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AN ENVIRONMENTAL STUDIES CENTER
FOR THE WEST BOULDER RIVER AREA
McLeod, Montana

Part I
Undergraduate Thesis in Architectural Design

By
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the requirements for the degree of Bachelor of Architecture

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**problem
identification**

PROBLEM
IDENTIFICATION

Need

"The great question of the 70's is shall we surrender to our surroundings or shall we make our peace with nature and begin to make reparations for the damage we have done to our air, to our land, to our water." ¹

The technology of living that we as human beings have created has gotten out of control. What has been devised for the betterment of mankind might well spell his extinction. The outdoors cannot be a separate entity from our everyday lives. It is a definite continuous part, and one need only look at our effects on it to believe this.

Our present environmental plight has been created through our talent for invention, our dedication to learning, and our willingness to work. These same characteristics must be used to regain control of our technology before it destroys us.

Purpose

"The key to human survival is education." ²

In a free society it is always the citizens who must bear the ultimate responsibility for the choices

¹From President Richard M. Nixon's State of the Union Address, 1970.

²Allen, James E., Jr., Education for Survival, address to American Council of Learned Societies, Washington, D.C., January 23, 1970. p. 3.

that are made and the actions that are taken. In all our history, we have found no better way than through the process of education for equipping citizens... with the knowledge and the understanding needed to make these choices and to take these actions.³

Educating the citizens on environmental policy must take place with two generations simultaneously. The adults must be made aware because it is they who have contributed most directly to our present degradation of the environment. Yet, at the same time, it is the children of today that must teach and develop control measures in the future. They must learn now about the problems created and of the checks and balances of "nature".

The teacher that will be sent into the public schools in America in 1975 is today a high school junior. He or she must be taught now, along with the rest of his or her age group, about environmental quality, about ecology and about all of the complex and interacting elements that go to make them up.

It is for the students of this age group, and younger, that I am proposing the development of an environmental studies center. The work does not stop with one such center, but requires many centers of varied quality and situations. Although there are

³ Ibid. p. 4.

today a few organizations attempting to serve this purpose, they need to be further developed and their number must be increased.

The tasks to be assigned to an environmental-ecological education are awareness, concern, motivation and training:

Awareness of how we and our technology affect and are affected by our environment;

Concern for man's new and unique responsibility to re-establish and to create beneficially balanced relationships among all forms of life within our earth system;

Motivation and training to enable us to acquire and spread the knowledge and skills that will help us solve interrelated environmental problems and help prevent their future occurrence. ⁴

Fundamental to awareness of one's self and his environment is the ability to perceive. This occurs through the sense of smell, touch, sight, taste, hearing, or some combination of these primary senses. ⁵ Participants in environmental-ecological education must be able to perceive different environmental conditions and communicate their perceptions. Without

⁴Ibid. p. 9.

⁵ Foote, Geoffrey, et al., Falls Creek Project, Missoula, Montana. p. 35.

the ability to communicate, perceptions are useless. Hopefully through this proposed program, a number of people will learn to interpret their perceptions and investigations and communicate them to others.

The desired result of this type of education is that within the decade just begun a citizenry will be created that has a clear understanding that man is an inseparable part of the earth's ecosystem and that his continued existence is totally dependent upon the continued functioning of that system.

An environmental learning program should be set up in a series of progressing activities, with a close look at man's relationships being an integral part of each lesson.

The program should begin with the establishment of the basic biological needs for survival. This could be done with slides and seminars to acquaint the students with the needs and their significance for the survival of plants and animals before the students are exposed to the actual situation. Slides indicating the life cycle of local species of plants and animals expected to be encountered in the field would be of primary importance. Differences in the requirements such as food and shelter for the different species should be demonstrated. Discussions and observations of this sort will familiarize the students with native flora and fauna and provide opportunities for

introducing basic ecological concepts.

The next step is to observe and experiment with actual situations in the field. Such things as territoriality and the carrying capacity of the land for different species will be looked for. Direct observation arouses interest, curiosity, and desire for investigation. The desire for learning then becomes important and significant to each individual.

Field observations, live trapping, use of markers, photographing, video-taping, and chemical analysis are a few of the techniques that might be employed to observe and discover how biological needs are met by plants and animals in their native habitat.⁶ Investigating these interrelationships will reinforce the principles learned in the first phase of the program and create interest in further investigation.

