From the Archives
Original Thesis Title:
"A Partial Natural Resources Inventory of the Upper Campus of Simon's Rock College (with results of the sampling of the Benthic Invertebrates of Lake Mansfield)."

B.A., Environmental Studies, Simon's Rock College, Great Barrington, MA, 1982.

B. Ricardo Brown, Ph.D.
Associate Professor of Cultural Studies
Pratt Institute
brbrowniii@earthlink.net

A PARTIAL INVENTORY OF THE NATURAL RESOURCES OF THE UPPER CAMPUS OF SIMON'S ROCK OF BARD COLLEGE

by
Bennie R. Brown

A Project submitted to the
Environmental Studies Faculty
in partial fulfillment
of the requirements for the
BACHELOR OF ARTS

Approved:

Donald R. Roelofs
Project advisor

Donald R. Roelofs
Major Head

Glenn T. Handelman
Academic Dean

Simon's Rock of Bard College
Great Barrington, Massachusetts

1981

Acknowledgements

I would like to acknowledge the help of the following persons:

Don Roeder for helping me keep up the required amount of dedication and frustration necessary for the completion of this project, and to both Don and Marty Naumann for teaching me all that they could about ecology (even though I am still half social scientist!)

Morgan and Betty Vigneron for taking Don and me flying.

The Ecological Methods Class (Don Roeder, Suzanne Hoover, Alison Plummer, Jon Woodward, Susan Phillips, Steve Golan, and Rachel Wilson.

Dave Jacke for somehow showing up at my door at the right moment on more than one occasion, and for starting this whole process.

Penny Wildes for typing this project.

Table of Contents

Introduction

There are two different approaches to the achievement of both an understanding of how nature functions and man's place in the natural order. The first approach may be termed a "macro" approach, i.e., addressing the question in a larger, broader scale. The second approach is directed at the "micro" level, i.e., helping to solve those environmental problems which effect us directly as individuals and as a community. To be effective the environmental movement must be equally effective on both the "micro" and "macro" levels. Moreover, it would be difficult for Simon's Rock to train people to protect the environment when there is the potential for (or actuality of) uninformed land management decisions pertaining to the campus environment.

Some positive steps have been made to increase our understanding of the natural environment of the campus. One such step was the natural resource inventory of the original campus of Simon's Rock Early College completed by David Jacke in May 1980. In his introduction, he stated one of the primary reasons why such a project should be undertaken:

> If it becomes necessary for Simon's Rock Early College to grow in order to survive, it will be necessary to be aware of the potential land use problems and opportunities that are inherent in the land on which the college is situated. (Jacke, 1980)

Ten months after Simon's Rock merged with Bard College, the adjacent property known as the Dehon Seminary was purchased. This property provided the college with an additional 7 buildings situated on 72 acres. The acquisition was

made to provide the college with the facilities necessary to increase enrollment and hence help to insure the survival of the institution.

Because the Jacke inventory was completed before the purchase of the Dehon Seminary, no data was collected on this area which will henceforth be referred to as the "Upper Campus". This project was undertaken in order to provide a partial inventory of the natural resources of the Upper Campus. In his inventory, Jacke identified topography, surface and ground waters, vegetation, soils, and unique and fragile areas as the major parameters of any such inventory. In addition, other parameters such as wildlife were identified, but not considered in depth. Because the time frame of this project was less than half of that of the Jacke inventory, not all of the important parameters could be considered in depth. The major parameters considered here are topography, vegetation, and surface waters. Unique and fragile areas were also identified. However, due to the lack of consideration of all important parameters, such as soils and ground water, this list should be considered partial.

Furthermore, this work is meant to be the background for a more complete inventory that will be completed in the future. (The final section of this paper lists what the author believes to be priorities for future studies of the Upper Campus.) It is also to be seen as a seemingly growing trend among students towards the willful undertaking of projects, such as the windmill feasibility study being performed concurrently with this

inventory, which will provide for a more healthy interplay between the human and natural environments. Such activities have a direct bearing upon the quality of life[1] at Simon's Rock. This is a trend that is in every way beneficial to the college and it should be actively promoted by the administration of Simon's Rock. This type of project increases our ability to raise the quality of life of the entire community because it increases the sum total of our knowledge of the natural component of the community. This knowledge of the local ecosystem is absolutely necessary if it is to be managed intelligently, i.e., if we are to be aware of what we should and should not use. Ultimately, this knowledge leads to a strengthening of the college by promoting the quality of the human environment through the protection of the integrity of the natural environment.

1. "Quality of Life" is a rather ambiguous term in this society and it is beyond the scope and intention of this paper to explore it. Let it suffice to say that it is a variable dependent upon the quality and integrity of the human and natural environments.

