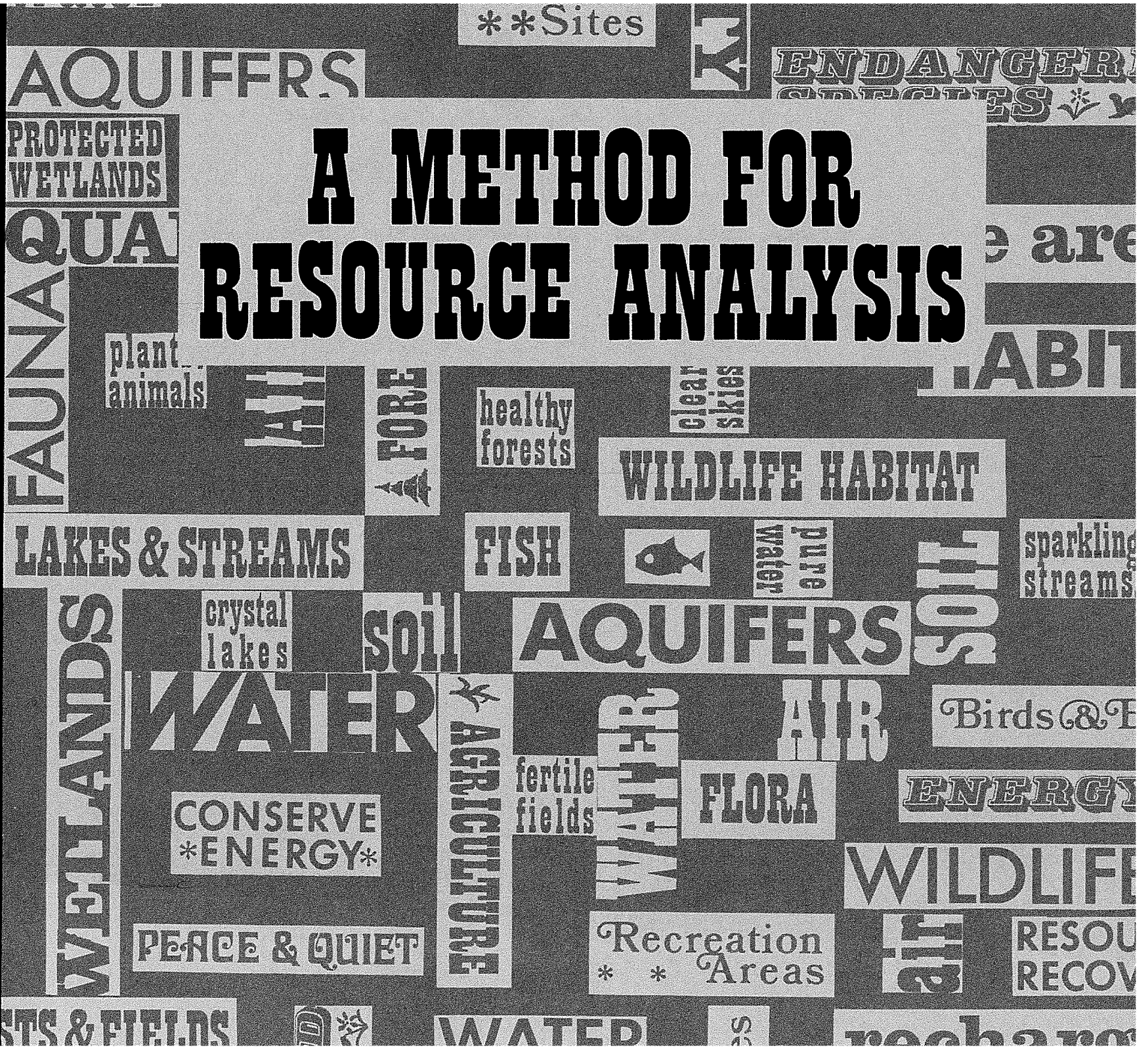
ULSTER COUNTY

ENVIRONMENTAL MANAGEMENT COUNCIL

A METHOD FOR RESOURCE ANALYSIS



Resolution 222, November 9, 1972, established the County Environmental Management Council to "advise on all matters affecting the preservation, conservation and ecologically suitable use of the natural resources of the county... The EMC shall be responsible for reviewing and advising local government on present and proposed methods of using, protecting and conserving the environment." Further, the EMC "Shall prepare a plan for the protection of the county's environment and the management of its natural resources."

A METHOD FOR RESOURCE ANALYSIS

ULSTER COUNTY, NEW YORK

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Prepared by

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-1975-

Ulster County Legislature

Kingston, New York

PETER J. SAVAGO
CHAIRMAN
COUNTY LEGISLATURE

244 FAIR STREET
KINGSTON, N. Y. 12401

September 1975

To My Fellow Citizens:

Land use commands a high priority consideration at all levels of government. What we carelessly expend today may never again be recaptured. This generation has the awesome responsibility to its heirs to conserve not only the pureness of water and air, but also the integrity of its land resources.

