OUTDOOR EDUCATION

A PROCEDURE FOR SITE ANALYSIS AND SELECTION

by

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B.Sc. University of British Columbia, 1967

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in the College of Education

We accept this thesis as conforming to the

required standard

THE UNIVERSITY OF BRITISH COLUMBIA

APRIL, 1971

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Date April 29/71

ABSTRACT

Recent popularity of interdisciplinary outdoor learning has resulted in a need for a method of selecting adequate learning sites. Observations by the author of outdoor sites presently in use indicated a need for analysis and selection of sites where students could derive the greatest benefit.

A survey was sent to each school district in the province to determine interest in this approach. Results of the survey showed fifty-five percent of the responding school districts have undertaken planning for outdoor education with emphasis in the elementary grades. Fifteen percent of the responding districts are presently developing sites for extended outdoor education and curriculum enrichment. Another seventeen percent would consider this type of site in their future plans.

A term, "corridors of learning", was coined to describe unique and distinct areas within a site. This concept was enlarged to include the potential use by students and teacher of each part of an outdoor site. Curriculum was defined as the total educational potential of a site.

Objectives for outdoor education in this province were phrased by determining the frequency of occurence in the literature of similar objectives. These were then

rephrased so that they would be practical within the British Columbia school system and serve as a basis for viewing the site as the curriculum.

Outdoor education was divided into the field trip approach, day trip approach and residential approach. A literature search and field observations were carried out to isolate problems related to the ecology of the site and the behavioural responses of students using a site. Problems of site availability, useability, physical uniqueness, and student use were considered important selection factors.

Numerical values were assigned to physical site factors for the purpose of comparative analysis of different sites. These numerical values were used to develop a graph for comparing the educational potential of several sites.

ACKNOWLEDGEMENTS

Special thanks are due to Professor D.C. Gillespie for his patience, excellent criticism and valuable editing of the manuscript. I also wish to thank the other members of the committee, Dr. Bandy, Professor P.J. Dooling and Professor Lorne Brown. Their suggestions greatly improved the thesis.

Finally, my gratitude to my patient wife who did most of the typing and without whose understanding and special kind of sacrifice this study would not have been possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Analytical methods useful in the selection of sites for outdoor studies have been developed in this thesis. Ecological factors affecting site suitability as well as student and teacher requirements and specific educational objectives have been considered in establishing the analytical methods.

Making decisions between alternate sites when acquiring land by lease, easement, purchase or rental, requires a prior knowledge of the physical features of a site.

Appendix A contains a division of outdoor education into three modes of approach. Each mode of approach has unique site requirements.

A survey of outdoor education being undertaken and planned by B.C. school districts was carried out to determine the need for this study. The results of the survey are given in Appendix B.

A set of realistic objectives is presented in Appendix C which is based on the literature and outdoor opportunities in B.C.

This thesis is intended to serve as a basis for outdoor educational site analysis and selection by proposing a procedure which includes the learning requirements of students and the effect of their learning activities on the living and non-living parts of a site.

Considerations of a School District for Extended Residential or Day Program Outdoor Studies.

I. Knowledge of Values and Procedures.

Administration, trustees and staff members in a school district must have a prior knowledge of the values and the procedures used for outdoor studies. In most cases this develops from a gradual process of individual and group interest, learning and practice, to the formation of a steering committee to analyse sites.

II. Nature of the Outdoor Site.

A. Program of Activities.

1. The first of two approaches consists of starting with a ready made program, then acquiring a site of unknown potential and attempting to have the site conform to the needs of the program. This approach attempts to take education out of doors.
2. The second procedure involves the analysis of several available areas and the selection of one

on the basis of criteria which will permit the greatest possible variety of activities. In this case a program can be specifically developed from the site.

B. Dangers of Missuse.

Overuse or adverse use of an outdoor site, such as the removal of living organisms or heavier foot traffic than the soil will bear, will result in altering the natural resources for which the site was secured. Once the ecological balance is altered, its educational value is depreciated. Therefore, a knowledge of the stability of the ecology of a site should precede any proposal for heavy student use.

C. Land Management.

Continued good land management requires a full knowledge of the outdoor site. A complete analysis at the early planning stages will help show changes brought about through time.

D. Variations Within the Site

Within a natural area there are many ecological varients. For example, when travelling from a pond to a wooded area one may pass through aquatic plants at the pond's edge, then through reeds, and then through shrubs to reach the trees. Each distinct study area such as the edge of the pond or

the band of shrubs around the pond, or an open grassy area has been loosely called an outdoor classroom, an outdoor laboratory, a field trip site or area, or some other term. Sometimes the term refers to an ecological entity, sometimes to subcomponents of an ecological entity. However, the terms have been applied in many contexts to large and small areas without definition. The idea of landscape corridors for forest recreation and camping has been developed in the State of Wisconsin. However, the idea has not been previously applied to areas uniquely suited for outdoor education.

CHAPTER II

THE ABILITY OF SITES TO SUPPORT OUTDOOR EDUCATION

I. Curriculum and Site

Each site has characteristics which are unique. This means that a repertoire of investigation or lesson topics needs to be developed for use in the site chosen. The extent of the resulting curriculum of studies is limited or extensive, depending on the site. Student learning requirements for recreational, arts, social, or science learning purposes should be satisfied by the chosen site. Preferably, a successful site should have physical features which permit the development of all these requirements. Sites with diverse physical features generally permit an extensive curriculum or course of studies resulting in a high rating on the analysis procedure when compared with sites which are comparatively uniform throughout. A city dumping ground may be extremely unique and may supply important topics but the repertoire of topics would likely limit it to use as a field trip site.

II. The Need for Considering Ecological Characteristics When Selecting an Outdoor Site.

Both duration and intensity of the disruption caused by students due to their collecting, walking, measuring and living activities are a necessary consideration when establishing use categories for the site. Generalizations about the stability and diversity of the species found on a site are difficult to make because generalizations do not apply to all sites. However, long range man-made changes, such as a change in water drainage, would result in a new pyramid of mass, energy and numbers as well as new plant and animal associations. The learning activities of students in an outdoor site should be considered as an outside influence which could overwhelm the self-regulating mechanisms of an ecosystem. The important point here is that a disturbed site will change from the type of community which the area was chosen for, to a different and perhaps less desirable community. To ensure the continued quality of the chosen site, use classifications for the site can be applied to regulate the intensity and duration of human disruption.

For study purposes, the most desirable sites occur where one type of natural area ends and another begins. This could occur where a rock outcropping forces a

change in vegetation from forest to mosses and lichens. Examples of types of natural areas which could be found on a site are; a mud flat, a sandy beach, a sand desert, a mountain brook or a lake.

Readily measurable differences occuring from one distinct type of area to another should be the goal for an outdoor site. Such areas within a site are high interest areas for student investigation. Although the gradients (pH, light, water, nutrients, etc.) are gradual, there are distinct and identifiable lines marking zones where the physical factor(s) have reached their maximum or minimum limit for the support of the dominant species. Such lines are very distinct on exposed salt water beaches and rocks, where bands of attached plants and animals can be seen. This phenomenon is also seen in the vegetation when going from high shrubs, to sedges and grasses and then reeds when travelling from a deciduous forest to marsh or pond, even when there is a uniform gradient in soil moisture.

Transition zones between plant and animal communities found within and between areas, are zones of tension where species from both communities compete under increasingly unfavourable conditions, either with each other and/or with the physical conditions. Some examples of transition zones are the banks of a stream running through a meadow, or the border between forest and

grassland, or between marsh and shrub communities. Such zones also occur between aquatic communities.

Outdoor sites where transition is abrupt are to be valued over sites where communities mix over a great distance and change is gradual. In sites where the controlling physical gradients change rapidly, the transition is abrupt. Transitions occur at water-land boundaries and on sites with sharp changes in elevation. Thus, the greater the number of different types of area; and the more distinct they are; and the closer together they are; the richer the site for all aspects of outdoor study. Figure 1 illustrates this kind of a hypothetical situation.

When such sites are used for study purposes it must be stressed that management and retention is more difficult than it would be for relatively homogeneous outdoor sites.

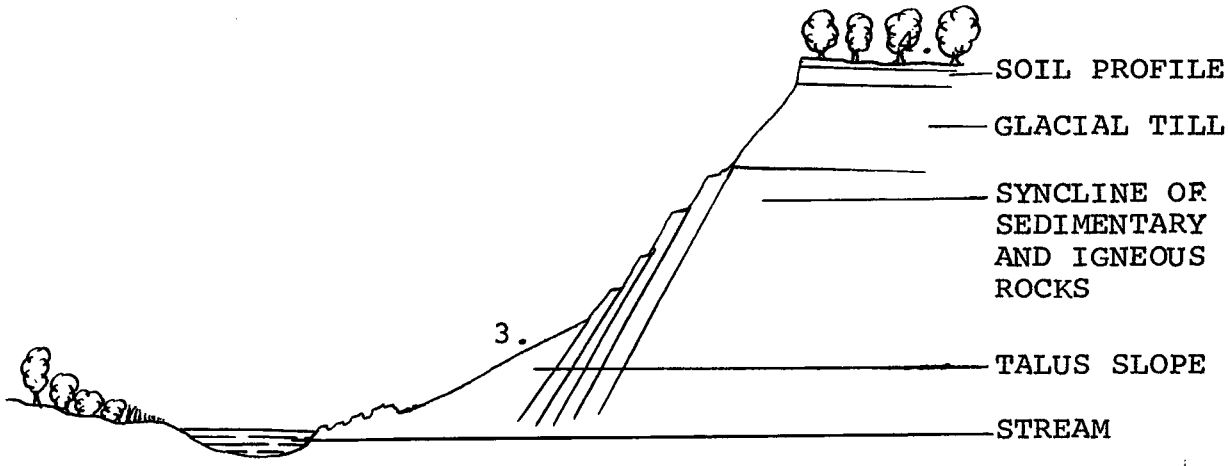
III. Corridors of learning

When a proposed outdoor site is mapped or toured on foot, sub-units or smaller areas within the site become apparent. For the purpose of analysis these areas can be designated according to use and will be called "corridors of learning". These smaller areas vary in shape but tend to be longer than they are wide. Their areas range from the size of a plant association of