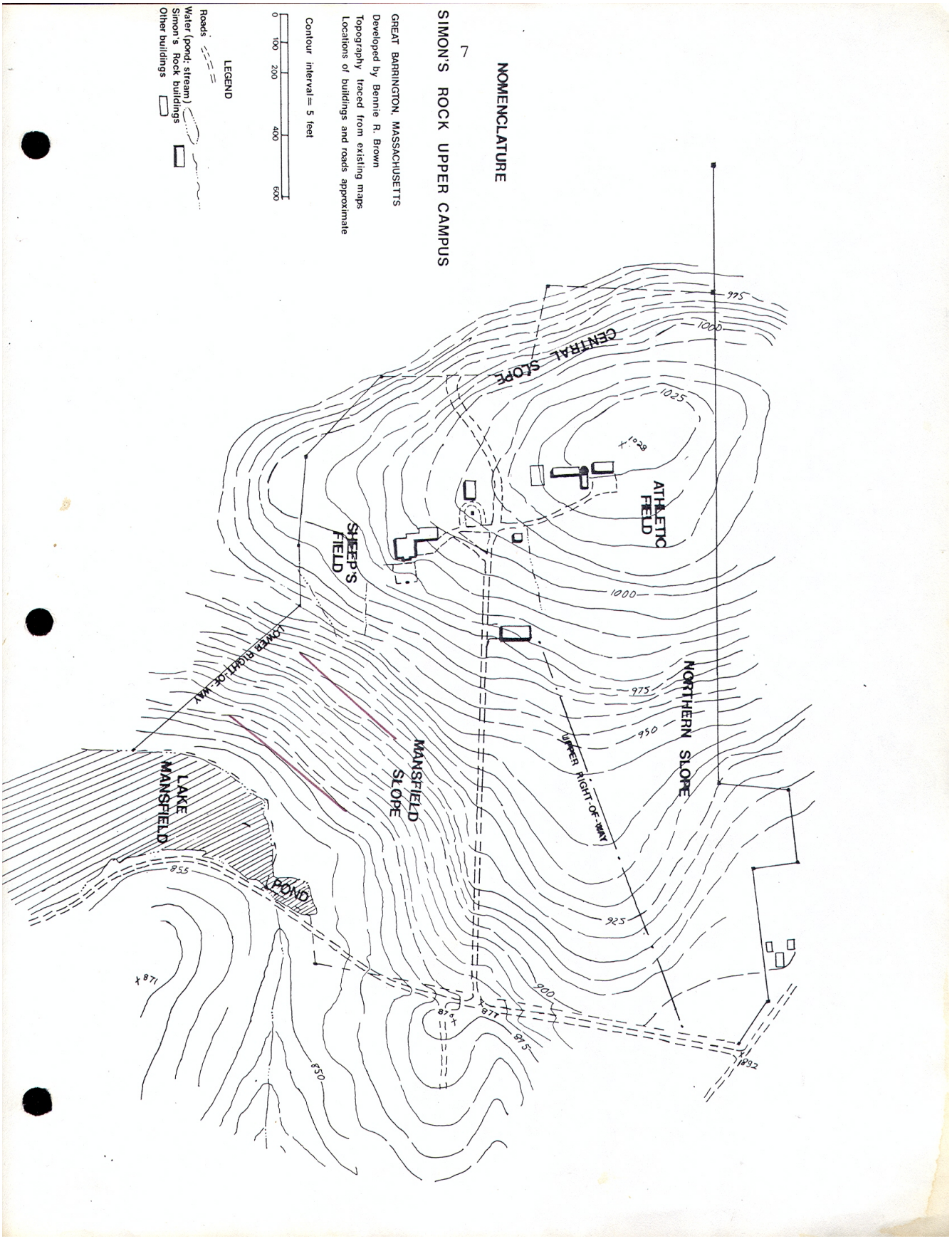
Materials and Methods

The data collection period of this study was from September 15, 1981 to November 4, 1981. Care was taken to remain as consistant as possible with the materials and methods used by Jacke (1980).

The first phase of the project consisted in developing a base map of the study area. A typographical map was obtained from Kelly and Granger Surveyors of Great Barrington, Massachusetts. The base typographical map used by Jacke (1980) was obtained by him from the same source. There are, however, some discrepancies between the map obtained by the author and the one obtained by Jacke (see Topography section of Discussion.)

The data for the vegetation analysis was obtained by three methods. First, a total of six relevé's were performed by the author during the data gathering period. Five of these were performed on the Mansfield Slope - Central Slope Area and one was performed on The Northern Slope. (Fig. 1) The method employed was a modification of that described in Muller-Dembois, et. al (1974). The technique involved walking through the area and determining what appeared to be the dominate canopy species present. In addition, data was collected on the species composition of the understory, shrub and herb layers.

An estimate of the relative importance of the canopy species of the Mansfield Slope were determined by a plotless sampling technique, the "point quarter" (Brower and Zar 1977), with the aid of the personnel of the ecological methods class. Two "point quarters" were performed on October 1, 1981: Two


NOMENCLATURE
SIMON'S ROCK UPPER CAMPUS
GREAT BARRINGTON, MASSACHUSETTS
Developed by Bennie R. Brown
Topography traced from existing maps
Locations of buildings and roads approximate
Contour interval = 5 feet
0 100 200 400 600
LEGEND
Roads
Water (pond, stream)
Simon's Rock buildings
Other buildings
CENTRAL SLOPE
ATHLETIC FIELD
SHEEP'S FIELD
LOWER RIGHT-OF-WAY
UPPER RIGHT-OF-WAY
NORTHERN SLOPE
MANSFIELD SLOPE
LAKE MANSFIELD
POND
975
1000
1025
1028
1000
975
950
925
900
875
850
855
871
971
1892

Some of the names assigned to those areas given in Figure 2 are those used by the students currently living on the Upper Campus. Others were supplied by the author. No satisfactory classification of the geographical areas of the Upper Campus had previously been developed, with the exception of the "Central Slope" (identified by Jacke) and Lake Mansfield. In order to facilitate surveying, the road entering the campus from the Lake Mansfield road was used as the dividing line between the Northern and Mansfield slopes. (Figure 2).

Plant communities were named using the method outlined by Jacke (1980). In this method cover class refers to the dominant or co-dominant genus or genera occupying the canopy layer of vegetation. Cover type refers to the specific species which dominate the canopy layer. The canopy layer was defined as vegetation over ten meters in height. The understory layer consists of those individuals whose height was between two and ten meters. The shrub layer underbrush were those woody species between thirty centimeters and two meters in height. The herb layer was defined as those species below a height of thirty centimeters.

Water quality data on Lake Mansfield and the pond was provided by the faculty and students of the Lake Mansfield Project and the Fall 1981 limnology class. The benthic organisms of the pond were also sampled in May 1981 by the author while participating in the Lake Mansfield Project. The section of the lake to be sampled was marked off on a map using a grid with each square measuring approximately twenty square feet.

The grid was numbered and the sampling sites determined using a random number chart given in Brower and Zar (1977). Flags were placed on the shore of the lake to mark the sampling sites. One sample was taken from the approximate center of each of the eight sample sites. (see Fig. 3). An Ekman benthic dredge with a sample area of ninety square centimeters was lowered over the side. It was raised after striking bottom and its contents were placed in 16oz glass jars. A preservative containing 1 part formilin, 3 parts alcohol, and 6 parts water, was poured into the containers at a ratio of one part fixer to nine parts substrata and water. The contents of the jars were then taken back to the lab where they were placed in metal trays. Water containing twenty percent sodium chloride was then added to the trays. All benthic organisms floating to the top were removed and counted. The specimens were identified using Needham and Needham (1962) and Pennak (1978). Specimens of each taxon were placed on a glass slide using gum arabic, the preservative as a mounting medium.

The locations of roads and buildings on the maps were estimated using previous maps, and ground and aerial observations. The sizes of the buildings are approximate.

