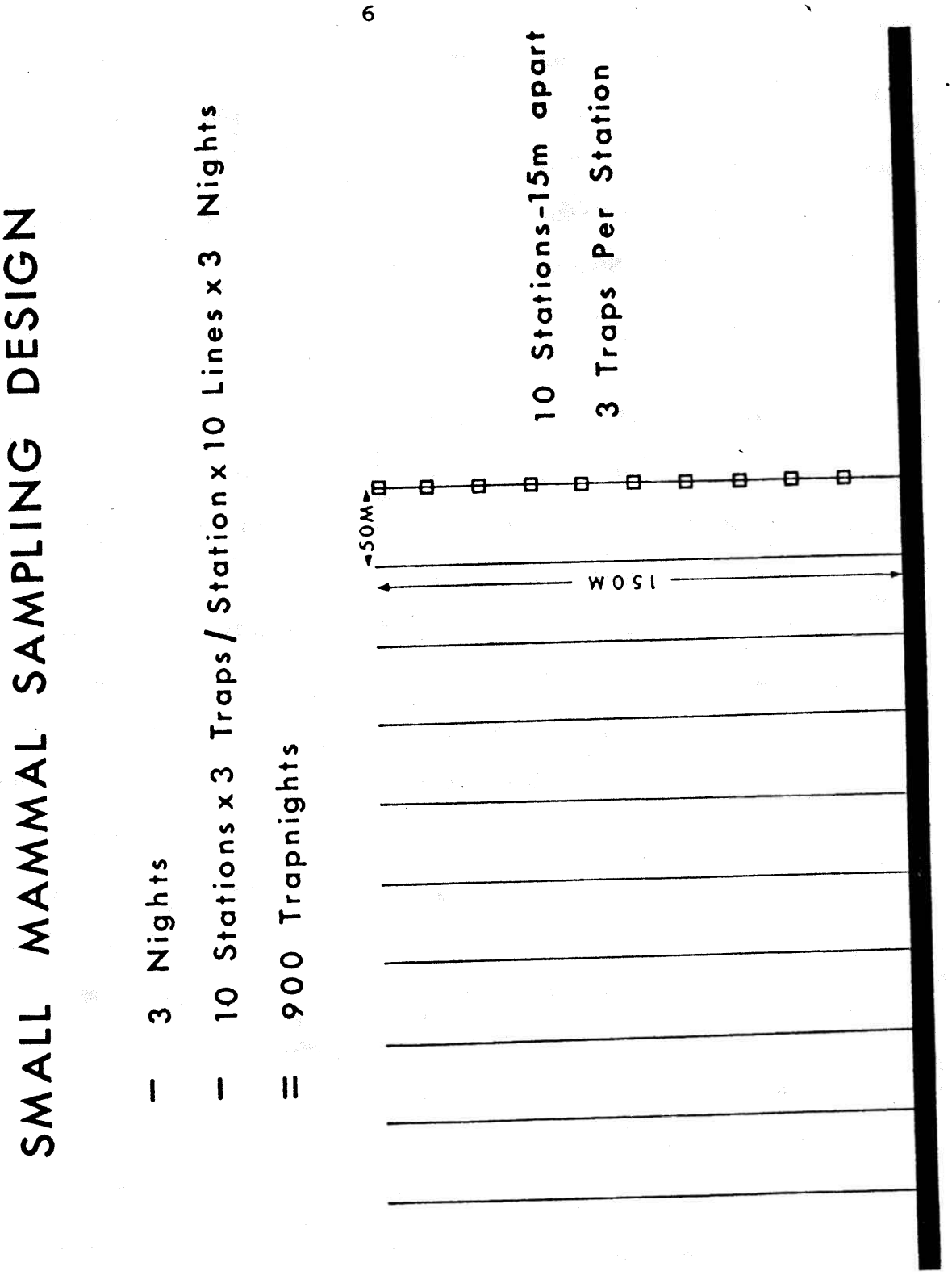

Figure 3. The design of the small mammal trapping grid.

coverage of 33%. The survey area included that area studied during the previous summer but was much more extensive (Fig. 1). We recorded the age and sex of the moose, the habitat in which we found the animals and all other wildlife observed.