The emphasis will then shift from wild animals and plants and their requirements for survival to man and his needs. Man's basic biological requirements are the same, and will be brought out not in the typical lecturing methods, but through seminars designed to stimulate self-awareness of our own personal needs, values, and attitudes. Trips to nearby rural and urban areas will serve to study how these needs, values, and especially attitudes have affected man's living.

⁶Ibid. p. 35.

These human attitudes are what have created the environmental conditions in which we now live. Man possesses the unique power to drastically affect the total ecosystem. Therefore, it is our responsibility, as humans, to provide for its survival. It is necessary in meeting this responsibility that we understand and interpret our interrelationships with plants and animals.

The size of the group involved as students in this type of an educational program should be small. Too much of our education is done in groups so large that the individual is lost. It is important that the individual feel a maximum of involvement and attain the greatest and most wholesome development within the time of his outdoor experience. Each student should have the opportunity to smell, touch, taste, hear, and see in a learning process. Whatever happens to the individual and what changes are made in his behavior, in his understanding of the environment and in his relationship to others comes as a result of the learning process. The small group, therefore, becomes the most potent force in this type of educational program.

Means of Implementation

The project should be established as a non-profit corporation by persons interested in and concerned

about our imbalancing of the ecosystem. Such persons should be open-minded and receptive to new teaching methods and possess a love for the outdoors. Funding would be accomplished through contributions from philanthropic corporations and private parties. Federal grants for this type of program will be inevitable in the near future because of mounting world-wide concern for our environment. Minimal tuition will be required of participating students; however, a scholarship fund will be set up to permit financially incapable students the chance to attend.

A coeducational group of students, ages 14 to 17, will be chosen to take part in the program. Selection of students will be done by pre-selected staff members through visitation to schools across the nation. Flyers would be sent informing school counselors of the project and asking for their recommendation of interested students. Emphasis should be placed on the involvement and informality required of the student enrolled in this learning process. The desire for the challenge for self-examination and discovery, the desire to build awareness of one's interrelationships with the total environment, and the sense of responsibility for environment and to pass on this sense of responsibility to others after leaving the project are characteristics necessary for success of the program.

The project will include two five-week courses from June through August. The first two weeks of each session are spent building an understanding of ecological principles through wildlife field studies, developing perception skills, and creating self-awareness of personal values. The last three weeks will be concerned with creating an understanding of the environmental crisis using these concepts. The personal communicational skills needed to create citizen organization and action when the participants leave the program, are a major part of the final three weeks. The program will include a wilderness, rural, and urban living experience and animal, botanical, and geological studies. The course will culminate in an examination of the political, economical, and social forces affecting the human environment.

To make further use of the proposed facilities, other programs will be devised for the winter months.

A series of two to three week wilderness-survival courses could be developed which would provide an opportunity of self-discovery of human needs for survival and correlate these with native animal needs. This time of the year provides easy observation of wildlife communities illustrating basic ecological concepts such as carrying capacity, limiting factors, territoriality, and predator-prey relationships. This course would also be coeducational and would require a certain

degree of skill in snowshoeing and cross-country skiing. The age group could include students both from the high school and early college level and would require a nominal fee for each participant.

LOCAL
CONDITIONS

Geographical

The town of Big Timber lies in the southcentral part of Montana on Highway 10 between Billings and Bozeman. Approximately twenty-two miles to the south of Big Timber on Highway 298, the West Boulder River meets the Main Boulder River at a town called McLeod. Twelve miles west of McLeod and into the Absaroka Mountain Range lies 500 acres of privately owned land bordering on Forest Service property. Through this area flows the West Boulder River. To the west and south the mountains, covered with a heavy stand of mostly virgin timber, rise to as much as 11,000 feet above sea level. Less than a mile to the south and east of the site on Forest Service land lies a series of small lakes called Nurse's Lakes.

Selection of this site for an environmental studies center was made because of the proximity of a wide variety of land. Marshes, springs and streams, a river, small lakes, timber, meadows, and rocky bluffs are all found within or near the 500-acre site. This land may be purchased from a private interest either in portions or as a total. Acquisition of the whole 500 acres would be advantageous for unrestricted use in experimentation and development.