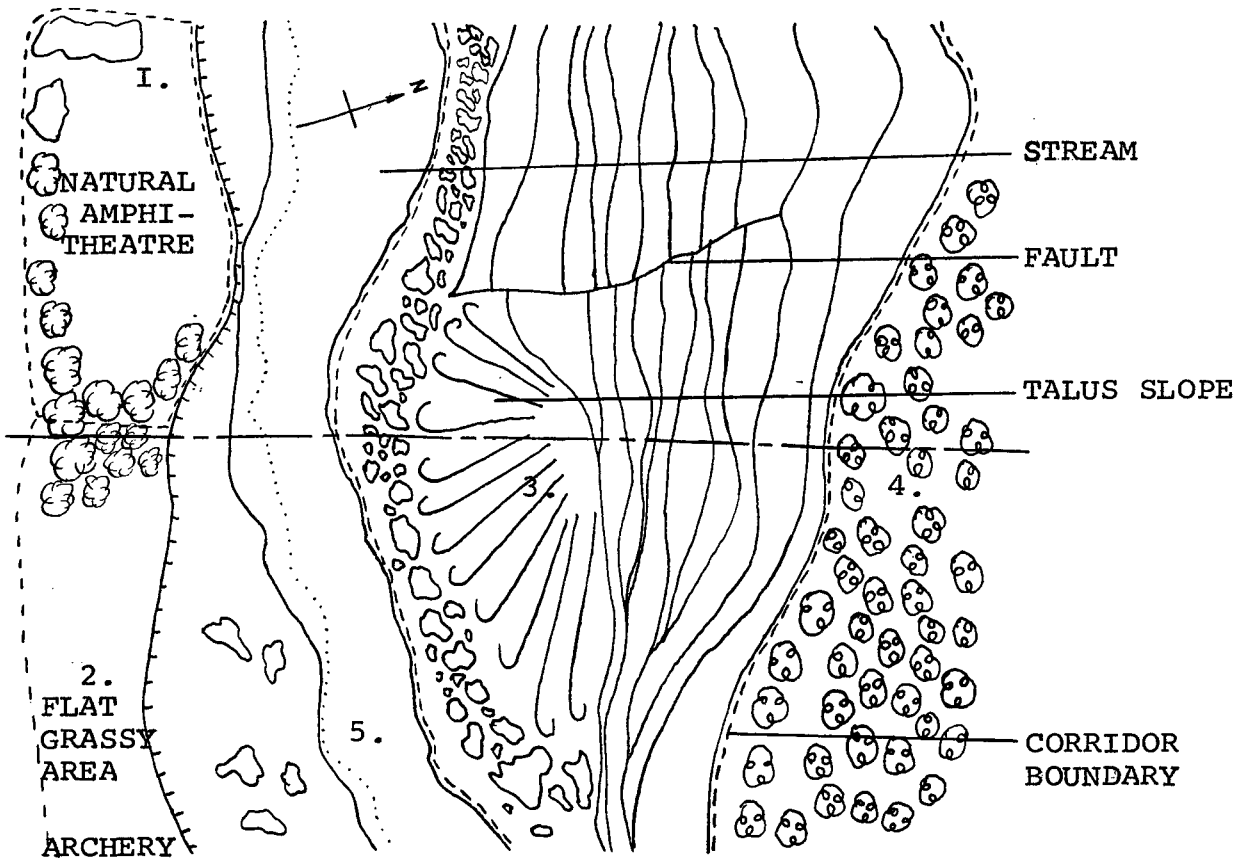
FIGURE I.

A SEGMENT OF AN OUTDOOR SITE WITH FIVE CORRIDORS DESIGNATED ACCORDING TO USE (1. SOCIAL, 2. RECREATIONAL, 3. EARTH SCIENCE, 4. and 5. LIFE SCIENCE STUDIES.)

SCALE 1"=50'



CROSS SECTION THROUGH BROKEN LINE



PLAN VIEW OF AREA

FIGURE 2.

A FIVE ACRE SITE OF TALL DOUGLAS FIR AND WESTERN HEMLOCK ON FLAT TERRAIN.

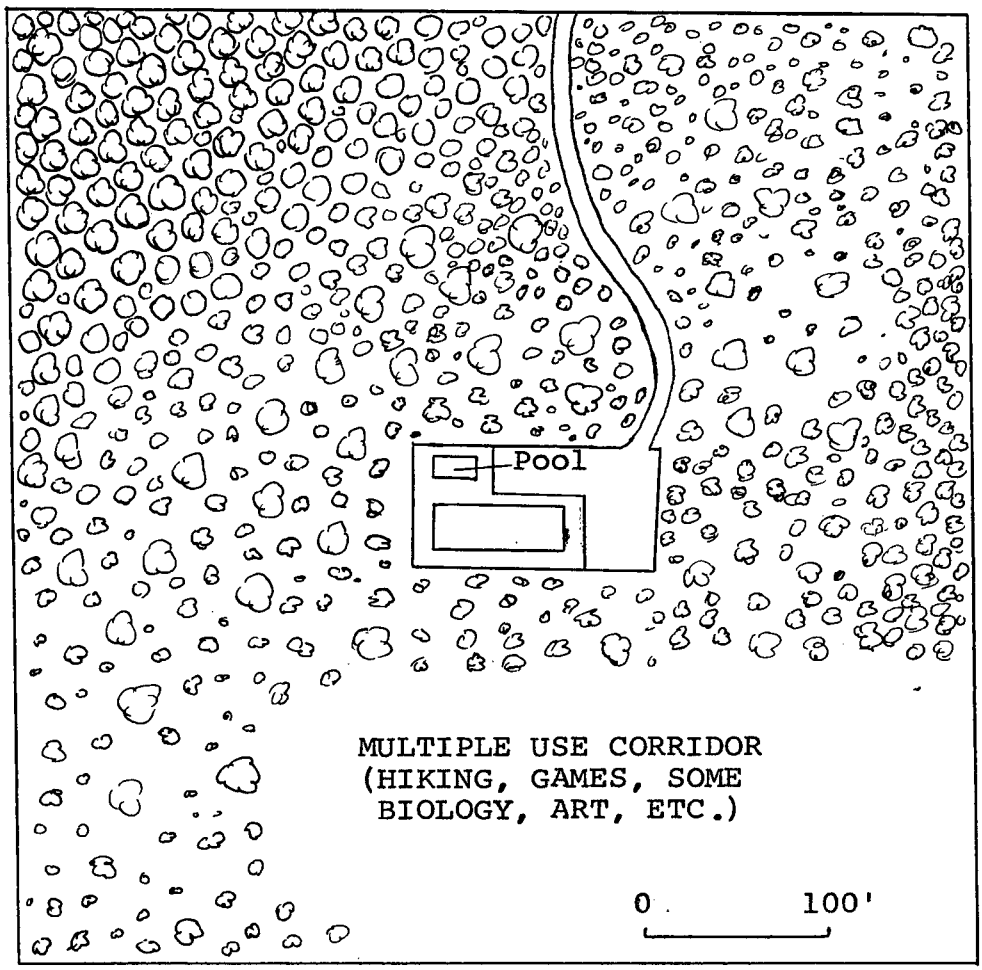
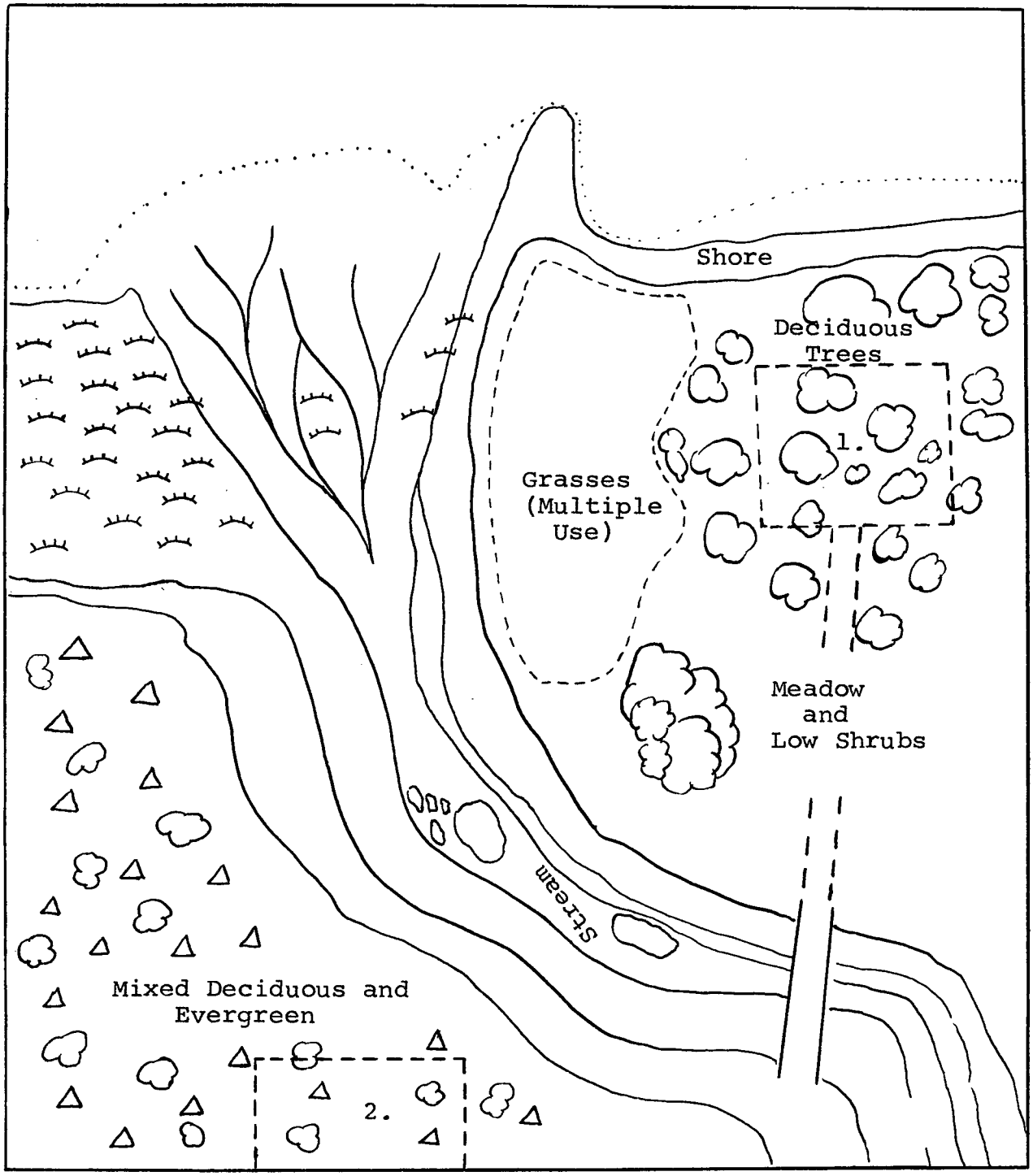