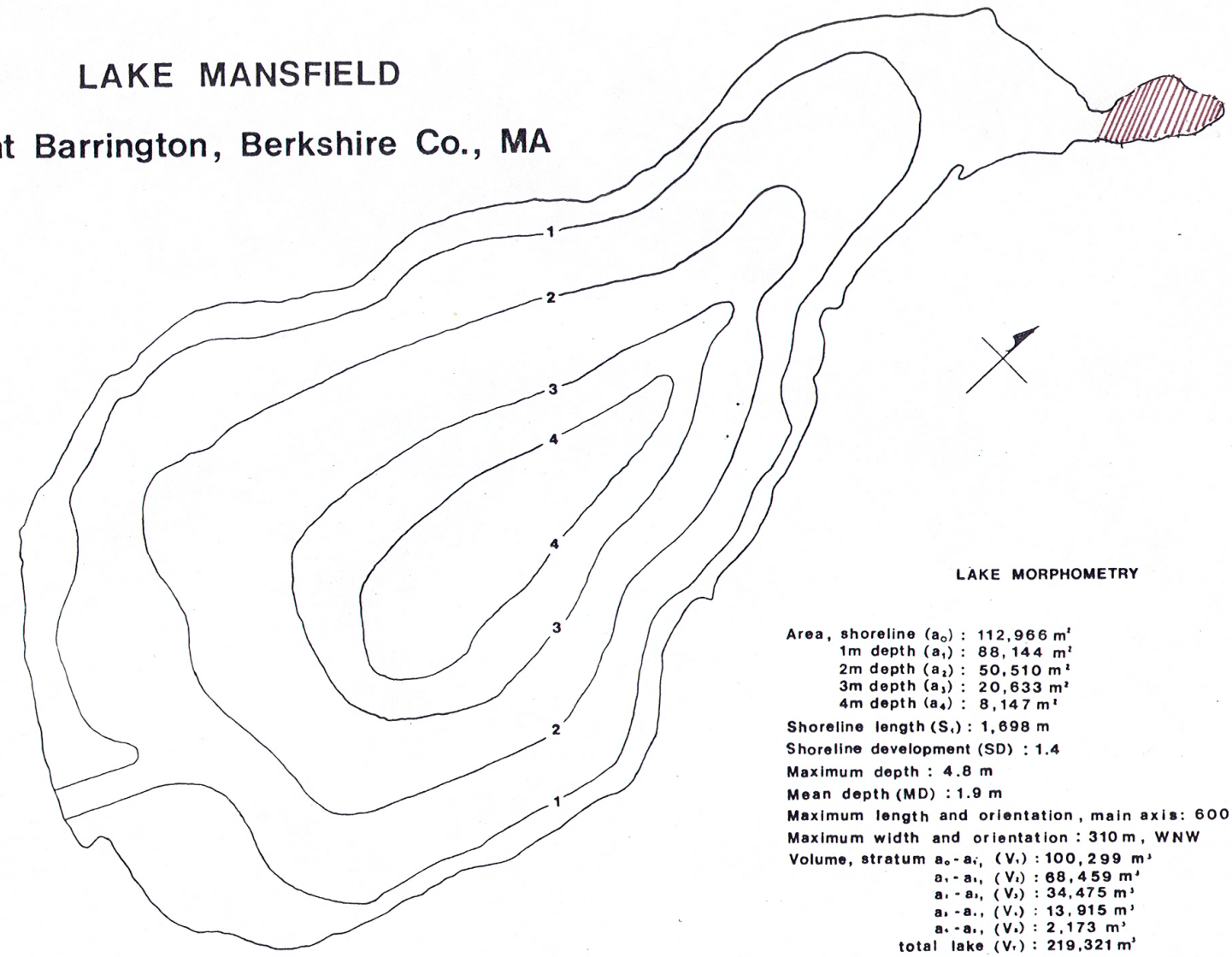
Figures 2 and 4 were produced from two overlays on water based acetate, overlying the base map. The maps with overlays were then photographically reduced to produce a permanent material transfer (P.M.T.). The original maps are in the possession of the Science Division, Simon's Rock of Bard College.

Figure 2. Location of benthic sampling sites. (shaded area) in the pond adjacent to Lake Mansfield, Great Barrington, Massachusetts.

(map adapted from J. Meczywor and L. Gensburg, unpublished.)

LAKE MANSFIELD

Great Barrington, Berkshire Co., MA



0 24 48 72 96

Submerged Contours : meters

LAKE MORPHOMETRY

Area, shoreline (a_0) : 112,966 m²
1m depth (a_1) : 88,144 m²
2m depth (a_2) : 50,510 m²
3m depth (a_3) : 20,633 m²
4m depth (a_4) : 8,147 m²

Shoreline length (S_L) : 1,698 m

Shoreline development (SD) : 1.4

Maximum depth : 4.8 m

Mean depth (MD) : 1.9 m

Maximum length and orientation, main axis: 600 m, NNE

Maximum width and orientation : 310 m, WNW

Volume, stratum a_0-a_1, (V_1) : 100,299 m³
a_1-a_2, (V_2) : 68,459 m³
a_2-a_3, (V_3) : 34,475 m³
a_3-a_4, (V_4) : 13,915 m³
a_4-a_5, (V_5) : 2,173 m³
total lake (V_T) : 219,321 m³

Dates:

Field mapping:
28 April - 8 May 1981

Drafting computations:
11 May 1981

Data/mapping by:
J. Meczywor
Pensburg

Results

Topography

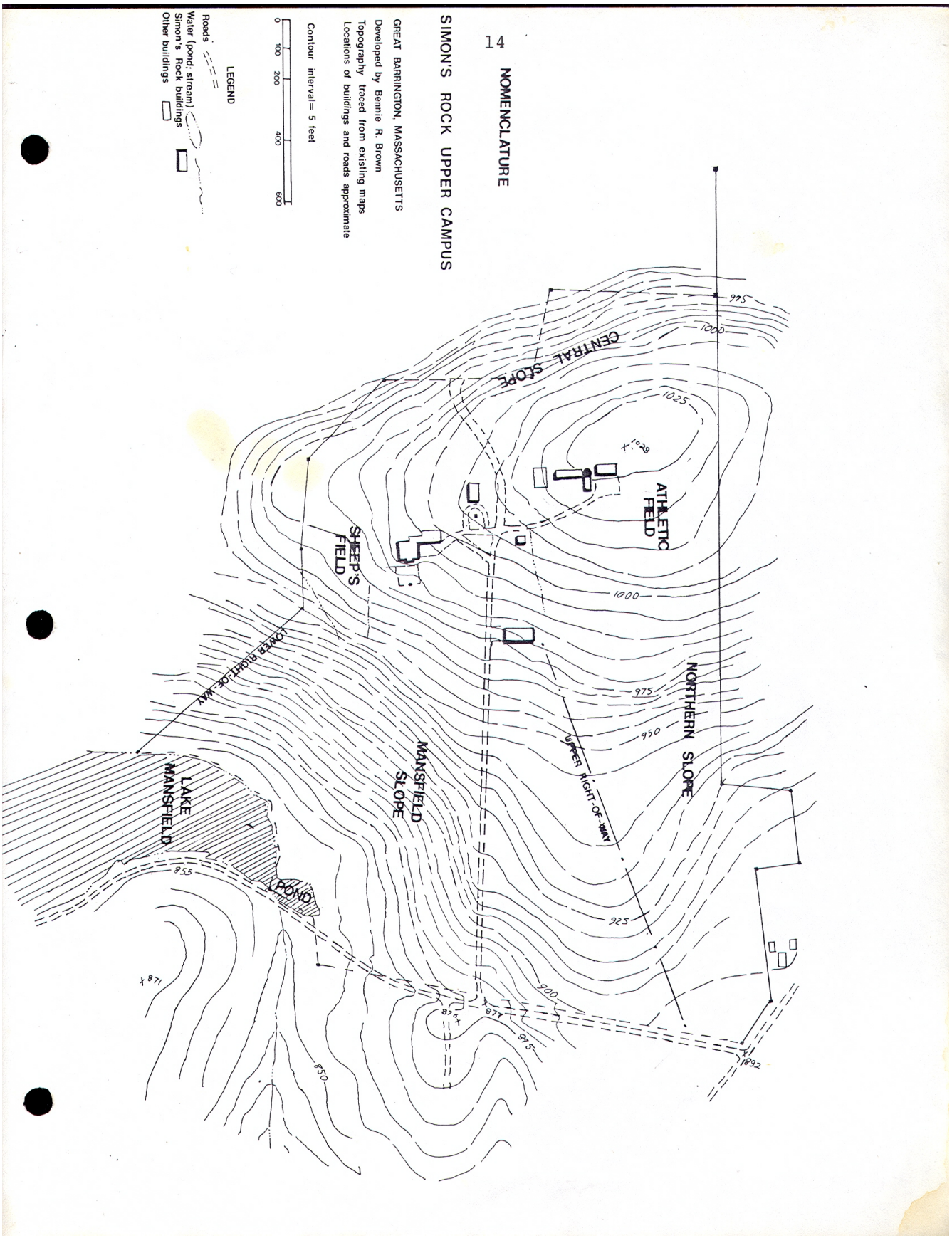
The Upper Campus of Simon's Rock of Bard College is located about 1½ miles northwest of the center of the town of Great Barrington in Berkshire County, Massachusetts. Prior to its purchase in 1981, the property was known as the Dehon Seminary.

The property borders Lake Mansfield and Lake Mansfield Road on the eastern side and Christian Hill Road on the northeastern corner. (Figure 2)

In general the campus faces east-southeast with the central slope area having a southwestern orientation. The maximum elevation of the campus is 1,028 feet above sea level while the lowest elevation is about 850 feet above sea level. The lowest area of the campus is along the border with Lake Mansfield. The maximum elevation is located in the area where the three principle slopes meet (Figure 3). The topography of the central slope is more fully shown by Jacke (1980).

The Mansfield and central slopes are for the most part greater than 25 percent. The Northern Slope varies from 5-15 percent. (See Discussion section)

Figure 3. Topography and Nomenclature of the Simon's Rock Upper Campus


14
NOMENCLATURE
SIMON'S ROCK UPPER CAMPUS
GREAT BARRINGTON, MASSACHUSETTS
Developed by Bennie R. Brown
Topography traced from existing maps
Locations of buildings and roads approximate
Contour interval = 5 feet
0 100 200 400 600
LEGEND
Roads
Water (pond; stream)
Simon's Rock buildings
Other buildings
CENTRAL SLOPE
ATHLETIC FIELD
SHEEP'S FIELD
NORTHERN SLOPE
MANSFIELD SLOPE
LOWER RIGHT-OF-WAY
UPPER RIGHT-OF-WAY
LAKE MANSFIELD
POND
975
1000
1025
1000
975
950
925
900
875
850
855
1892

Vegetation

One of the most important parameters of any natural resource inventory is vegetqtion. This parameter may be extremely useful in determining which areas are suitable for any given human activity. This section deals with the specific data gathered on vegetation communities. Refer to Figure 4 for locations of these communities and Table 1 for list of abbreviations used in the Figure.

Broadleaf System

Acer - Betula Cover Class

Acer Saccharum (sugar maple; SM) - Betula papyrifera (White Birch; B)

The canopy of this plant community is composed of an equal percentage of Acer saccharum and Betula papyrifera. This community is located in the extreme north eastern section of the Northern Slope of the campus. The understory, shrub and herbal layers were not extensively studied. The lower layers contain dense growths of Rhus robicana (poison ivy) along with Acer and Fraxinus saplings.

This community covers less than one percent of the total area of the Upper Campus.

Table 1

Abbreviations Used in Figure 4

Latin Name	Common Name	Abbreviation
Acer saccharum	Sugar Maple	SM
Betula papyrifera	White Birch	WB
Quercus rubro	Red Oak	O
Fraxinus spp.	Ash	A
Pinus strobus	White Pine	WP
Tsuga Conadensis	Hemlock	H
Rhus typhina	Staghorn Sumac	S
Corpinus caroliniana	Ironwood	IW
Cornus spp.	Dogwood	DW

Table 2

Vegetation system definitions, based on Massachusetts Natural Heritage Program Systems. (Adapted from Jacke (1980) and personal communication.

I.	Broadleaf Forest System	Greater than 50% tree cover, more than 75% of which is broadleaf trees.
II.	Needleleaf Forest System	Greater than 50% tree cover, more than 75% of which is needleleaf trees.
III.	Mixed Broadleaf-Needleleaf Forest System	Greater than 50% tree cover, composed of 25-50% broadleaf and 25-50% needleleaf trees.
IV.	Shrub System	Less than 50% tree cover with more than 50% shrub cover.
V.	Graminoid System	Less than 30% tree and shrub cover with more than 50% gross cover in herb layer.
VI.	Moss System	Less than 30% tree and shrub cover with the herb layer composed of more than 50% moss.