4. **Track Counts:**

We were unable to conduct the track counts this winter so shall do them in the early winter of 1992/93. the technique we shall follow is to count all wildlife tracks on 2m wide strips along 60km of existing cutlines in the burn (Fig. 1). This will be accomplished by three people each on their own snow machine following predetermined routes. The 2m strip will be estimated by using the centre of the snow machine as the middle of the strip and stretching out one's arm 1m on each side. From the 60km of track counts, we shall randomly choose 30 individual km and estimate a track count per km (plus Standard Deviation) for each species of interest. These track counts shall be done (or adjusted to) 24 hours after the completion of a snowfall. The habitat type shall be recorded each time a major species track is located.

RESULTS AND DISCUSSION

As indicated in the Introduction, this first annual report shall consider mostly the techniques used and sample sizes required. Data in final reports and publications shall mostly be compared over time, therefore the data from only one burn will not be over emphasized but used to setup the final graphs.

1. **Vegetation:**

We compared the analysis results from the raw data with that from data massaged by an arcsin transformation and then with that from a natural log transformation. In most cases, the natural log transformation provided the lowest Coefficients of Variation (CV) for both percent cover and number of stems (Tables 1 & 2). Therefore, from now on we shall use the natural log transformation on all raw data.

By comparing the changing CV with sample size we found that most percent cover variables had a stable CV by n=20, with one or two requiring a few more samples (Figures 4 and 5). This held for number of stems as well, although it was not as clear cut (Figure 6). Therefore, during the subsequent field seasons we shall limit our m^2 plot examination to a sample size of 30.

Table 1. Coefficients of Variation (CV) for raw and transformed (arcsin and log) vegetation percent cover data for HY49/81 collected in Aug./91.

Vegetation Type	RawCV	ArcCV	LogCV
Duff	0.437	0.278	0.149
Moss	0.916	0.593	0.526
Live Grass	0.684	0.410	0.328
Dead Grass	1.212	0.723	0.542
Herbs	0.671	0.409	0.346
Pine	1.639	1.172	1.050
Potentilla	0.915	0.688	0.610
Rose	1.259	0.983	0.944
Dead Wood	0.956	0.702	0.640
Willow 1	0.919	0.658	0.547
Willow 2	2.483	2.269	2.172
Dwarfbirch	1.376	1.096	0.937
Aspen	2.095	1.760	1.699

Table 2. Coefficients of Variation (CV) for raw and transformed (arcsin and log) the "number of stems" data from HY49/81 collected in Aug./91.

Vegetation Type	RawCV	ArcCV	LogCV
Black Spruce	1.348	0.938	0.903
Pine	1.338	1.010	1.018
Willow 1	1.196	0.800	0.691
Willow 2	2.502	2.310	2.274
Dwarf birch	1.584	1.143	1.015
Aspen	2.567	1.840	1.782
Shepherdia	2.815	2.560	2.600
Poplar	6.417	6.420	6.570

The vertical structure of the vegetation in this ten year old burn was limited (Fig. 7). No shrubs or trees exceeded 1.5m and only dwarf birch and one willow species, Salix mackenzieana Barralt, reached that height.