FIGURE 3

AN OUTDOOR SITE WITH SEVERAL CORRIDORS,

SHOWING PLACEMENT OF FACILITIES.



of approximately one-fifth of an acre or larger, to the size of an exposed geological formation, shore area, or body of water, which could be many acres in extent. A corridor of learning may include a complete ecosystem within the site which would be a source of lesson topics or a topographic area characterized by physical features which make it particularly suitable to a specific group of activities (Figure 1). Corridors will always have overlapping uses such as social interaction or recreation which are part of most activities done in an outdoor setting whether the topic of study is in earth science, or art. Moreover, activities on a site which can withstand heavy foot traffic may range over the whole site without any attempt at using any one sub-area within the site for a specific purpose. This type of site would have one or more multiple use corridors and have a comparatively homogeneous topography and vegetative cover (Figure 2). However, areas which lend themselves to more than one activity and result in a multiple use for any one spot are rare (Figure 3). No attempt has been made by the author or anyone in the literature to find out how much use an area can withstand before it becomes permanently altered.

IV. Topography of an Outdoor Site

Topography of the site should include features which meet recreational, social, scientific and historical learning needs. The presence of a body of water forms the core feature to look for when considering an outdoor site and is heavily weighted in the analysis procedure. Many of the topographic features required are found around water areas.

People are attracted to water by a strong natural urge. The need for water areas is clearly recognized in the reports to the Outdoor Recreation Resources Review Commission (ORRRC). More time is spent around shore areas and "edge" near shore areas than in open areas away from water. Walking, hiking, and outdoor camping skills are more interesting in diversified terrain especially if a body of water is included.

Specific topographical features are required for the following needs:

1. Recreational
   (a) Water is required for water sports, fishing, canoeing, sailing, and swimming activities.
   (b) Cliffs and steep slopes are required for climbing activities.
   (c) Varied landscape is required for orienteering, hiking, camping and horseback trips.

(d) Open areas are needed for archery and throwing games.

(e) Scenic beauty is required for art activities and sightseeing.

2. Social

(a) Water and beach areas are required for campfire activities although clearings can also be used.

(b) For a residential school, a living area for tents or cabins is required.

(c) It is desirable to have an area for manual skills and activities where students might find simple tools, materials and equipment to make things out of natural objects (e.g. driftwood, etc.).

(d) An area is required where vehicles may be inconspicuously parked.

3. Science

(a) Transition areas are needed for physical and life science studies.

(b) Exposed igneous, metamorphic and sedimentary rocks, and geological formations are required for earth science activities. A diversified topography lends itself to map making activities.

(c) Diverse flora and fauna are needed for life science studies, particularly trees and the vegetational changes near bodies of water, with changes of elevation, exposure, and soils.

4. Historical

(a) Areas having an observable anthropological history are needed. Examples would be the first man, first white settlers, or land first surveyed.

(b) Areas having a geological history which show the effects of climate or formations of paleontological significance are required.

V. A Classification of Study Areas Within a Site.

1. High use corridors

High use corridors will support intelligent but not indiscriminate temporary collecting activities (i.e. the undamaged return of organisms to the place from which they are taken). Jeopardizing the natural state of an area is hardly worth the little educational value derived from permanently removing living or non-living material. Photography is an excellent alternative for keeping a permanent record of investigations.

The following high use areas will support reasonably heavy student traffic for the limited collecting of abundant, fecund species as well as measuring and observing activities.

(a) Salt water

Some tide pools will withstand this type of activity although some are easily upset and

ruined. This would depend largely on where the students must walk to do their observing. Boulder beaches, rocks exposed at low-low tides, sand and mud flats and reefs could also be classified as high use corridors.

(b) Fresh water

High use corridors for fresh water would include; highly productive lakes, ponds, a marsh or swamp, or a slow moving stream or river.

(c) Land

The center of large areas of homogeneous vegetation where species diversity is low but population numbers are high could be considered high use corridors. Special attention should be given to the protection of flowering monocotyledons, mosses, lichens, shrubs, trees and grasses.

2. <u>The "cathedral concept" for corridors where use should be restricted to quantitative studies and observation</u>.

Some corridors could be thought of as valuable irreplaceable museum pieces which will withstand only quantitative studies and observations by students. Collecting activities would be as out of place as they would be in a rare historic cathedral.

Examples of areas within outdoor sites having restricted use corridors would be; alpine meadow

areas, areas of sharp transition previously discussed, bog and peat areas, some areas of young forest, and areas of homogeneous vegetation less than one acre in extent.

Important considerations when designating restricted use corridors would be:

(a) Soil type and rainy season.

(b) The number of other similar corridors on the site.

(c) The presence of rare species.

(d) The amount of foot traffic received by mosses, flowering monocotyledons, grasses and low shrubs.

Environmental factors such as rainfall, temperature, length of the growing season, the effects of snow and frost, describe the ability of an area (such as muskeg) to support life.

CHAPTER III

SITE USE AND LOCATION.

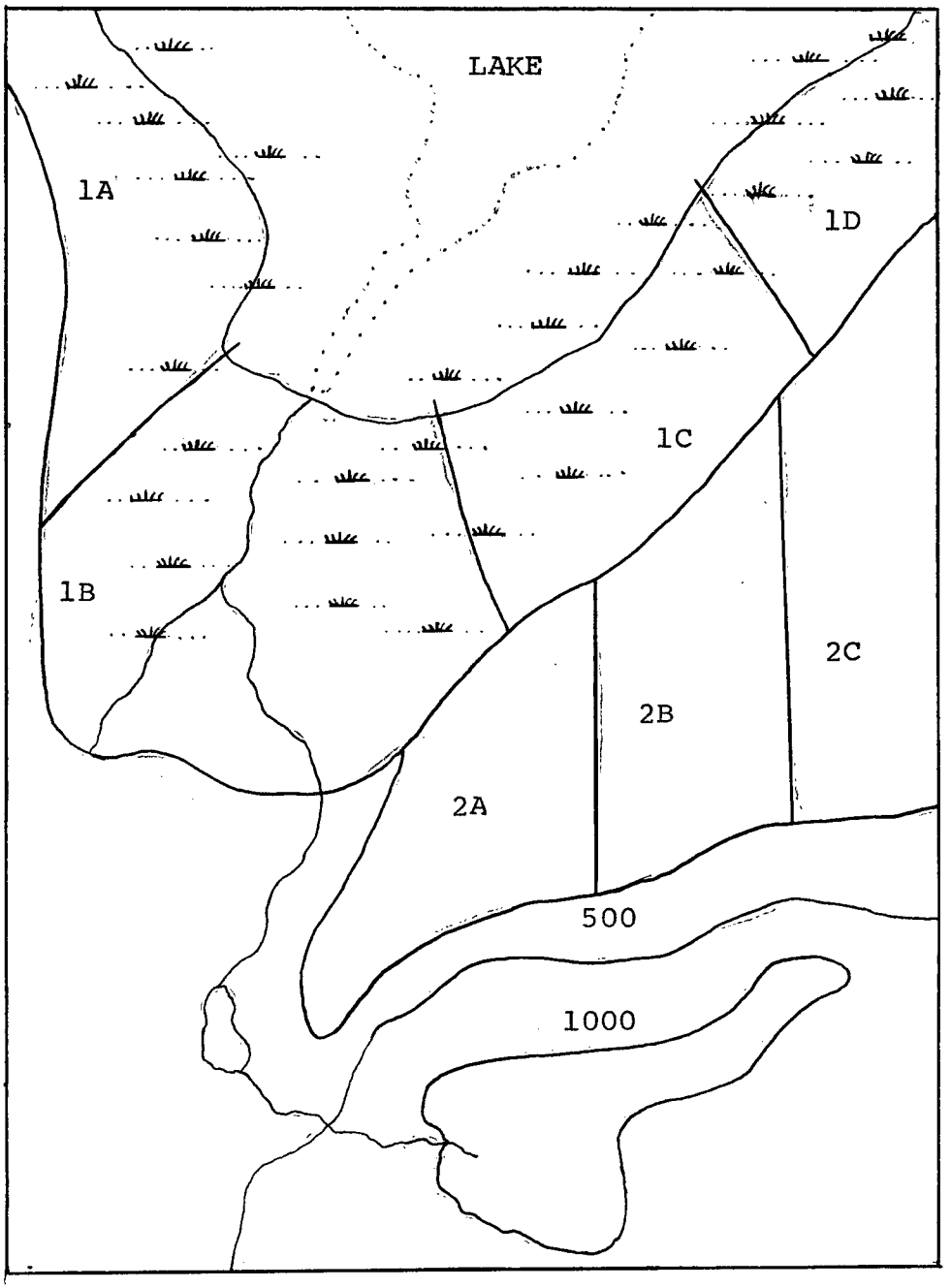
A. Sites and their use.