This text book is the contribution of the Ulster County Environmental Management Council toward facilitating the implementation of these goals for Ulster County. It will be valuable as a guide and further presents a method for analyzing the data.

Peter J. Savago, Chairman
Ulster County Legislature

ULSTER COUNTY PLANNING BOARD
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September 1975

The need to consider the interaction of natural conditions is the important message of this work. By guiding growth to sites which can best support development, both the needs of man and the laws of nature can be served.

Herbert Hekler

Herbert Hekler
Planning Director

ACKNOWLEDGEMENTS

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The conceptualization of the methodology that formed the basis for this study was developed by the faculty of the Department of Landscape Architecture at the Harvard Graduate School of Design. Thanks are due to Carl Steinitz, Frederick Smith and David Sinton.

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SUMMARY

This study attempts to explain a method by which towns:

1. Select issues of concern
2. Determine which natural systems are critical to those concerns
3. Collect appropriate information
4. Analyze the information in order to
   - *predict potential impacts of land uses
   - *recommend locations for minimal environmental impacts of land uses
   - *define high priority areas for open space conservation
5. Implement the analyses in local planning decisions.

INTRODUCTION

The Environmental Management Council has produced this study:

1. To give Conservation Commissions an opportunity to understand natural systems
2. To provide a method for evaluating and protecting the County's environment.

This study is not a definitive environmental plan. It is an example of a method that can be used by local Conservation Commissions, town planning boards, town boards, and county planning boards to evaluate the degree of impact to be expected from potential land uses. The method is intended to supplement the Natural Resource Inventory Training Program given for Citizen Conservationists through the Dutchess County Cooperative Extension.

natural systems

The problem of producing an environmental planning method for Ulster County must first be approached by establishing what it is that makes up the environment of the County. It is necessary to define the natural resource system in order to preserve and manage it.

The County is a working system of interrelated components. Trees, rocks, fields, forests, mountains, lakes, rivers and human settlements contribute to the total landscape. Man is one element in this system of interacting components. In order to evaluate the potential impacts of human land use on those elements that maintain the balance of the system, it is necessary to understand their sensitive interaction. What processes provide clean water, productive soil, healthy vegetation or abundant wildlife?

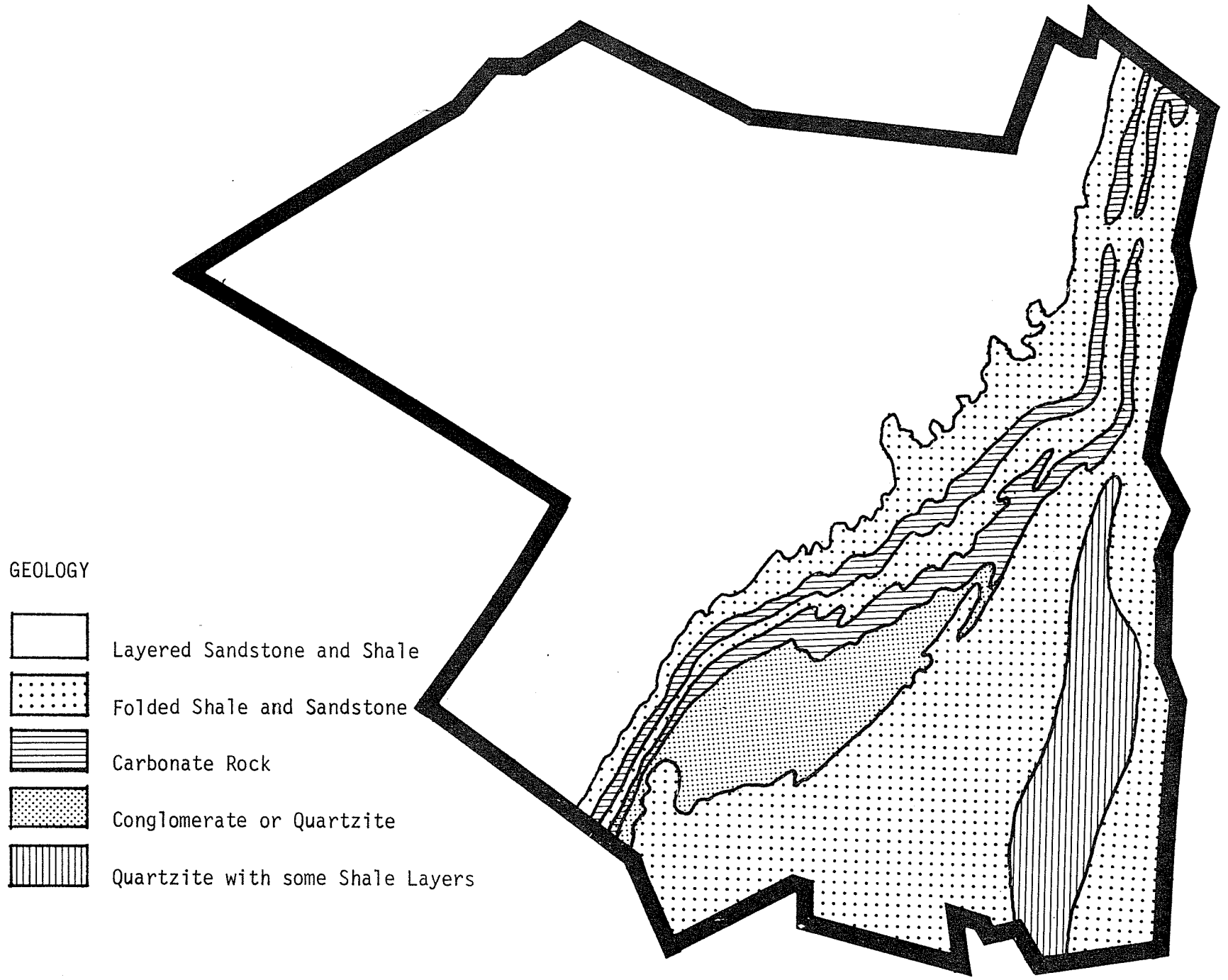
From a microscopic point of view, the County is made up of billions of atoms and molecules continuously moving under the force of sun energy. The atoms and molecules are clustered into systems: physical systems, such as light, temperature, water, wind, atmospheric gases and the minerals of rocks and soil; and biologic systems, like fungi, plants, animals and man.