Climate

The temperature of the West Boulder River area

varies considerably with the season, as is typical throughout Montana. Figures for the last three years show that the top range during July through August is 75° to 85° F., with June and September being about 10° colder. The temperature seldom exceeds 95° F. in the hottest portion of the summer. Figures are not available for the winter months, but areas nearby show a usual range of 0° to 20° F. and an infrequent minimum of -35° F. Snowfall averages around 40 inches per year and average total precipitation is 16.0 inches. ⁷

Neither humidity nor wind values are available for the winter months in this specific area. Sampling done in the mid or late afternoon from June to September show quite a variation in relative humidity, but a value of around 43 percent seems most prevalent. This figure drops somewhat as the summer approaches fall. Wind measured during the same period of time averages between five and seven miles per hour and comes from the north, and more frequently the northwest. At times the wind shifts to the opposite direction, coming from the south and southeast. ⁸

⁷U. S. Forest Serv., Main Boulder River Sta., Big Timber Range, Dist., Temperature and Precipitation Records, 1967, 1968, 1969.

⁸Ibid.

No Scale

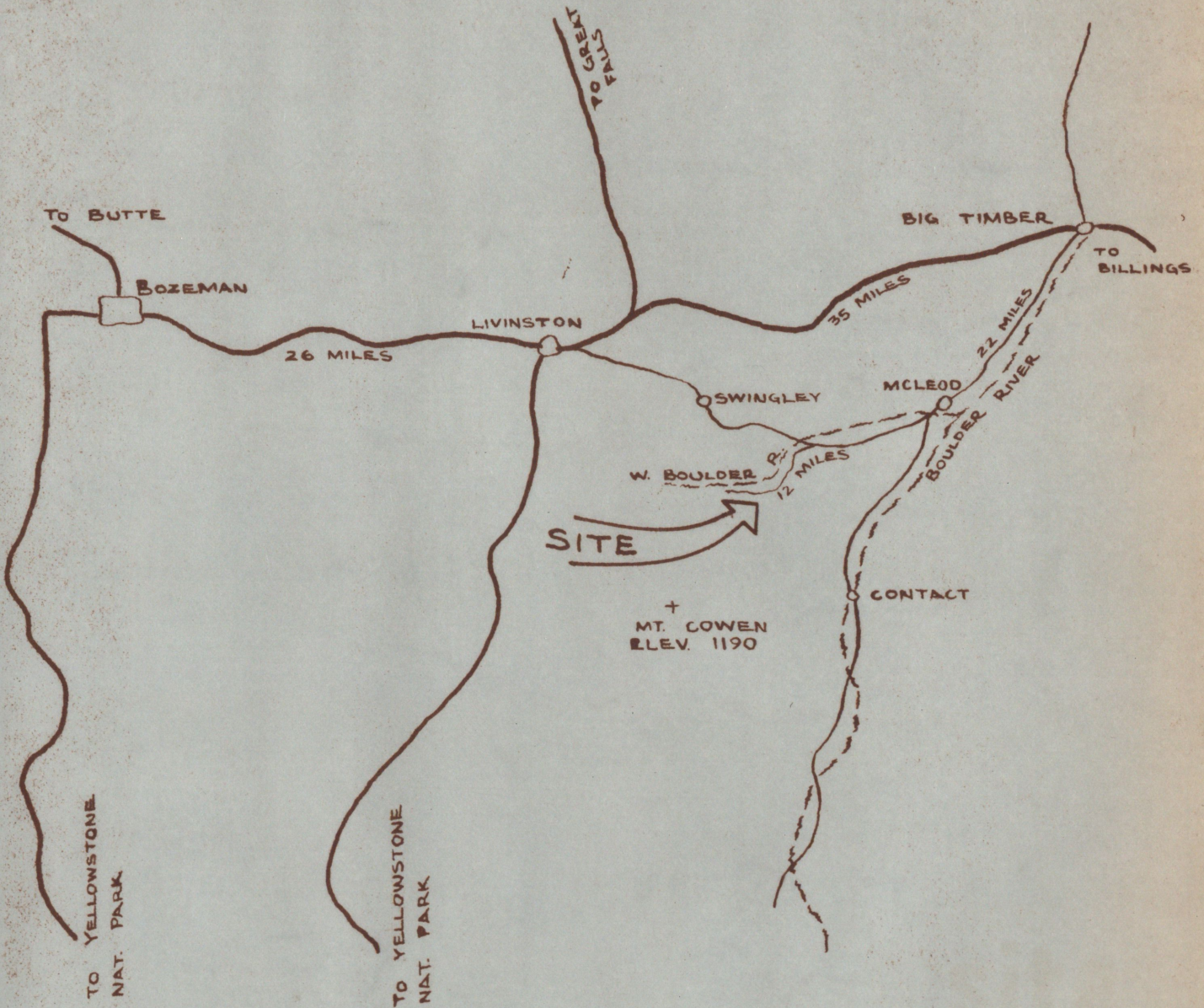
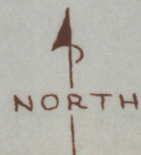


Illustration 1. Site Location.