Some areas may support sensible collecting activities and considerable foot traffic. If there are several corridors which are similar, their use can be alternated yearly, reducing the effects of human traffic to a minimum. Recurring areas which are easily damaged could be left "fallow" for longer periods of time. A large relatively homogeneous area could be arbitrarily classified into smaller corridors and the same management practice used (Figure 4), again leaving an area to lie "fallow". If a corridor begins to show signs of adverse use, a reclassification of the area may be necessary, and a record of use intensity would provide invaluable information. Moreover, a cumulative record of past activities and what effect these have had on the site could serve as guidelines for planning.

Consideration of corridors of learning should determine the planning of the site. For an example, the sleeping quarters and cookhouse should not displace the only available stand of a rare species of tree. Nor should a stem-trail be pruned through an area having

FIGURE 4

AN OUTDOOR SITE SHOWING LARGE
RELATIVELY HOMOGENEOUS AREAS ARBITRARILY
CLASSIFIED INTO SMALLER CORRIDORS



heavy fine textured soils which will turn into a sea of mud when it rains and heavily rutted "cement" when dry.

Areas of clay, sand, peat and muskeg may have a shear strength which is so low that feet sink through and shear the surface. The drainage of bog type humous soils can be permanently altered by compaction through foot traffic. Organic soils which are usually found near lakes, rivers and marshes include peat and peaty soils and muskeg. These soils are usually highly compressible (spongy) and will develop deep ruts and raised clumps of vegetation in areas which receive heavy traffic.

Laboratory tests on compaction, consolidation, rebound behaviour and shearing strength give information of value in the assessment of a particular soil. Fine-grained, silt and clay soils have a medium to highly plastic property depending on their liquid limit. If the surface becomes muddy, rutted and impacted the area is not suited to heavy traffic and board walks may have to be constructed.

Consideration should be given to the number of available corridors and the amount of use which they will tolerate before deciding where an access road should go. In Figure 3 the area of grasses would be the easiest place to put the road but very wasteful in

educational terms because it would cut through the only available meadow on the site. Placing the buildings at location number two on the same diagram results in the smallest amount of lost area and keeps vehicles off the site.

Natural shelter from prevailing winds in exposed areas is required, especially where a field station is set up and students are writing in their books and using measuring and observing equipment. The inclusion of areas open enough to permit sun during daylight hours is necessary for an area to warm up. Relief from the direct sun is also necessary when students are measuring, digging, sketching, etc. in an open area. The availability of partial shade is particularly important in arid areas of the province in hot weather. Exposure to the South with a 10% slope results in as much increase in solar heat energy and climate change as flat land 6^{o} closer to the equator.[1]

B. Site Location

Whenever possible, the residential camp should be located with one of its boundaries adjacent to an existing Federal or Provincial Park. This arrangement vastly

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[1] Elizabeth Beazley, Designed For Recreation, Faber and Faber, London, 1969.

increases the potential recreational value of the site in particular. It also expands the variety of habitats available in the area. However, proposed use of Park areas should be thoroughly discussed with Park authorities.

If the area is close to habitation or range used for grazing, it may have to be fenced to prevent disruption of the vegetation, although fencing also impedes the movement of larger wild animals.

The site should not be visible from regularly travelled roads to give it a sense of isolation from civilization. Automobile and aircraft noise and odours are distracting and come under the category of non-compatible human activity in the surrounding area along with industrial operations. Ideally the area should have only one access road to discourage the public from using the area as a park. Vegetative screening and topographic location are two devices commonly used by park officials to hide unsightly surroundings.

The problem of students finding their way within a natural area is greatly simplified if natural features mark the boundaries of the area. Natural boundaries should be extended to include natural drainage or watershed areas which means carrying them to the crest of hills. If this is not done, commercial cutting of

nearby timber could visually scar the area and upset the ecological balance by altering the drainage pattern.

The nearer the site is to the student population, the more it will be used, particularly for short term use.

CHAPTER IV

SUPPORT NEEDS FOR RESIDENTIAL AND DAY PROGRAM SITES.

Water supply and waste disposal are the two main support problems. Solution of these problems may determine where facilities will be placed on the site.

A. Water For Support Purposes

Application must be made to the Comptroller of Water Rights, Parliament Buildings, Victoria, B. C. to legalize a water supply. Application forms will be sent on request. Arrangements may be made through the local Public Health Officer to have the water supply tested for purity; the rules governing water sample taking will be given when the arrangements are made.

District Engineers located in Kamloops, Kelowna, Mission City, Nelson, Prince George and Victoria will assist applicants in filing an application for a Water Licence and in providing general information on water law and water use in B.C.

> "The Crown owns all water and permits the use of it only by licence under the WATER ACT. A WATER LICENCE is a legal document issued by the COMPTROLLER OF WATER RIGHTS which specifies the conditions governing the right to the use

of water. These conditions, or TERMS of the licence, include a statement of:

(a) the source of water supply;
(b) the point of diversion from the stream;
(c) the priority date of the licence;
(d) the purpose for which the water is to be used;
(e) the maximum quantity of water which may be diverted;
(f) the period of the year during which the water may be used;
(g) the land to which the licence is appurtenant; and
(h) the works authorized to be constructed to collect and convey the water from the stream to the place of use."[1]

No licence is required for digging a well, although a commercial concern should be consulted.

Planning for water use depends upon the type of facility on the site. Availability of water encourages its use. Water demand ranges from ten to fifty gallons per camper per day.[2] Water demand for various types of establishments for planning purposes is given by the Comptroller of Water Rights as follows.[3]

Bath houses (per bather).	.10 U.S. gallons per day
Day camp with no meals served (per camper).	.15 " "

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[1]Department of Lands, Forests and Water Resources, Water Resources Service, Water Rights Branch, General Information on Water Law In British Columbia, 1970.

[2]U.S. Public Health Service Manual of Individual Water Supply Systems.

[3]Comptroller of Water Rights, personal letter.

Luxury camp (per camper)	100-150	U.S. gallons per day
Resort camps, day and night, with limited plumbing (per camper). . .	50	" "
Cottages with seasonal occupancy (per resident)	50	" "
Horses (drinking per animal)	12	" "
Overnight parks with flush toilets (per camper)	25	" "
Picnic area with bath houses, showers and flush toilets (per picknicker)	20	" "
Picnic area with toilet facilities only (per picknicker)	10	" "
Boarding school (per pupil)	75-100	" "
Day school with cafeteria but no gymnasium or showers (per pupil)	20	" "
Swimming pools (per swimmer)	10	" "

New water systems should have a capacity beyond the requirements of most outdoor education facilities to allow for peak load demands involving laundering, dishwashing, irrigation of growing areas, cooking, showers and toilets. This would also give a margin of safety for emergencies like fire or for future expansion of facilities. The estimate given by the U.S. Public Health Service[4] for a

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[4]Robert W. Douglass, Forest Recreation, Pergamon Press, 1969.

residential facility housing one hundred and fifty people is five hundred gallons per hour. This flow should be consistent if the area is to be used through the dry season.

B. Sanitation Requirements.

The best method of eliminating soil and water pollution is to link with a municipal sewage system. If this is not possible the alternatives are non-water carriage or a water-carriage sewage system.

Non-water carriage systems are cheaper to build but more difficult to maintain. These systems include chemical tanks, simple pit privy, and incinerator vaults.

Water carriage sewage systems with underground distribution require the construction of a septic tank and leaching field. The following soil percolation test must be performed to see if a water carriage system can be built on the site. The local municipal inspector is required to do the following test before authorizing a permit for the construction of a septic tank and leaching field.

Dig approximately six holes having a diameter of one to twelve inches as deep as the trenches will be. The sides of these holes should be roughened and the bottoms covered with two inches of loose gravel to prevent the soil from puddling. These holes should be kept full of water for four hours, at which time the soil should be saturated. Next adjust the water level to six inches above the gravel and

measure the drop in water level after thirty minutes have elapsed. The site is unsuitable if more than sixty minutes are required for the water level to drop one inch.

Rate of sewage flow can be determined by multiplying the gallons per hour for each type of proposed unit by the number of units. The average gallons per hour flow for various types of units is given in Table 1.

TABLE 1

VOLUME OF WATER USE FOR VARIOUS TYPES OF PLUMBING FIXTURES USED ON OUTDOOR SITES.

Type of Unit	Gallons per hour flow
Flush toilets	36
Urinals	10
Showers	150
Fawcets	15

Size of the leaching field can be calculated from Table 2 which compares the percolation rate in minutes per one inch with the maximum sewage application rate in gallons per square feet per day.