Acer - Quercus - Betula Cover Class

Acer Saccharum - Quercus alba (Red Oak; O) - Betula papyrifera (WB) Cover Type

This community is found in the southern section of the Central Slope area. The understory as well as the shrub layer is open and composed of Fraxinus (Ash), Acer and Quercus saplings with some Pinus strobus (White Pine saplings are also present.) The total cover in the understory and shrub layer is low. Grasses and ferns are present in the herb layer.

This community occupies less than one percent of the Upper Campus.

Table 2

Vegetation system definitions, based on Massachusetts Natural Heritage Program Systems. (Adapted from Jacke (1980) and personal communication.

I.	Broadleaf Forest System	Greater than 50% tree cover, more than 75% of which is broadleaf trees.
II.	Needleleaf Forest System	Greater than 50% tree cover, more than 75% of which is needleleaf trees.
III.	Mixed Broadleaf-Needleleaf Forest System	Greater than 50% tree cover, composed of 25-50% broadleaf and 25-50% needleleaf trees.
IV.	Shrub System	Less than 50% tree cover with more than 50% shrub cover.
V.	Graminoid System	Less than 30% tree and shrub cover with more than 50% gross cover in herb layer.
VI.	Moss System	Less than 30% tree and shrub cover with the herb layer composed of more than 50% moss.

Figure 4. Vegetation Communities of the Upper Campus of Simon's Rock (see text for explanation)

SIMON'S ROCK UPPER CAMPUS

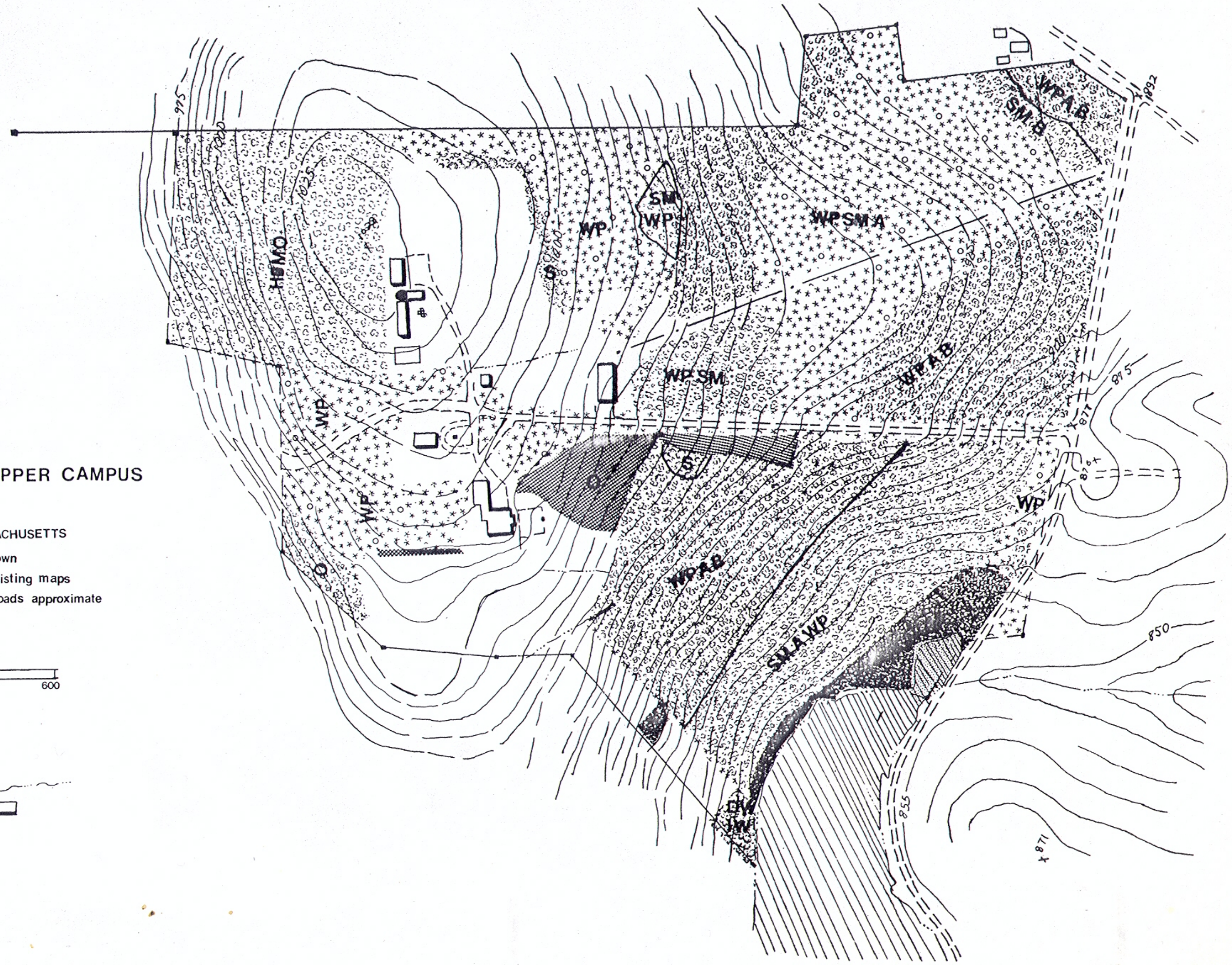
GREAT BARRINGTON, MASSACHUSETTS
Developed by Bennie R. Brown
Topography traced from existing maps
Locations of buildings and roads approximate

Contour interval = 5 feet

0 100 200 400 600

LEGEND

Roads
Water (pond; stream)
Simon's Rock buildings
Other buildings



Needleleaf System

Pinus Cover Class

Pinus strobus (White Pine) Cover Type

Pinus strobus is one of the most widespread canopy species on the Upper Campus. It appears to have been planted where it exists in pure stands. The pure stands of Pinus strobus are located on the Central Slope, Northern Slope north of the Athletic field, along the access drive from Mansfield Road and along the lower right of way (Figure 1). For the most part, the canopy of this community is so thick as to allow little daylight penetration to the understory shrub and herb layers. Scattered plants exist in the herb layer. These are primarily Tricentalis boreales (starflower) and Mitchella repens (partridgeberry). In those areas where this community borders on a graminoid system and light is able to penetrate from the side Lonicera (honeysuckle), Fraxinus, Rubus (prickly brambles) and Rhus may be found.

This community occupies one and one half percent of the Upper Campus.