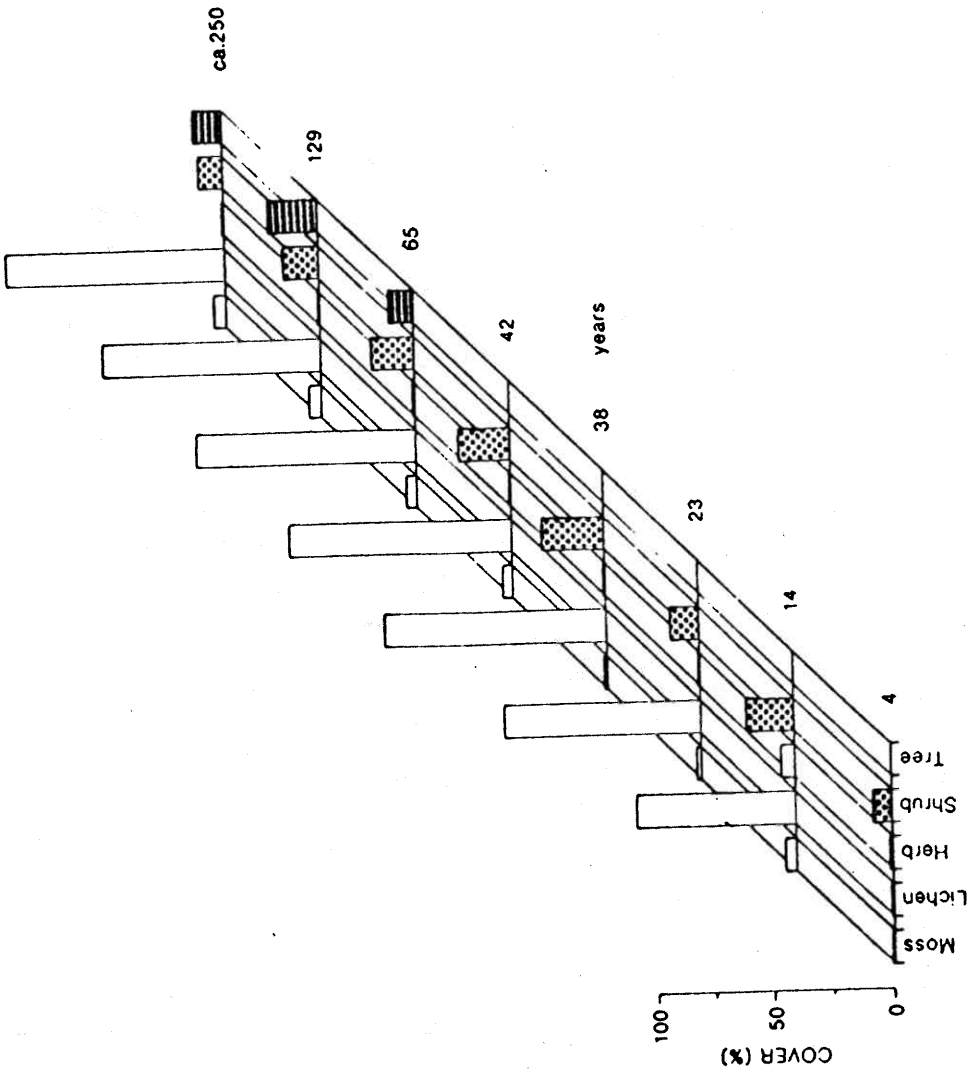

FIG. 2. Changes in vegetation structure during succession. (MORNEAU AND PAYETTE 1989)

Figure 4. An example of the type of graphical comparison over time the data shall be used to portray (from Morneau and Payette, 1989).