TABLE 2[5]

PERCOLATION RATE FOR A SEPTIC TANK DRAINAGE FIELD RELATED TO MAXIMUM SEWAGE APPLICATION RATE

Percolation Rate Min./1"	Maximum sewage application rate gallons/ sq. ft./ day
2	3.5
3	2.9
4	2.5
5	2.2
10	1.6
15	1.3
30	0.9
45	0.6

C. Camp Refuse

Analysis of a proposed site for outdoor education should include a plan for the disposal of camp wastes. The best way to deal with waste is to load it onto a camp vehicle at regular intervals and haul it to the nearest municipal dump. If the camp is not too isolated, arrangements could be made to have the municipality's garbage truck make a pick-up when necessary. Establishment of an incinerator, a burial pit or a fill type dump on the site may attract flies, rats, mosquitoes, racoons, bears, and

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[5]Robert W. Douglass, Forest Recreation, Pergamon Press, 1969.

dogs. In summary, nearness to an established disposal facility is an advantage. One thing students can learn from their outdoor experience is the quantity of waste produced per person per day. Additionally, they should consider existing disposal methods and perhaps invent new ones.

CHAPTER V

ANALYSIS OF SITES

Each one of the proposed sites should be viewed by the same person or group of people to keep the information comparative. If maps or aerial photographs (see Appendix D) are used for any of the descriptive categories they should be used for all of the sites analysed.

One or more descriptive categories may be deleted, or added, to suit the educational objectives and mode previously decided upon, without disturbing the ability of the procedure to select the site with the greatest educational potential. The length of the graph scales may have to be adjusted if this is done. Descriptive categories included herein were chosen for their ease of application by school personnel, information content and time required.

Mapping Boundaries Within the Site

Drawing map boundaries for the corridors of learning and assigning their use classification is a subjective activity which should be undertaken by the same person or group of people for the sites analysed. Layers of transparent map overlays have been used by the author for this

purpose. Multiple use corridors receive extremely heavy use and should be kept to a bare minimum.

Boundaries for corridors of learning should be drawn along definable naturally occuring units such as plant associations, "edge" regions, an open grass area, etc. as previously discussed. Mapping vegetation boundaries on the site can be done by taking sightings and distances from a number of selected fixed points.[1] Naturally occuring boundaries will slowly change as long as the process of evolution continues to have an effect. Although these boundaries may change with time they have the advantage of rapid boundary reference for recording frequency and intensity of use as well as orientation on the site. Consideration for rare, threatened and endemic species should be given when drawing boundaries.

Completion of the Analysis (see Chapter VI)

Step #1. The section of the analysis dealing with administrative characteristics should be completed first because a great deal of energy can be wasted on an unobtainable site. Each site is given an identifying number 1, 2, 3, etc. depending on how many sites are analysed.

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[1] Edwain A. Phillips, Field Ecology, B.S.C.S. Laboratory Block, D.C. Heath and Company, Boston, 1965.

Step #2. The analysis should be completed as far as possible by repeatedly crossing the site on foot. Aerial photographs (Appendix D) may be helpful. Each descriptive category should be awarded a point value from 1 to 5 and entered in the column "total for site". The help of a naturalist may be required to complete the ecological inventory of living organisms on the site. Soil analysis may require the aid of a resource person from the Department of Agriculture or a Forester. The resource person should be contacted on how he would like the soil samples to be taken to determine the trafficability of the soils. Climatic information can be obtained from the nearest Dominion Weather Bureau Office or from references.[2]

Step #3. Totals for each part of the analysis (Availability, Usability, Physical Uniqueness, and Student Use) are plotted on the axes as in Figure 5. Each site number is projected onto the next plane at a 45^{o} angle. Dispersal of the points on the X axis of the second and

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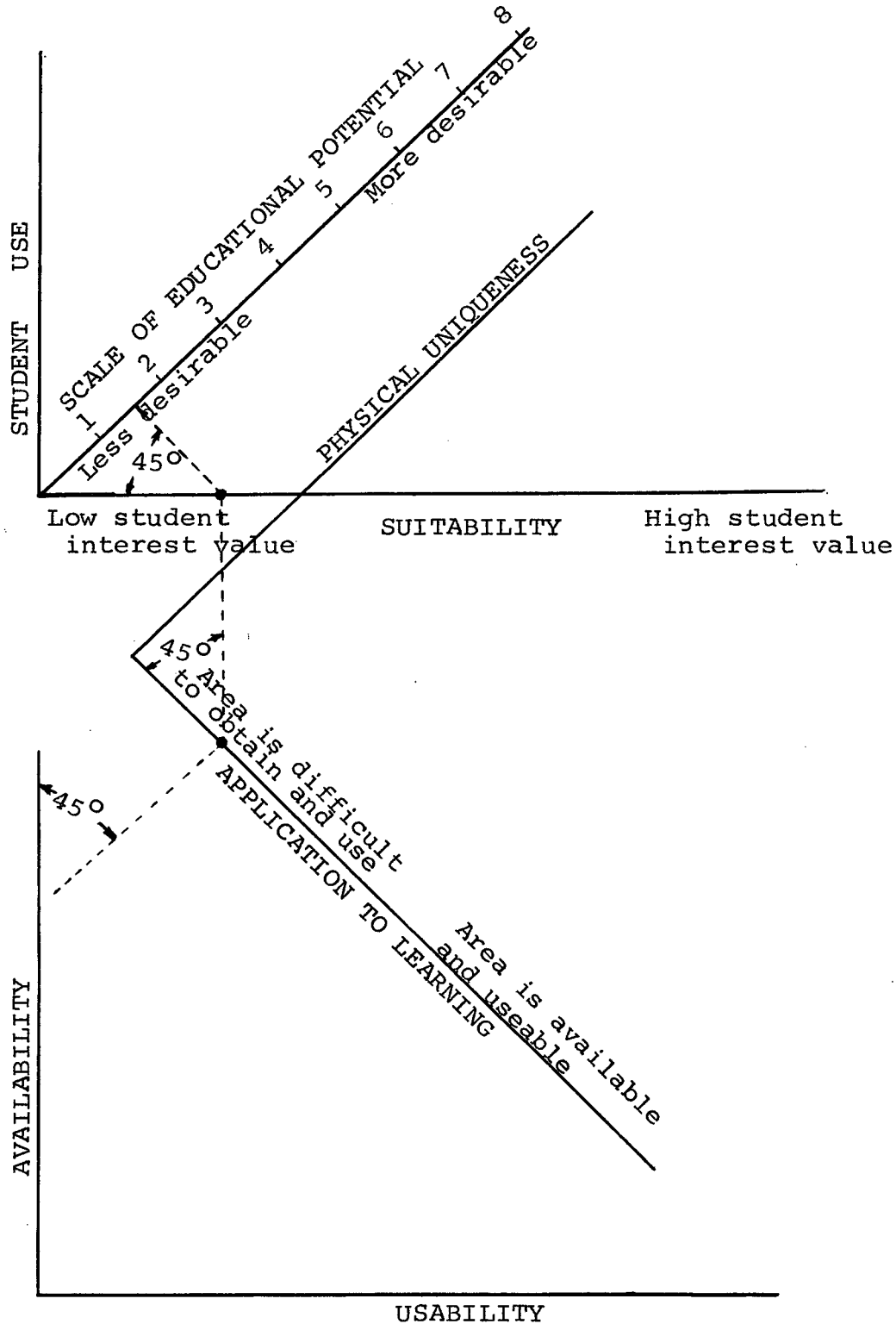
[2] V.J. Krajina, Ecology of Western North America, Vol. 1, Department of Botany, University of British Columbia, 1965.

third graph results in ranking the sites according to their application to learning and suitability. Usability, Physical Uniqueness, and Student Use are all separately plotted on the Y-axis versus Availability on the X-axis.

Selection of descriptive categories and their inclusion under each of the four major sub-divisions is a matter of judgement. However, this analytical procedure results in the quantification of the educational potential of one area over another. Each descriptive category is given an evaluation number which is descriptive only. Descriptive categories which receive high value numbers for a specific site indicate greater potential for outdoor education over sites with lower value numbers for the same descriptive categories. The result provides a numerical way of looking at complex material and constitutes an aid to decision making.

FIGURE 5

GRAPH AXES SHOWING THE MAJOR DESCRIPTIVE CATEGORIES.