Mixed Broadleaf-Needleleaf System

Pinus - Fraxinus - Betula Cover Class

Pinus strobus - Fraxinus - Betula papyritera Cover Type

This community is located on the upper half of the Mansfield Slope area and in the eastern section of the Northern Slope. P. strobus, Fraxinus, and to a somewhat lesser degree B. papyritera make up the canopy layer of this community. Other species that are found in the canopy layer are Acer

Needleleaf System

Pinus Cover Class

Pinus strobus (White Pine) Cover Type

Pinus strobus is one of the most widespread canopy species on the Upper Campus. It appears to have been planted where it exists in pure stands. The pure stands of Pinus strobus are located on the Central Slope, Northern Slope north of the Athletic field, along the access drive from Mansfield Road and along the lower right of way (Figure 1). For the most part, the canopy of this community is so thick as to allow little daylight penetration to the understory shrub and herb layers. Scattered plants exist in the herb layer. These are primarily Tricentalis boreales (starflower) and Mitchella repens (partridgeberry). In those areas where this community borders on a graminoid system and light is able to penetrate from the side Lonicera (honeysuckle), Fraxinus, Rubus (prickly brambles) and Rhus may be found.

This community occupies one and one half percent of the Upper Campus.

Mixed Broadleaf-Needleleaf System

Pinus - Fraxinus - Betula Cover Class

Pinus strobus - Fraxinus - Betula papyritera Cover Type

This community is located on the upper half of the Mansfield Slope area and in the eastern section of the Northern Slope. P. strobus, Fraxinus, and to a somewhat lesser degree B. papyritera make up the canopy layer of this community. Other species that are found in the canopy layer are Acer

saccharum and Castanea dentata (American chestnut).

Because the density of the canopy varies in thickness, the understory and shrub layers vary in density and variety. The understory species present are Acer, Fraxinus, Hamamelis Virginiana (Witch Hazel) and Populars tremuloides (Quaking Aspen). The shrub layer includes those same species as in the understory as well as Rubus spp., Castanea dentata, Sambucus canadensus (common Elderberry) and Caprenus caroliniana (Iron-wood). The herb layer consists of sensitive ferns and grasses. (Susan Phillips, personal communication.)

This cover type occupies 19 percent of the area of the Upper Campus.

Acer - Fraxinus - Pinus Cover Class

Acer saccharum - Fraxinus sp. - Pinus strobus Cover Type

The community is located on the lower section of the Mans-field Slope. The dominate canopy species are Acer saccharum, Fraxinus sp. and to a slightly lesser degree P. strobus. The canopy and understory are dense and limit the number of plants in the shrub and herb layers. Other species occupying the canopy are Carya sp. (Hickory), Prunus serotina (Black Cherry), and Ulmus americana (American Elm). The understory and shrub layers consist of these same species along with Carpenus caro-liniana, Cornus spp. (Dogwood) and Hamamelis virginiana (Witch Hazel). The herb layer is sprace and consists primarily of grasses and ferns with Acer saplings.

This community occupies two percent of the Upper Campus.

Pinus - Acer Cover Class

Pinus strobus - Acer saccharum Cover Type

P. strobus and Acer saccharum are the dominate canopy species of this community. The understory of this community dominated by Acer saccharum, Fraxinus sp., Quercus alba and Ulmus americana. The shrub layer contains these species along with Caypenus caroliniana, Rhus rabicans, Populas sp, and Sambucus canadensis.

This community is located east of the Pibly Gymnasium and occupies less than one percent of the Upper Campus. A much smaller community of this type is located to the north of the Pibly Gymnasium.

Pinus - Acer - Fraxinus Cover Class

Pinus strobus - Acer saccharum - Fraxinus sp. Cover Type

This is a community of the Northern Slope and was not extensively studied (see Materials and Methods section). The canopy consists primarily of P. strobus with Acer saccharum and Fraxinus sp. also present in varying density. The community is present on both sides of the Upper Right-of-Way. The understory appears to have a low density with the same species present as in the canopy layer. The shrub layer is so think as to inhibit passage and is composed of Acer saccharum, Fraxinus, Quercus, Hamamelis Virginiana with dense growths of Lonicera (Honeysuckle) and Rhus rabicans and other venes.

This community is present on 19 percent of the Upper Campus.

Tsuga - Acer - Quercus Cover Class

Tsuga canadensis (Hemlock), Acer saccharum, Quercus rubra Cover Type

This community is located on the upper section of the Central Slope. Tsuga canadensis, Acer saccharum and Quercus rubra are the dominate canopy species of this community. The understory and shrub layers consist of these species and also Fraxinus sp., Pinus strobus, Quercus alba and Bertula papyrifera, Hamamelis virginiana, Ostrya virginiana, (Hornbeam), Cornus, (Dogwood), Corya (Hickory), and Castenea dentata (Chestnut). The herb layer is composed of ferns and grasses.

This community occupies approximately twenty-four percent of the Upper Campus.

Betula - Pinus Cover Class

Betula papyrifera - Pinus strobus Cover Type

This community is located on the north eastern section of the Northern Slope. It was not possible to perform an accurate survey of the species present in the understory and shrub layers of this community. (see Materials and Methods).

Shrub System

Rhus Cover Class

Rhus typhina Cover Type

This community is made up of pure stands of Rhus typhina and occupy less than one percent of the total area of the Upper Campus. The herb layer is dominated by grasses.

This community is located on the northern and eastern sides of the Athletic Field and south east of the Pibly Gym-

nasium. This community has been identified as unique and fragile. (see Unique and Fragile section).

Corpinus - Cornus Cover Class

Corpinus caroliniana - Cornus sp. Cover Type

This community is located at the bottom of the lower right of way between the graminoid community and Lake Mansfield. The herb layer consists of grasses and a few Acer saplings.

The cover class occupies less than one percent of the Upper Campus.

Graminoid System

Graminoid Cover Class

This system occupies eighteen percent of the total area of the Upper Campus and is maintained by periodic mowing. Dicotyledonous plants are also present, including Taraxacum officinde (Dandelion), Trifolium agrarium (larger Hop Clover), and Trifolium procumbens (smaller Hop Clover).

Moss System

This community is located along the border of Lake Mansfield and the Pond. There are few individuals in the canopy and shrub layer. The species present in these layers are Acer saccharum, Carpenus caroliniana and Cornus sp. The herb layer is dominated by sphagnum moss.

This community occupies approximately one and one-half percent of the Upper Campus.