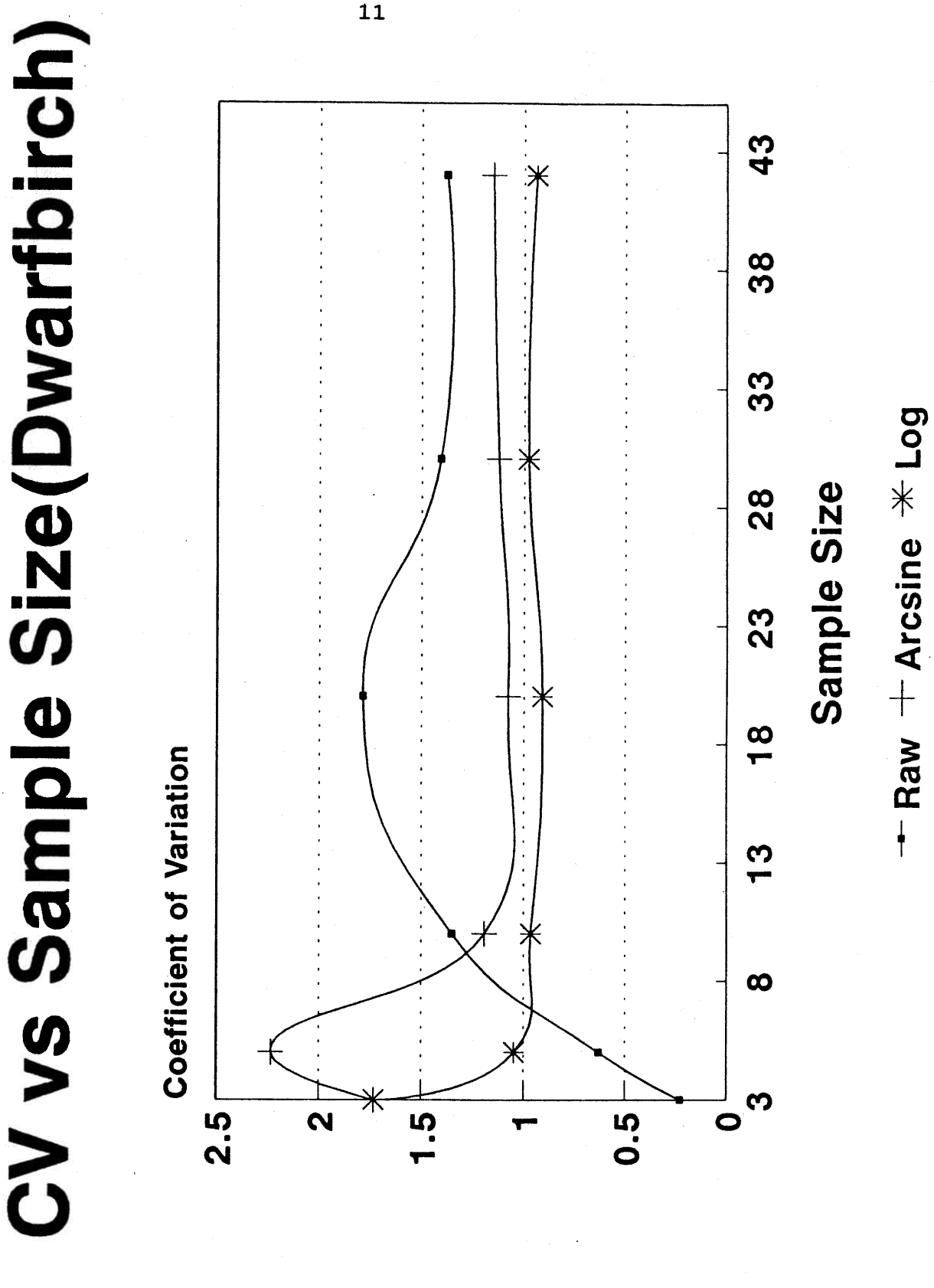

Figure 5. Changes in CV with increasing sample sizes for percent cover of dwarf birch.