CHAPTER VI

SITE SURVEY AND ANALYSIS FOR DAY TRIP OR RESIDENTIAL CAMP USE

I. ADMINISTRATIVE CHARACTERISTICS

Committee Comments

A. Surveyor

Name_____ Date Survey started_____

Address_____ completed_____

B. Identification of Site

1. Site number assigned for the purpose of this analysis_____
2. Name of the area_____
3. Map showing boundaries attached? Yes__ No__
4. Sketch map of area showing significant features and landmarks, magnetic north, scale and grid numbers attached? Yes_____ No_____
5. Arial photographs available? Yes___ No___
6. Arial photographs attached? Yes___ No___
7. List of main maps for the area attached Yes_____ No_____
8. List of major biological/geological references used for the analysis attached? Yes_____ No_____

C. Location of Site

1. Latitude____^{0}____' "N/S Longitude _____^{0}_____' "E/W
2. Name of land recording district_____ No_____
3. Land bulletin area number_____
4. Land status map number_____
5. Name of mining division_____

D. Administration

Committee Comments

1. Address of administration_____
2. Land status
   a. Crown land_____
   b. Provincial Forest_____
   c. Tree farm licence_____
   d. Park_____
   e. Watershed_____
   f. Indian reserve_____
   g. Mining claims_____
   h. Mineral claims and placer leases___
   i. Township, surveyed_____
   j. Township, unsurveyed_____
   k. Land alienated or covered by application under the Land Act_____
   l. Surveyed Timber Lease, Licence, or Berth_____
   m. Government reserve_____
   n. Provincial forest_____
   o. Municipality_____
   p. Water rights_____
   q. Area with formal conservation status _____
   r. Area without formal conservation status_____

II. PRELIMINARY SURVEY

A. Characteristics of site (to be used in section on usability)

1. Surface area (state units of measure) _____
2. Altitude
   (State units of measure)
   Maximum_____
   Minimum_____
3. Main exposure_____

Committee Comments

B. Vegetative formation and relief type (to be used in section on physical uniqueness).

VEGETATIVE FORMATION	Relief Type: Flat	Undulating 0-600ft.	Hilly 600 - 3000ft.	Mountainous-over 3000ft.	% Total Area
Open-Ground type-any dominant plants not more than 15cm. high					
Field type-dominant life form coincides with field layer, not more than 2m in height					
Scrub type-dominant life form does not exceed a shrub layer, height generally not over 7.6m					
Woodland type-trees dominant life form.					
% Total Area					100

Committee Comments

C. Special landscape features (to be used in section on physical uniqueness)

	Percent of Site Area
Boulders	
Cliffs	
Ravines	
Canyon	
Sand Dunes	
Mud Flats	
Other	

D. Biota

1. Animal life (to be used in section on physical uniqueness)

a. Animals sighted_____

b. Animal signs_____

c. Animal artifacts--nests, holes, etc.

Committee Comments

2. Floral analysis (to be used in section on physical uniqueness) (Optional)

	Diversity	Area Sampled
Algae		
Lichens		
Bryophyta		
Pteridophyta		
Grass		
Herbs		
Shrubs		
Deciduous trees		
Gymnospermae		
Epyphytes		
Macro-fungi		
Submerged vegetation		
Emergent vegetation the bases of which are in the water		
Age of Dominant tree species (using an increment borer)		

3. Rare, threatened, endemic or relict species

_____

_____

_____

_____

Committee Comments

III. ANALYSIS CHARACTERISTICS AND THEIR POINT VALUE

DIVIDED INTO FOUR SECTIONS.

AVAILABILITY

(Total for each site to be plotted on first X axis. See Figure 6).

Description	Point Value 1	2	3	4	5	Total for Site #1	#2	#3
Duration of time for which site is available	Short winter rental				Available for the full time required			
Travelling time to area from point of departure	Return trip is longer than daylight hours			1-3 hours	One hour			
Access roads	None	Trail-dry weather only		Gravel most weather	All weather			
Cost (rental for time required)	Prohibitive				Reasonable			
Total for each site								

Committee Comments

USABILITY

(Total for each site to be plotted on first y axis. See Figure 6).

Description	Point Value					Total for Site		
	1	2	3	4	5	#1	#2	#3
Surface Area	1 acre per student		1-5 acres per student		5 acres per student			
Precipitation from Sept. to June	Heavy		Moderate		Light			
Number of months when the mean temperature is below 40°F	4	3-4	2-3	1-2	1			
Prevailing winds	Heavy (movement restricted)				Light			
Sewer	No possibility		Costly		Available			
Telephone	No possibility		Costly		Available			
Hydro	No possibility		Costly		Available			
Water for support needs A. Quantity	None	Very Limited		Adequate	Abundant			
B. Quality	Rejected		Passed	Good	Excellent			

Committee Comments

Description	Point Value 1	2	3	4	5	Total for site #1	#2	#3
Soil for a drainage field (if required)	None	Very Limited	Adequate		Good			
Non-compatible human activity in the surrounding area	Considerable		Minimal		None			
Travelling time to nearest medical and supply area	>2 hr.		<1/2 hr.					
Depth in shore region	Very shallow		Vertical		Sloping			
Speed of water flow (or tidal flow)	Turbulent		Moderate		Slow Motionless			
Pests which may be a problem (devils club, mosquitoes, black flies)	Numerous				Few			
Protected bays or indentations suitable for anchorage	None		Few		Many			
					Total for each site			

Committee Comments

PHYSICAL UNIQUENESS

(Total for each site to be plotted on second y axis. See Figure 6).

Description	Point Value					Total for Site		
	1	2	3	4	5	#1	#2	#3
Water for recreactional purposes								
A.Swimming	None	Very Limited		Adequate	Abundant			
B.Canoeing	None	Very Limited		Adequate	Abundant			
C.Sailing	None	Very Limited		Adequate	Abundant			
Water for study purposes								
A. Fish	None	Very Limited		Adequate	Abundant			
B. Amphibians	None	Very Limited		Adequate	Abundant			
C. Invertebrates	None	Very Limited		Adequate	Abundant			
D. Plankton	None	Very Limited		Adequate	Abundant			
Water permanence	Intermittent			Permanent				
% Beach area								
Mud	100%			20-30%				
Shell beach	100%			20-30%				
Sand beach	100%			20-30%				
Shingle beach	100%			20-30%				
Boulder beach	100%			20-30%				
Rock	100%			20-30%				

Committee Comments

Description	Point Value 1	2	3	4	5	Total for Site #1	#2	#3
% Shoreline Flat Sloping Cliffed	 100% 100% 100%				 20% 20% 20%			
Exposure	Windward				Leeward			
Hours of sunlight in open areas	Afternoon sun		Morning Sun		All day			
Adjacent fresh or salt water	None		A vehicle must be used		Available within walking distance			
Vegetation formations (see pg.38)	All one type	Two types	Three types	Four Types				
Relief type (see pg. 38)	All one type	Two types	Three types	Four types				
% of total area which is naturally occuring "edge".	10%				40%			
Special landscape features (see pg.39)	100%				20%			
Animal life (see animal life pg.39)	None				Abundant			
(Optional) Stability of the ecology of the site as summerized from Floral Analysis pg. 39.	Easily upset				Stable			

Committee Comments

Description	Point Value 1	2	3	4	5	Total for Site #1	#2	#3
Fire	Recent impact		Past Impact		None			
Public recreation & tourism	Presently in use				None			
Human artifacts trash and litter	Large quantity of material				None			
Sewer, water or hydro lines	Create an obstruction		Unsightly		None			
Degree of change	Greatly altered			Natural Wilderness				
Recovery potential	Natural recovery not likely				Natural recovery			
History of land use. A. Cultivation	Present impact		Past Impact		No impact			
B. Drainage	Altered by man				Natural			
C. Soil Disturbance	Erosion caused by land abuse				Natural erosion			
D. Grazing	Permitted		Past Impact		None			
E. Tree Farming	Presently allowed		Past Impact		None			
F. Logging	Presently allowed		Past Impact		None			
G. Mining	Presently allowed		Past Impact		None			

Committee Comments

Description	Point Value					Total for Site		
	1	2	3	4	5	#1	#2	#3
H. Farming	Presently allowed		Past impact		None			
I. Trapping	Presently allowed		Past impact		None			
J. Hunting	Presently allowed		Past impact		None			
K. Removal of predators	Presently allowed		Past impact		None			
L. Pesti-cides used	Presently allowed		Past impact		None			
M. Intro-duced plants and animals	Many		Few		None			
					Total for each site			