Surface Waters

The surface water area present on the Upper Campus is considerably less than that present on the lower campus. The majority of standing water present on the Upper Campus is contained on the pond section of Lake Mansfield. The Pond area is owned by Simon's Rock while the rest of the lake is owned by the Town of Great Barrington. (see Figure 2). In addition to the pond, three intermittant streams are located on the campus. Two of these are in Sheep's Field and one is located on the border of the Athletic Field. (see Figure 3).

The pond has an area of approximately one acre and a maximum depth of approximately one meter. The aquatic vegetagion of the pond is extensive and in summer the surface is covered with emergent and free floating macrophytes. Submerged macrophytes and algae are also present. Those macrophytes and algae in the pond include Elodea, potomogeton spp., chara, and Myriophyllum. In addition, various grasses, sedges and semi-aquatic plants are also present.

The marcobenthos sampling revealed that diptera of the family chironomidae was the dominate group of insect larvae present. The Chironomidae found included Chironomus Pentaneura, Brilla, Prodludius, and Symbiocludius. The Heleidae (biting midges) included Probezzia and Palpomyia tibalis. Chaoburus was also found. Of the Odonata, only Arehilestes was present. The Hyracorina was represented by Limnochares and Hydrachna. The Annelida were represented by Helobdella stagnalis and the Gastropoda by Vivaparus and Gyraulus.

Table 3 shows the results of the sampling of the macrobenthos of the pond.

Table 3

Density and relative density of macrobenthos in the pond connected to Lake Mansfield in May 1981.

Order	Density of Individuals/cm^2	Relative Density
Diptera	7.4	.87
Hydracarina	.29	.038
Ordonata (Zygoptera)	.25	.03
Amphipoda	.22	.026
Gastropoda	.1	.012
Ephemeroptera	.1	.012
Hydra	.02	.0025
Hirudinea	.01	.0012

Discussion

Topography

The topographical features of the Central Slope differ slightly from those reported in Jacke (1980). These inconsistancies are due to differences in the topographical maps obtained from Kelly and Granger Surveyors on which this and the Jacke study were based. The map used by Jacke was produced in 1975 by Granger of Kelly and Granger in connection with the proposed Route 7 bypass of Great Barrington. The map used for this study was produced by Kelly of Kelly and Granger Surveyors in 1950 and updated in 1957. The Kelly map was used in this study because the Granger map was unavailable. The azmith of the northern property line on the Kelly map differed from the Granger map by about 10° N. A check of the records of the Great Barrington Town Assesor showed the Granger map to be correct in this case. The lines of elevation differ in some places from one to five feet. For viewing, the property lines are consistant and should be used to align the basic map from this study with that of Jacke (1980). Because a detailed study of the precise elevations was not feasible, the Kelly map was considered reliable. The size and general features of the study area were unaffected by this decision. It is important to note that if both maps were accurate, then the differences may show change in elevation over 20 years' time. However, for the purposes of this study, the differences are minor.

From the data obtained from the topographical maps, there

appears to be two areas of the campus where development is limited due to the steepness of the slope: the Central Slope and that section of the Mansfield Slope that is above Lake Mansfield and the Sphagnum swamp. In both cases, the slope is in excess of 25 percent. Development such as construction or clearing of vegetation for some other purpose could cause serious erosion problems. This is especially true for the Mansfield Slope. Lake Mansfield is the alternative drinking water supply for Great Barrington. (Susan Phillips, personal communication.) An increase of runoff into the lake as a result of construction on the slope could adversely affect the water quality of the lake. Increased erosion could also damage the Sphagnum swamp and the pond, where a great amount of the entire primary and secondary production of the lake takes place.

Rare and Endangered Species

The Upper Campus provides suitable habitats for the following rare or endangered species.

Lypridedium arictinum (Lady's Slipper), Arethusa bulbosa (Arethusa), Ambystoma laterale (spotted salamander), Clemmys muhlenbergi (Bog turtle), Cicus cyaneus hudsonius (marsh hawk), Dryocopus pileatus (Pileated woodpecker). (Massachusetts Audobon Society, 1973). Of these species L. arietinum, A. laterale, C. cyoneus hudsonias, and D. pileatus have been seen on the Upper Campus or nearby. (Richard St. Louis, personal communication.) C. Cyoneus hudsonius have been seen by three independent observers including the author, near the Horseshoe Swamp. Those

areas that are deemed unique and fragile due to either the suspected presence of an endangered species or because it is a potential habitat for one are described in the Unique and Fragile Vegetation section. Meleagris galloparo (wild turkey) has also been seen on the Mansfield Slope. (Donald Roeder, personal communication). Habitat protection is just as important for the protection of a once endangered species which is presently experiencing a resurgence as for a species that is currently endangered.

Vegetation

No biotic community is static in time. Organisms are constantly dying and being replaced by others. If a community is disturbed by fire or weather or human activity, it enters a sequence of changes referred to as succession.

First pioneering species become established because of their adaptabilities to invade a disturbed habitat. As time goes on, these species, because of their activites, make the disturbed habitat suitable for other, slower growing species. These new species compete with the pioneer species for moisture, nutrients, and sunlight. The pioneer species cannot successfully compete and are gradually replaced. This new community is then replaced by another and so on until a final association of plants called a climax community is achieved. The final association depends upon a variety of factors but whatever the climax, it follows an orderly and specific pattern of community change. The general characteristics of plants during the early and late stages of succession

is shown in Table 4.

Table 4

General characteristics of plants during early and late stages of succession. (adopted from Ricklefs, 1979).

Character	Early Stages	Late Stage
seeds	many	few
seed size	small	large
dispersal	wind, stuck to animals	gravity, eaten by animals
seed viability	long, latent in soil	short
root/shoot ratio	low	high
growth rate	rapid	slow
mature size	small	large
shade tolerance	low	high

In addition, it is generally agreed that communities become more diverse and complex as succession progresses. (Ricklefs, 1979).

In the case of the Upper Campus, there are communities present which represent each stage of succession for their locality. These varieties range from the graminoid system to the climax Acer - Quercus stand on the Central Slope. (see Figure 2). The stages of succession on the Upper Campus probably follow a pattern similar to that described in Ricklefs, (1979) i.e., graminoid → shrub → white pineforest → mixed needleaf-broadleaf forest → hardwood forest. The majority of the vegetation systems of the Upper Campus are currently in the mixed needleleaf-broadleaf forest stage.