STUDY COMPANY
HAS BEEN
IDENTIFIED AS THE

**site
considerations**

SITE
CONDITIONS

Topography

See pages 15, 16, and 17 for a topographical map and pictures of the site and its surroundings.

Vegetation and Other Natural Features

Near the river, and on alluvial fans and stream terraces, the surface soil is a cobbly loam of varying depth. The subsoil consists of a clayey material, extending to approximately two feet. A lime accumulation exists just below the subsoil and overlies gravelly loam at about 40 inches. Loams and sandy loams over hard sandstone comprise the steeper slopes.

River bottom marshes, hilly grass range, and timbered slopes make up the terrain. Lodgepole pine and Douglas fir comprise the majority of the timberland areas with frequent stands of cottonwoods covering the lower slopes and mesas.

Availability of Utilities

Electric power lines follow the river bottom to a nearby ranch. Extension of these lines to the proposed facilities would be easily and inexpensively accomplished.

Heat for warmth and for cooking can be supplied by propane, fuel oil, electricity, or wood and coal, or a combination of these. There are no natural gas lines into the area because of its primitiveness. Comparative

installation and maintenance costs should be studied for a recommendation of the method to be used.

Water may be supplied either by driven well or by utilizing a continuously flowing spring which comes out of a mountain slope one-half mile to the southeast. The proximity of the river to the site would not be of much advantage for water supply due to its fluctuation and a pumping and treatment system would be of necessity. Of the methods available for water supply, the driven well would be most practical. A pump must be provided for maintenance of adequate water pressure for the proposed facilities, but would be cheaper than the laying of water lines from the spring. Closeness of the water supply would reduce the possibilities of future maintenance costs.

Waste disposal could be accomplished by installation of a typical septic tank and drainage field system. Placement of this system would depend upon the water supply and applicable sewage and plumbing codes.

Accessibility of Site

A gravelled road follows the river to within a mile of the site. From there and to about a mile past the site, it is dirt of fairly good quality for vehicular travel. The proposed building site lies within two hundred yards of the dirt road and a connecting road could be constructed without much difficulty.