Committee Comments

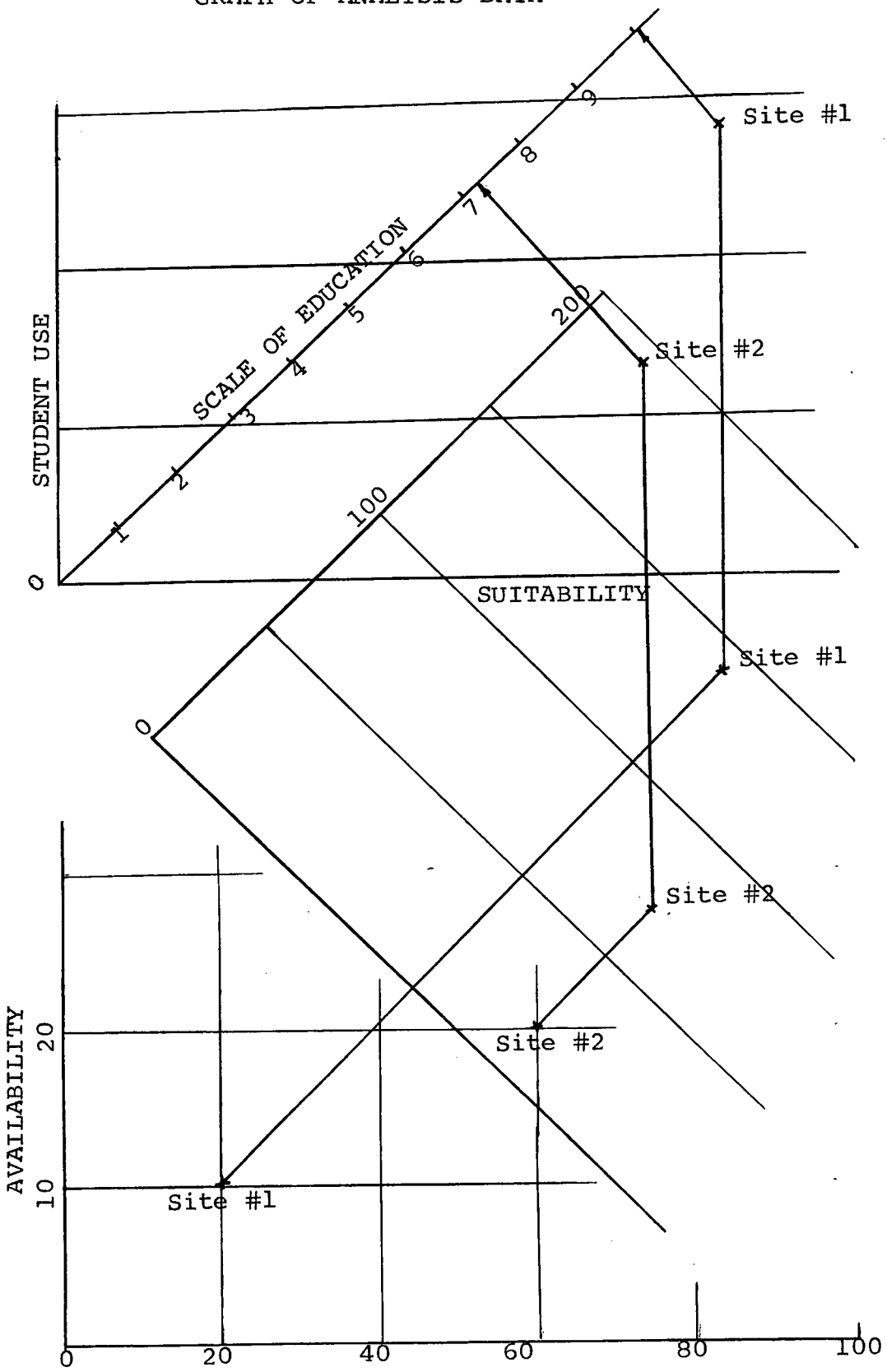
STUDENT USE

(Total for each site to be plotted along third y axis. See Figure 6).

Description	Point Value					Total for Site		
	1	2	3	4	5	#1	#2	#3
Prominent points with a view	None		One		More than one			
Variety of exposed areas of soil and rock for earth science studies	None		Few		Abundance of areas			
Trafficability of soils	Trails muddy and soil easily compacted		Fair weather only		Good all weather use			
Number of corridors of learning	0	1-3		3-6	6-9			
Number of observation and measurement areas	0	1-3		3-6	6-9			
Number of collection sites	0	1-3		3-6	6-9			
Number of open areas suitable for field stations (warmed by sun)	0	1-2		3-4	4			
			Total for each site					

FIGURE 6

GRAPH OF ANALYSIS DATA



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APPENDIX A

MODES OF OUTDOOR EDUCATION

1. The Field Trip Approach

If an outdoor site is to be used for a day field trip or even a shorter period of time, the teacher has a single lesson purpose and a specific site in mind and takes his class directly to the area. Activities are planned beforehand, or the teacher may use the site to develop a unit of studies as questions arise from the students. If the teacher is dealing with earth science studies, an area of exposed rocks may be chosen. If a social studies class is studying agricultural practices, the site may be a farm; a recreation class studying skiing, may use a ski slope; a creative writing or art class, may visit a nearby park or seashore area. Primary concerns of the teacher using the field trip technique are an initial visit to the site and an analysis of the area to see if there are sufficient facilities available for eating, washrooms, telephone, etc. for his group.

2. Day Trip Programs

For day trip programs to a nearby site which is repeatedly used, and acquired by a School District, the

site becomes a temporary daily residence. Even though the students do not stay overnight at a site the analysis procedure should be used for land management reasons. A site acquired for day trip use requires less stringent support needs for water supply or soil drainage. Fencing of the area, parking, toilets, and roofed shelter may be all the development required.

3. The Residential Approach

Types of sites:

(a) Organization Camps (Y.M.C.A., Church group camp, etc.)

(b) Park lands including campsites

(c) Acquisition and development of a site for extended Outdoor Education and Curriculum Enrichment within a School District

Planning and preparation based on regular classroom activities is undertaken prior to visiting the site. The principle of gradualism is used by first introducing students to the field trip approach and possibly the day trip approach. Preparation includes motivation, planning learning-packages so the greatest gains can be made when returning to the classroom, student selection of leaders, working and sleeping groups, camp fire programs and study projects, and teacher-student agreement of standards of

conduct and study. Pre-planning should be undertaken with the view of the outdoor site as the curriculum and a full knowledge of the corridors of learning available for use.

On the site, each activity undertaken should have the realization of an educational objective as its goal. Students deal with their planned and spontaneous outdoor activities with the help and guidance of their learning leaders. Observations, discovery, hypotheses and measurements are done for the learning-packages. Recreational skills and activities proceed as well as peer group social activities by using different corridors of learning to obtain maximum use of the site in the time available. During the time of the residence the leaders should hold the responsibility for the wise management of the land and keep a record of the use it receives.

Follow-up activities in the classroom are an extension of the observing and measuring activities undertaken at the field stations. Group and individuals continue with research write up reports, make permanent records, displays, murals, exhibits and productions. Programs are planned for parents or classes. Evaluations are done and conclusions drawn.

APPENDIX B

SURVEY OF BRITISH COLUMBIA SCHOOL DISTRICTS

The first noteable school residential outdoor programs in B.C. were undertaken in 1968. A rapid growth of interest and scope over the past few years indicates the need for realistic objectives for outdoor education which bridge the gap between what a program should do and the actual analysis, selection and use of a site. Physical features of the site determine the extent and quality of the curriculum, in other words, whether or not objectives can be met.

Questionnaires were sent to 67 school superintendents representing the 89 School Districts in the province of British Columbia. All returns were anonymous. Information from the returns was compiled in the form given in Table I. The results of the questions relating to sites were further broken down into those which are presently being used and those which the superintendent would like to see used in the future. Comments made in the last section of the questionnaire indicated the need to separate education taken out of doors and outdoor education. Some of the questionnaire comments were as follows:

TABLE 3

SUMMARY OF A SURVEY OF BRITISH COLUMBIA SCHOOL DISTRICTS

TO DETERMINE PLANNING FOR OUTDOOR EDUCATION

TOTAL NUMBER SENT	67
TOTAL NUMBER REPLIES	40
PERCENTAGE RETURN	59

	# Yes	# No.	No Reply	% of Total No. of Replies Which Were Affirmative
1. Has your District undertaken any planning for outdoor education?	22	18	0	55%
2a Have your teachers developed an outdoor education program for grades 1-7?	17	19	4	42%
2b Have your teachers developed an outdoor education program for grades 8-10?	8	20	12	20%
2c Have your teachers developed an outdoor education program for grades 11-13?	5	20	15	12%
3. Kind of sites which plans call for:				
a. Present school yard	15	1	24	37%
b. Adjacent land within walking distance of the school, acquired by the school	11	2	27	27%
c. City or municipal parks within walking distance	11	2	27	27%
d. Federal or Provincial Park	12	0	28	30%
e. Organization Camps (Y.M.C.A., Church group camp, etc.)	2	5	33	5%
f. Acquisition of a site within driving distance for one day programs	3	4	33	7%

TABLE 3 (Cont'd.)

	# Yes	# No	No Reply	% of Total No. of Replies Which Were Affirmative
3. g. Development of a site for extended (longer than 24 hours), Outdoor Education and Curriculum Enrichment	6	4	30	15%
Kind of sites which plans would call for:				
a. Present school yard	8	1	31	20%
b. Adjacent land within walking distance of the school, acquired by the school	4	2	33	10%
c. City or municipal parks within walking distance	7	0	33	17%
d. Federal or Provincial Park	4	1	35	10%
e. Organization Camps (Y.M.C.A., Church group camp, etc.)	3	1	36	7%
f. Acquisition of a site within driving distance for one day programs	3	3	34	7%
g. Development of a site for extended (longer than 24 hours), Outdoor Education and Curriculum Enrichment	7	1	32	17%

TENTATIVE

"Most of these activities are appropriate for development in our area. However, the concept of Outdoor Education must be established first, then a program to meet our needs will develop."

"This is a difficult questionnaire to reply to in as much as this kind of programme is left to each supervising principal for development. The NO reply really gives an inaccurate picture in as much as several schools are doing all of these things."

> "Due to the fact that this district is well supplied with areas for all kinds of out-of-doors recreation the schools have not pressed for any immediate action for camp sites or out-door classroom space. I can see that action is needed soon so that the Board can set aside a reserve of Crown land for such a purpose."
>
> "We have an advisory committee from the community assisting us in developing (1) day trips (2) inventory of science areas in the district. Priority is given for in-service for teachers to learn about the outdoors and be able to communicate their knowledge and facilitate the spread of enthusiasm for the natural environment."
>
> "At the present time a committee has been formed to investigate the establishment of an Outdoor Education programme. All plans at present are tentative and under study."
>
> "We are just getting involved in this field this year. Hence the questionnaire is sketchilly completed. Anticipate much more development between 1970-73 especially in the new Elementary Science programme K-7".

Summary of the Survey

Percentage return for the questionnaire was fifty-nine percent. Of this total, fifty-five percent have undertaken planning for outdoor education. More emphasis has been placed on the development of outdoor education programs for grades K-7 than for grades 8-13.

Fifteen percent of the districts which replied are presently developing sites for extended outdoor education and curriculum enrichment and another seventeen percent would consider this type of site in their future plans.

APPENDIX C

OBJECTIVES

A literature search revealed that objectives for outdoor education were as diverse as the many educators involved in phrasing them. Although objectives tend to be political in nature and vary in the wording used, there was found to be a very definite overlap in their guiding intent. After reviewing the objectives stated in planning grants, outdoor programs and in the literature on outdoor education, each objective was written on a separate card. Four broad categories were the first to emerge. The criteria used for placing the objectives into these categories were:

(a) Objectives which had goal behaviour which students should experience or demonstrate.

(b) Objectives which dealt with <u>teacher</u> training and practice.