Unique and Fragile Vegetation Communities

In order to be classified as a Unique and Fragile Area, a plant community must meet one or more of the following criteria: 1) currently provide a nesting, feeding, or breeding area for a rare or endangered species, 2) provide a suitable habitat which a rare or endangered species may possibly use, 3) serve an important role in erosion control and help maintain the water quality of Lake Mansfield, 4) prove an important food source for a varied number of wildlife species, 5) occupy less than one percent of the total area of the Upper Campus, or 6) is a wetland community. Thirty-nine percent of the Upper Campus meets one or more of these criteria. The majority of acreage is located on the Mansfield Slope.

Sphagnum Cover Class

The plant community is classified as a unique and fragile area for a number of reasons. The Sphagnum swamp provides an appropriate habitat for C. cyaneus hudsonius, C. muhleabergi, D. pileatus and L. arietinum, all of which have been seen in or near this community.

Sphagnum communities are also important for erosion control and drought prevention. This type of moss absorbs large amounts of runoff which is slowly released over time, therefore preventing erosion after a heavy rainfall, or during periods of little rainfall, providing a reserve supply of water. (David Jacke, personal communication.)

The community is also an indicator of a wetland area which is protected under the Massachusetts Wetlands Protection Act. (Massachusetts Association of Conservation Commissioners 1978, Wetlands Areas.)

Pinus - Fraxinus spp. - Betula Cover Class

Acer - Fraxinus - Pinus Cover Class

These communities are important for the control of the quality of runoff and erosion which enters Lake Mansfield. It also serves as a feeding area for Dryocopus pileatus. It is also used by Meleagris gallopano.

Acer - Betula Cover Class

This community is classified as Unique and Fragile because it occupies less than one percent of the total area of the Upper Campus.

Carpinus - Cornus Cover Class

Because of its size (less than one percent of the total area of the campus) and because of its role as a possible barrier to excessive runoff from the lower right-of-way, this community has been classified as being Unique and Fragile.

Rhus Cover Class

Rhus typhina is an important food source. The red fruit has been found in the stomach contents of songbirds. Bonasa umbellus (ruffled grouse), Pedioecetes phassanellus (sharp-tailed grouse), Colinus virginianus (bobwhite), Phasianus colchicus (ring-necked pheasant), Zenaidura macroura (morning dove) and Mephitis mephitis (striped skunk). The twigs are eated by Odoeoileus virginianus (whitetail deer) and Sylvilagus spp. (cottontail rabbit). (Petrides, 1972).

Wetland Areas

All those areas that are identified in the surface waters section and the swamp community are classified as wetland areas and are therefore under the jurisdiction of the Massachusetts Wetlands Protection Act. Before any construction or other development activities can take place which may affect these areas, plans must be submitted to the Great Barrington Conservation Commission. The commission must then grant a permit before any development may take place.

Conclusion

The natural resources of the Upper Campus are a valuable addition to those of the lower campus. These resources must be used intelligently, i.e., with foresight, a respect for the preservation and importance of nature, and with the knowledge that land use decisions rarely have only a single effect. Many environmental problems are the result of improper land use. In the long run, it is less costly and inconvenient to design with nature and therefore avoid possible adverse environmental reprocussions.

As a result of this study, approximately thirty-nine percent of the Upper Campus may be listed as being Unique and Fragile areas. These areas should be protected from any development project which might adversely affect them.

It should be again noted that due to the partial nature of this inventory, it is possible that other Unique and Fragile areas exist which were not identified. In order to complete this inventory, the soil composition of the land must be studied. The vegetation of the Northern Slope must also be more extensively studied.

In order to be able to make informed land use decisions for Simon's Rock, studies such as this are very important, but they can not serve as an environmental impact analysis of any specific project. Such an analysis must be much more in depth and specific than a general resource inventory can be.

Bibliography

Anonymous. 1964. Identification of Tree Species on Large-Scale Panchromatic and Color Aerial Photographs, Handbook No. 261. U.S. Department of Agriculture, Forest Service, Washington.

Brallier, Sylvia-Elaine, Peter Jacke, and Joy Nakanishi. 1979. The Trees of Simon's Rock. Unpublished. Available from the Simon's Rock Bookstore.

Brewer, Richard. 1979. Principles of Ecology. W.B. Sanders Company. Philadelphia.

Brower, James E. and Jerrold Zar. 1977. Field and Laboratory Methods for General Ecology. Wm. C. Brown Company. Dubuque, Iowa.

Conant, Rodger. 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 2nd edition. Houghton Mifflin Company, Boston.

Etherington, John R. 1975. Environment and Plant Ecology. John Wiley and Sons. New York.

Jacke, David. 1980. A Natural Resource Inventory of Simon's Rock Early College. Unpublished Senior Thesis, Simon's Rock of Bard College Library.

Jorgensen, Neil. 1978. A Sierra Club Naturalist Guide to Southern New England. Sierra Club Books, San Francisco.

Lind, Owen T. 1979. Handbook of Common Methods in Limnology, 2nd edition. C.V. Mosby Company. St. Louis.

Massachusetts Association of Conservation Commissioners. 1978. Environmental Handbook for Massachusetts Conservation Commissioners. Lincoln Filene Center, Tufts University, Medford, Massachusetts.

Massachusetts Audobon Society. 1973. Rare and Endangered Plants and Vertebrate Animals of Massachusetts. Lincoln, Massachusetts.

McHarg, Ian. 1971. Design With Nature. Doubleday and Company, Inc. Garden City, New Jersey.

Mueller-Dombois, Drieter and Heinz Ellenby. 1974. Aims and Methods of Vegetation Ecology. John Wilen and Sons. New York.

Needham, James G., Paul R. Needham. 1962. A Guide to the Study of Freshwater Biology. Holden-Day, Inc. San Francisco.

Pennak, Robert W. 1978. Freshwater Invertebrates of the United States. 2nd edition. John Wiley and Sons, Inc. New York.

Petrides, George A. 1972. A Field Guide to Trees and Shrubs, 2nd edition. Houghton Mifflin Company, Boston, Massachusetts.

Ricklefs, Robert E. 1979. Ecology. 2nd edition. Chiron Press, Concord, Massachusetts.

Robbins, Chandler S., Bertel Braun and Herbert S. Zim, 1966. A Guide to the Field Identification of Birds of North America. Houghton Mifflin Company, Toronto.

Stokes, Donald W. 1976. A Guide to Nature in Winter. Little, Brown and Company. Boston, Massachusetts.

B.Ricardo Brown B.A. Thesis, Simon's Rock College, 1982, pdf version.