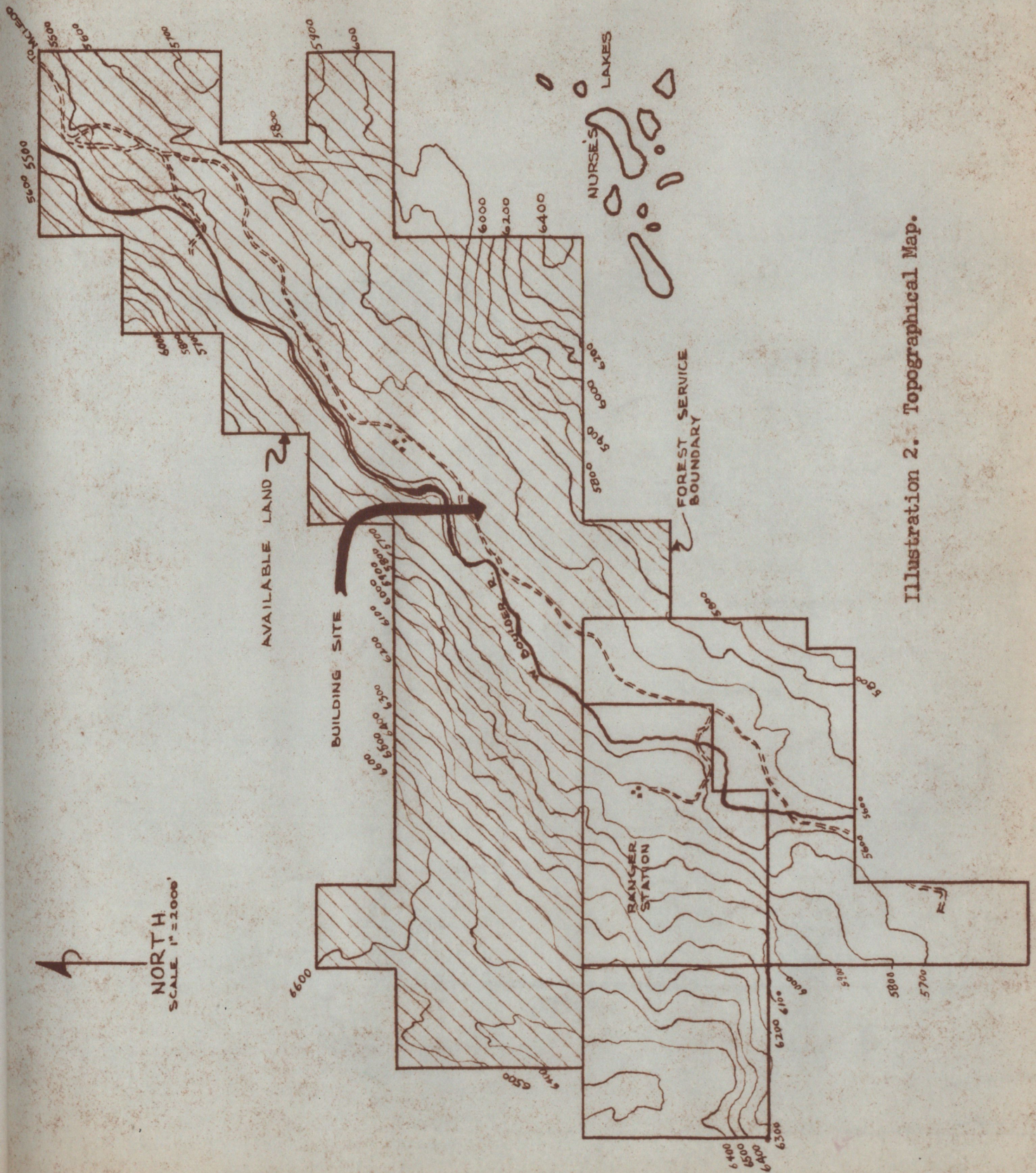


Illustration 2. Topographical Map.



VIEW TO THE NORTHWEST
LOOKING ACROSS THE BUILDING
SITE



VIEW OF MOUNTAINS TO THE
SOUTH OF THE BUILDING SITE



VIEW TO THE NORTHEAST OF
THE BUILDING SITE



VIEW OF THE BUILDING SITE
LOOKING NORTH BY
NORTHEAST



VIEW OF THE BUILDING SITE
LOOKING FROM THE NORTH



**building
requirements**

SPATIAL
ACTIVITIES
AND
REQUIREMENTS

Educational Facilities

Laboratory:

Activities -

Basic ecological field analysis of collected specimens, including autopsy of deceased animals from polluted areas; studying plant life displays, assembling ecological collages.

Persons -

20-25 students and 3 staff members

Size of Space -

Approximately 950 sq. ft., including a small greenhouse-type area.

Equipment -

100 lin. ft. of work tables, stools, 10-12 dissecting microscopes, 3 herbarium cases, 3 plant presses, bulletin board, blackboard, storage for field equipment (traps, cameras, markers, devices for measuring water in the soil, comparative temperatures, comparative hours of light, and evaporation, and other required equipment), 3 sinks, small bookcase

Illumination -

150 footcandles at work benches

Environmental Control --

Heating, natural and mechanical ventilation.

Library, Seminar, Lounge:

Activities --

Reading and reference work, seminars, viewing of films and slides, relaxation

Persons --

20-25 students and 3-4 staff members

Size of Space --

Approximately 700 sq. ft.

Equipment --

Book shelves, couches, chairs, improvised seating, low (coffee) tables, audio-visual equipment and storage, TV

Illumination --

Variable, 30-70 footcandles

Environmental Control --

Heating, natural ventilation

Darkroom:

Activities --

Processing of film and production of prints

Persons -

4 students and 1 staff member

Size of Space -

Approximately 100 sq. ft.

Equipment -

2 sinks, enlarger, storage for chemicals, pans,
miscellaneous small equipment

Illumination -

Small safelight, large safelight, 15-watt white
light

Environmental Control -

Heating, mechanical ventilation

Living Accommodations

Dining:

Activities -

Dining

Persons -

20-25 students and 4 staff members

Size of Space -

Approximately 550 sq. ft.