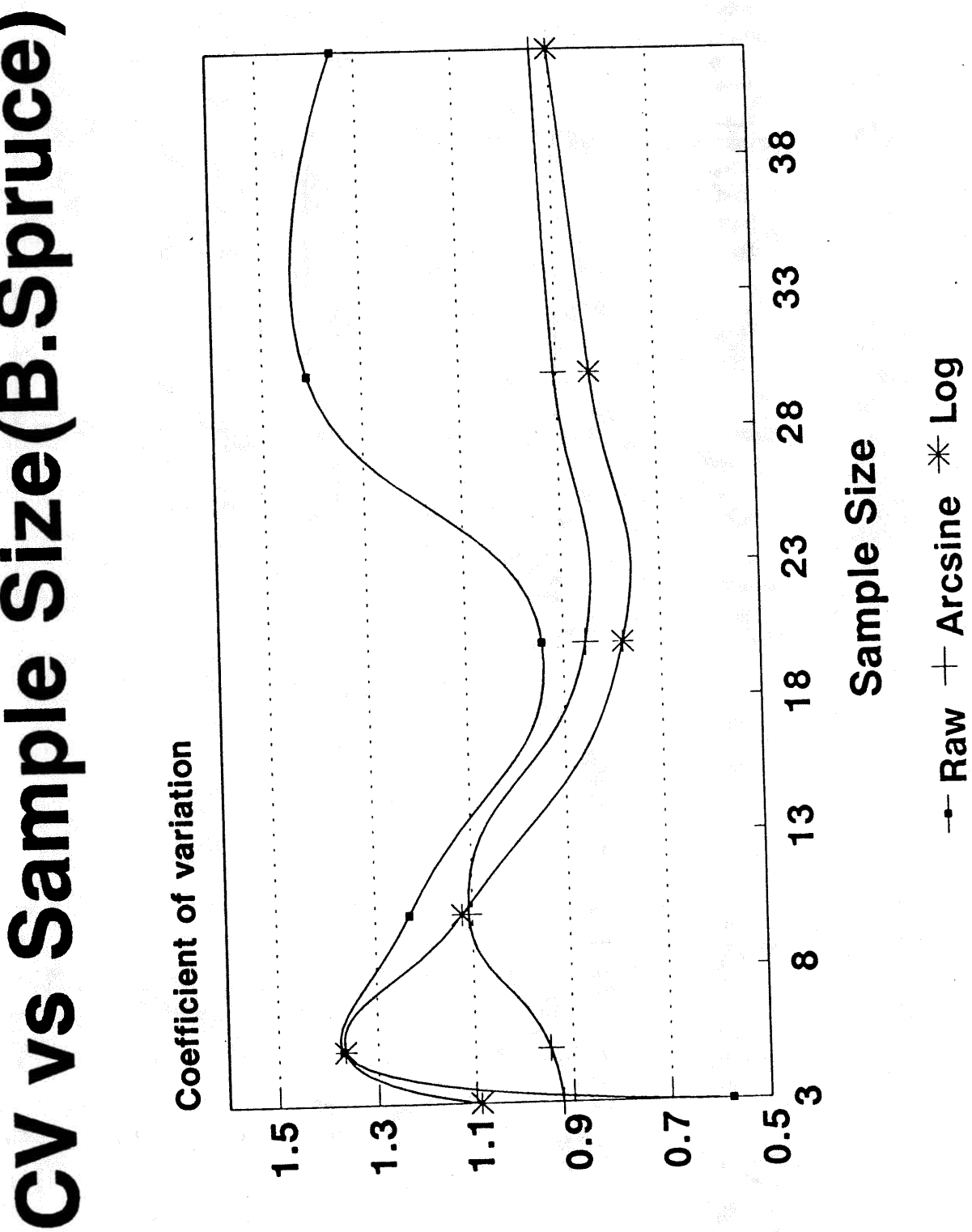

Figure 6. Changes in CV with increasing sample sizes for number of stems of black spruce.