(c) Objectives which proposed <u>curriculum</u> enrichment through using the out-of-doors.

(d) Objectives which expressed the need to develop values which benefit the <u>community</u> and nation.

Following this major division, each of the four categories were found to have objectives which contained phrases and words which were often repeated and which defined the intent of the objectives. Synonymous words and phrases were grouped together into twenty-two sub-categories of intent given in Table II. The cards were re-categorized until the same number of cards ended up in the sub-categories of intent. The sub-categories were then ranked in Table III on the basis of the number of cards in each. The histogram of the frequencies (Figure 7) indicates that there is twice as much agreement in the first seven sub-categories of intent as there are in the remaining fifteen categories.

Rephrasing of the objectives in the literature was next undertaken, using the sub-categories of intent as a guide. Accepted models of learning and current educational needs were also considered. Moreover, all of the objectives had to be practical within the British Columbia school system.

TABLE 4

SUB-CATEGORIES OF THE BROAD OBJECTIVE CATEGORIES IN THE LITERATURE

Sub-Categories of:

(a) Objectives which had goal behaviours which students should experience or demonstrate.

Criteria words and phrases:

- self or character development
- leisure time
- first hand experience
- physical fitness
- attitude development
- developing learning skills
- motivation

(b) Objectives which dealt with teacher training and problems of practice.

Criteria words and phrases:

- in-service opportunities
- co-operative teacher effort
- pooling resources and ideas
- improving student-teacher relationships
- developing new techniques of teaching and learning

Sub-Categories of:

(c) Objectives which proposed curriculum enrichment through using the out-of-doors.

Criteria words and phrases:

increasing content to include concepts new to the curriculum (conservation, multiple land use, etc.)

the tentative nature of scientific data and conclusions including a wider scope i.e. open-endedness

curriculum flexibility and transition between grade levels using the full calendar year

discovering and including what can not be done in the classroom

interdisciplinary learning

providing work experience

providing experience for disadvantaged and handicapped

(d) Objectives which expresses the need to develop values which benefit the <u>community</u> and <u>nation</u>.

TABLE 5

RANKED SUB-CATEGORIES OF OBJECTIVES FOUND IN THE LITERATURE IN THEIR ORDER OF FREQUENCY OF OCCURENCE

Total # Publications Analysed	Total # of Objectives
United States---------	---------
Canada ---------	---------
Total _____	_____

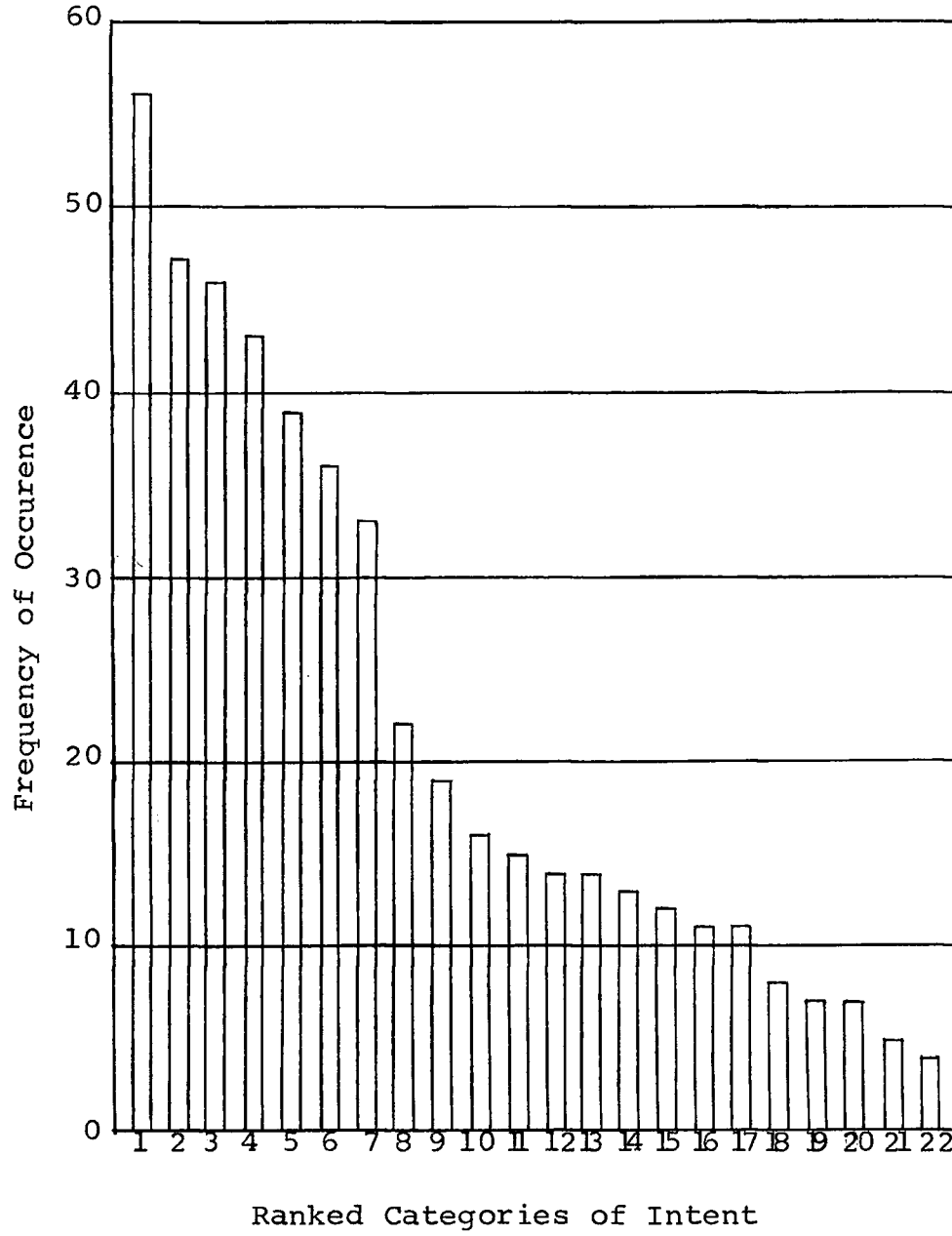
Ranked Sub-categories of Objectives in Order of Their Frequency of Occurence.

Rank	Frequency
Objectives containing:	
1. first hand experience	56
2. attitude development	47
3. increasing content to include new concepts (conservation, multiple land use, etc.)	46
4. self or character development	43
5. community and national benefit	39
6. developing learning skills	36
7. developing new techniques of teaching and learnning	33
8. discovering and including what can not be done in the classroom	22
9. physical fitness	19
10. including a wider scope i.e. open-endedness	16

	Frequency
Objectives containing:	
11. motivation	15
12. leisure time	14
13. curriculum flexibility and transition between grade levels	14
14. providing experience for disadvantaged and handicapped	13
15. in-service opportunities	12
16. improving student-teacher relationship	11
17. interdisciplinary learning	11
18. pooling resources and ideas	8
19. co-operative teacher effort	7
20. tentative nature of scientific data and conclusions	7
21. providing work experience	5
22. using the full calendar year	4

FIGURE 7

FREQUENCY OF OCCURENCE OF THE RANKED CATEGORIES OF INTENT



Statement of Objectives as a Basis for Site Analysis

The following is a set of objectives which have been phrased by the author. They are the objectives redefined from the analysis of the objectives given in the available literature and are used for this model of site analysis. Each objective is a goal behaviour which a student should experience or demonstrate as a result of his outdoor education on a chosen site.

Given in their order of importance

1. To provide first hand experience with nature. (i.e. to learn by doing).
2. To develop constructive attitudes towards
   (a) living things and their non-living surroundings
   (b) man's problems of survival
   (c) an increase and gainful use of leisure time
   (d) active participation within a peer group away from a school setting
   (e) establishing a good rapport with leaders and adults.
3. To provide an effective way of increasing curriculum content to include concepts like conservation, multiple land use, wise resource use, pollution control, and population dynamics.

4. To provide an effective way to develop learning skills (using natural materials and settings) such as the ability to observe, to gather information and organize it into a meaningful scheme, to hypothesis, to conduct controlled experiments, to make predictions, inferences and generalizations and ultimately to become self-motivating, to see questions where at first none are apparent.
5. To provide a setting where teachers can develop and test:
   (a) new techniques of learning, teaching and motivation
   (b) new programs in the arts and sciences for all grades
   (c) those concepts, skills and techniques which can only be done outdoors.
6. To provide experiences in living which will prepare students for co-operative citizenship and wise decision making in a society based on an understanding of man's dependence on his total environment.

APPENDIX D

MAPS AND AERIAL PHOTOGRAPHS

To obtain indexes for ordering the topographical maps required write to Province of British Columbia, Department of Lands, Forests, and Water Resources, Lands Service. Request the free Index to Departmental Reference Maps and Manuscripts, Indexes 1 to 14 inclusive and Keys 15, 16, 17 and 18 which show B.C. Government air photographs at various scales. Topographical maps and aerial photographs should be at the largest scale obtainable as the analysis deals with areas as small as one-fifth of an acre. Aerial photographs of an area may also be obtained by clearly marking the boundaries of the area on a topographic map having a scale of 1:50,000. This should be sent to The National Air Photo Library, Surveys and Mapping Branch, Department of Energy, Mines and Resources, 615 Booth Street, Ottawa.

The nearest Land Commissioner's Office will provide a copy of the pamphlet British Columbia Index to Provincial Land Status Maps and Land Bulletin Areas. The land status maps show vacant Crown Land to date of issue, boundaries of Crown reserves, alienated (privately owned or leased) lands, and surveyed district lots.