Equipment -

Dining tables, seating

Environmental Control -

Heating, ventilation

Kitchen:

Activities -

Preparation of foods, food storage

Persons -

Cook and cook's helper

Size of Space -

Approximately 500 sq. ft.

Equipment -

2 broilers, 1 fryer, 2 ranges, 2 sinks for food preparation, triple sink and single sink for pot washing, 1 large refrigerator, 1 walk-in refrigerator, dishwasher, cabinet space, counter space, hood over ranges and fryers, 1 steamer, 2 kettles, 1 bain marie

Illumination -

70 foot candles

Environmental Control -

Heating, mechanical ventilation

Sleeping

Sleeping Facilities - Male Students:

Activities -

Sleeping

Persons -

15 male students

Size of Space -

Approximately 350 sq. ft.

Equipment -

Sleeping bags, mattresses

Environmental Control -

Heating, ventilation

Sleeping Facilities - Female Students:

Activities -

Sleeping

Persons -

10 female students

Size of Space -

Approximately 250 sq. ft.

Equipment -

Sleeping bags, mattresses

Environmental Control -

Heating, ventilation

Sleeping Facilities - Staff, 2 Rooms:

Activities -

Sleeping

Persons -

Possibility of husband and wife

Size of Space

Approximately 150 sq. ft.

Equipment -

Double bed, night stand, closet, drawer space,
desk and chair

Environmental Control -

Heating, ventilation

Sleeping Facilities - Staff, 1 Room:

Activities -

Sleeping

Persons -

1 or 2 staff members of same gender

Size of Space -

Approximately 18 sq. ft.

Equipment -

2 single beds, 2 night stands, closet, drawer space, 2 desks and chairs

Environmental Control -

Heating, ventilation

Sleeping Facilities - Staff, 2 Rooms:

Activities -

Sleeping

Persons

Cook, cook's helper

Size of Space

Approximately 110 sq. ft.

Equipment -

Single bed, night stand, closet, drawer space

Environmental Control -

Heating, ventilation

Restrooms and Baths

Restroom - Male Students:

Activities -

Personal hygiene, dressing, clothes storage

Persons -

15 students

Size of Space -

Approximately 400 sq. ft.

Equipment -

2 urinals, 2 water closets, 4 shower fixtures,
22 lin. ft. of closet space, mirrors, 4 sinks,
floor drains, bathroom accessories

Environmental Control -

Heating, ventilation

Restroom - Female Students:

Activities -

Personal hygiene, dressing, clothes storage

Persons -

10 students

Size of Space -

Approximately 400 sq. ft.

Equipment -

3 water closets, 3 to 4 sinks, 3 shower stalls,
15 lin. ft. of closet space, mirrors, floor drains,
bathroom accessories

Environmental Control -

Heating, ventilation

Restroom - Staff, 4 Typical Rooms:

Activities -

Personal hygiene

Persons -

2 occupants per room

Size of Space -

Approximately 50 sq. ft.

Equipment -

Bath-shower, stool, sink, accessories

Environmental Control -

Heating, ventilation

Administration Facilities

Activities -

Administrating and organizing programs, fund raising, financial supervision

Persons -

1 director

Size of Space -

Approximately 110 sq. ft.

Equipment -

Desk and chair, file cabinet, telephone, type-writer desk and chair, couch

Illumination -

100 foot candles

Environmental Control -

Heating, ventilation

Associate Director and Teaching Staff Office:

Activities -

Organization and implementation of programs,
secretarial work, map making

Persons -

1 associate director, 2 teaching staff members

Size of Space -

Approximately 350 sq. ft.

Equipment -

3 desks and chairs, file cabinet, couch, drafting desk and stool, small conference table and four chairs, typewriter and stand, desk calculator, copy machine

Illumination -

100 foot candles

Environmental Control -

Heating, ventilation

Supporting Facilities

Clothes Washing and Equipment Storage:

Activities -

Clothes washing and drying, storage of camping and pack equipment, storage of food and miscellaneous equipment

Persons -

1 to 10 persons

Equipment -

Washer and dryer, shelves, walk-in cold storage (freezer), racks and hooks for equipment storage

Environment Control -

Ventilation

Corral and Shed:

Activities -

Retention of and shelter for pack stock, storage of animal feed

Number of Animals -

3 to 4 horses

Size of Space -

Shed - approximately 250 sq. ft., corral - adequate for exercise

Car Parking and Garage:

Activities -

Protection of Vehicles

Number of Cars -

Garage - 3 private cars, 2 center vehicles;
parking area - 5 cars

Size of Space -

Garage - approximately 900 sq. ft.