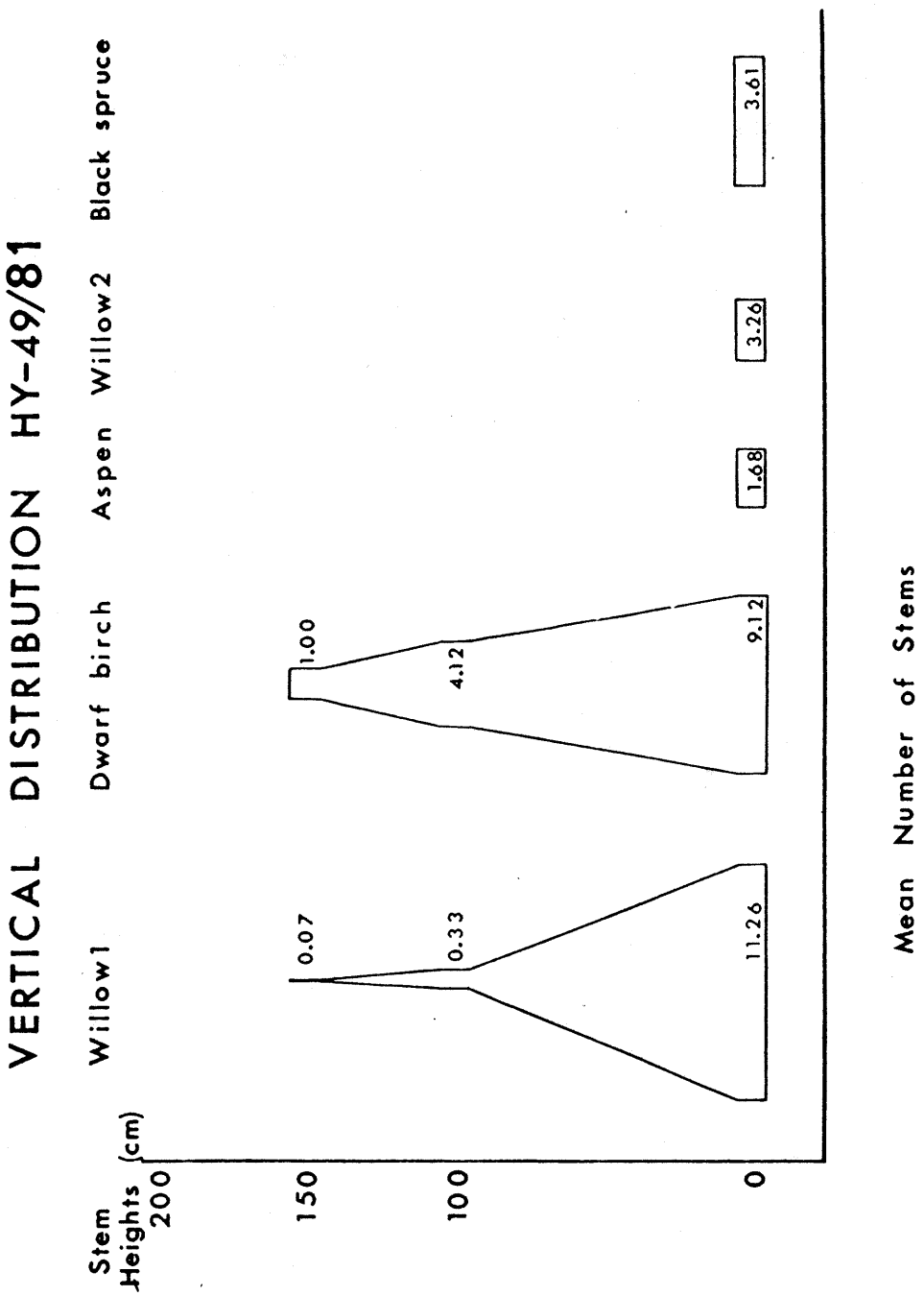

Figure 7. Vertical structure of the shrubs and trees from ground level to 2m.

No black spruce stems exceeded 1m.

In the beginning we measured all of the CWD along the transects but soon found the time required was far more than anticipated. After doing eight of the 25m transects between the m^2 plots, we began to sample the CWD by measuring only the first five logs on the ground and then counting the number in the rest of the 25m transect. We continued to count and measure all dead standing trees within 50cm of the transect line. The distance above ground of the logs seems to be the most variable characteristic (Table 3) but the mean of 21.5cm would seem to suggest good cover possibilities for small mammals and their predators.

Table 3. Some characteristics of Coarse Woody Debris (CWD) found in the HY49/81 burn in August 1991; DBH= Diameter at Breast Height.

Variable	Range	Mean	S.D.
Log Diameter (m)	1.4-17.3	6.95	3.38
Estimated Log Length (m)	1.0-16.0	5.74	2.99
Distance Above Ground (cm)	0.0-140.0	21.46	24.18
Snag DBH (cm)	1.1-25.0	6.30	4.80

Total number of fallen logs was 223 or 2,124 logs/ha.
Total number of standing snags was 300 or 2,933 snags/ha.

2. **Small Mammal Snap-trapping:**

The results from our first trapping in a burn were quite surprising! During the 900 TN's we managed to catch only one vole or mouse but we did catch 20 shrews

for a total capture rate of 2.3 captures/100 TN's. This high percentage of shrews was not reflected in any of the other small mammal trapping which we had done during this same period in the South Slave area. The shrews accounted for only 2.9-26.3% of the captures in these other areas which were mostly in mature forests. These are capture rates for shrews ranging from 0.2-1.0 captures/100 TN compared to 2.2 captures/100 TN in the burn.

The overall capture rate of 2.3 was the lowest we found of five areas sampled in the South Slave area this year. The other four areas ranged from 3.8 to 9.1 captures/100 TN and all are considered to be at the low phase of the four year vole cycle.

3. **Moose Survey:**

During our one-day (7.1 hours including ferry time) survey we observed 18 moose on transect, three moose off transect, five woodland caribou, two lynx and one fox. This represents a density of 0.05 moose/km^2 and a sex ratio of 45 bulls: 100 cows. The low numbers preclude any other consideration of age or sex ratios. Our Coefficient of Variation was 0.25. This technique of using a fixed-wing aircraft rather than a helicopter to do an unstratified survey seems to provide a sufficiently precise result in burns of this size and age. Therefore, next year we shall follow this technique again but will remain flexible as we begin to examine smaller areas or

areas in which the regeneration is more developed.

One factor which we shall change next year for the moose surveys is to conduct them in late November or early December rather than in mid-winter as was necessary this year. Our concern is that moose may move from the more open burned areas into areas with more mature forest in order to escape winter storms and cold. November/December is also the standard season to conduct moose surveys in the NWT, as well as elsewhere, because of snow and light conditions.

RECOMMENDATIONS

1. Use a sample size of 30 plots to determine vegetation percent cover and number of stems for shrubs.

2. Our monitoring of the number and size of fallen logs should remain flexible depending upon the density found in early transects.

3. Use log transformations on most data.

4. Conduct the moose surveys in November/December.

5. Consider re-trapping the same area for small mammals during a high or increase phase of the cycle in the same season that the other 10 year old burn is sampled.

ACKNOWLEDGMENTS

I would like to thank the many people who helped to get this study started, especially Bob Bailey and Rick Lanoville of the Territorial Fire Centre and the numerous staff of the District office and elsewhere who were kind enough to review the proposal. Chris Carlisle has been very tolerant while helping me learn some of the "ins and outs" of the Forestry field. I would especially like to thank Tom Duncan, Fire/Wildlife Technician, for his efforts in the logistic preparations, data input and data analysis.

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