Equipment -

Electrical outlets for engine heaters

Illumination -

Night light operated from administration area
and garage

Color Code:

- ☐ PRIMARY RELATIONSHIP
- ☐ SECONDARY RELATIONSHIP
- ☐ UNDESIRABLE RELATIONSHIP
- ☐ UNRELATED

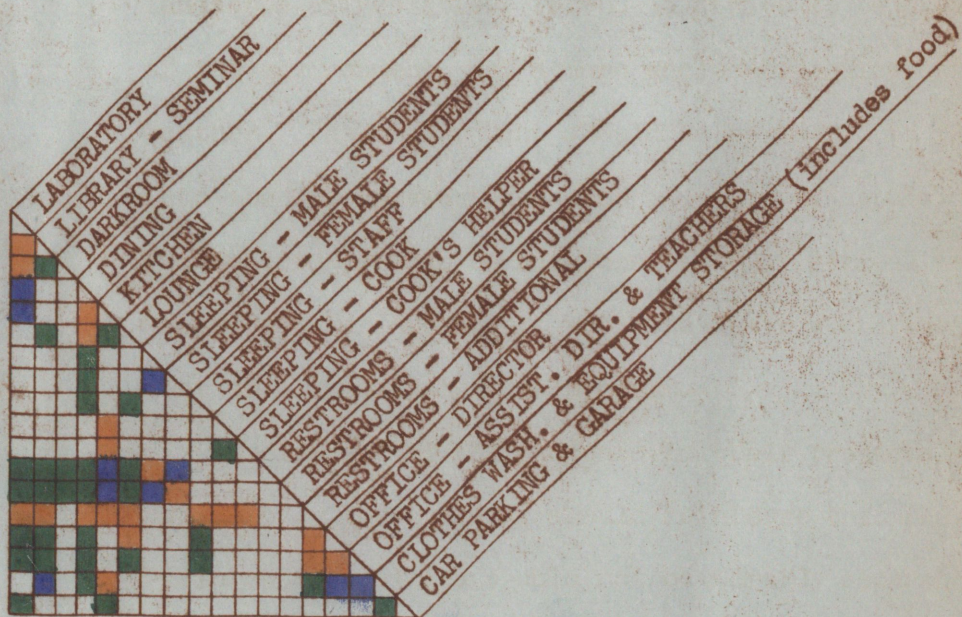


Illustration 5. Interrelationship of the Spaces.

Building Concept

Most buildings that man has built are a flagrant disregard for nature. He cuts into the earth to suit himself, to satisfy his need for shelter. Too often the result is a permanent blight on the landscape.

A building in which a love and understanding of nature is to be related to others should not feel like a permanent obstruction. Rather, it should be an area borrowed from nature with a little disturbance of the landscape as possible. It should strive to be a part of the environment, not a mere enclosure against the weather. The environment should be permitted to flow into the spaces created—a continuation of nature. The building should be inexpensive and practical, yet where cost is in conflict with the desired character, cost should yield to that program.

Involvement of the students in their projects is necessary. The building should reinforce that feeling. Different activities should not be harshly separated, but should melt together as much as possible. The purpose here is to show that learning and concern for the environment is not a part-time activity. The purpose for the students' participation should be constantly felt. Arrangement of spaces should be informal to aid the students in feeling at ease with

themselves and with others as they experience this
involvement with nature.

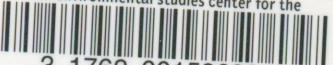
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summary

SUMMARY

In view of our continuous degradation of the environment and our eventual self-destruction, a definite need exists to create concern and knowledge of our ecosystem. The intention of the program herein is to reach as large a portion of the population through a concerned and dedicated group of young students. By providing a scholarship fund for the needy, and personally selecting students from across the nation, it is hoped that all economic classes can be reached.

The program itself will attempt to instill in the selected students an awareness of the needs for perpetuation of the ecosystem and a fresh look at man's position within it. The students will be encouraged to propose and implement projects within their own areas of interest when they complete the course. The communication of their learning and ideas to others will be a measure of the success of the learning process.

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