The balance among these systems is in a continous state of evolution. Under the influence of the forces of time, gravity and sun energy, the components change, break down and are regenerated.

The input and output of the systems, their function and interaction, determine the course of environmental evolution. When the material equilibrium between solid, liquid and gas is altered, the environment changes.

Change brought about by disruption is an essential natural occurance. Landslides, hurricanes, and fire provide space for resource regeneration. Man-made disturbances frequently function as part of a healthy system (as when new tree types find growing space after lumbering). However, human activity, from agriculture to industry, can have the potential to disrupt the balance in such a way that loss of resources, rather than regeneration is the result.

An investigation of the environmental system must precede any evaluation of human impact. To comprehend the system as a whole, the parts must be analyzed individually. Their function is so complex that it is necessary to draw upon the knowledge of a variety of specialized fields; physics, meteorology, geology, hydrology, soil science, biology and botany. Since the influence of man is critical to a systems investigation, it is also necessary to consider sociology, history and economics.



ulster county

GEOLOGY

The geology of Ulster County provides the starting point for systems analysis. As an overview, imagine the County playing the leading role in a movie with a billion years time span. The present configuration of the landscape is one frame in the film which follows the slow action of submergence, sedimentation, folding, faulting, uplifting and erosion to a peneplain, followed again by submergence by the ocean.

One point in time is critical to this environmental evaluation. Look at a close-up of the frame in the movie that depicts present day geology. This is just one stage in that continuing process by which internal earth energy thrusts initial landforms upward, so that external climatic forces - water, ice, wind, temperature and gravity - can wear the masses down and in so doing, create the soils, drainage patterns and surface water bodies of the County. As the external energy forces strive toward equilibrium, the mountains will inevitably be worn away and the water bodies filled by the erosional sediment.

The Catskill, Shawangunk and Marlborough Mountain formations are the remnants of the sediment exposed after the County's most recent uplift, 220 million years ago. When the layers of sedimentary sandstone and shale were wrinkled and folded by pressure from the southeast, the Valley and Ridge pattern of southeast Ulster developed: the Shawangunk and Marlborough Mountains, with their northeast-southwest axis. The different rates of erosion of these tilted layers of hard sandstone and soft shale account for the narrow ridges and valleys of the area.

The northwest portion of Ulster is composed of thick layers of horizontal sandstone and shale beds. The high-peaked Catskill Mountains are the incompletely eroded remains of what was once a sandstone and shale plateau.

Between these mountain ranges are the Rondout, Esopus and Wallkill River Valleys. These are the channels eroded by mountain drainage carrying sediment to the Hudson River.

Twenty-five thousand years ago, a major geologic disturbance hastened the erosion of the County. A continental ice lobe covered the area, causing abrasion and plucking of the mountain ranges. With the shift in climate, and slow melting of the glacier, the scraped-off rock material was redeposited in two forms:

(1) Unsorted boulders, gravel, sand, silt and clay. These moraines lie over 2/3 of the County to 20 feet in thickness. Occasional large masses, drumlins, lie in the southeast portion of the County.

(2) Stratified layers of sands, silts, clays and gravels. The layers were laid down as:

   a. glacial lake deposits, such as those in the lower Esopus Creek Valley;

b. ice contact deposits, such as kames, laid over the moraine; or

c. outwash, carried down the stream valleys as melt water drained from the glacier. These layers of highly permeable sand and gravel outwash, lying in the County's river valleys are the prime ground water aquifers. Since these aquifers are a limited resource, it is necessary to determine their carrying capacity, so that ground water quality and supply can be preserved.

HYDROLOGY

Surface water flow has played a critical role in shaping the land. The surface water bodies fed by this flow are prime visual and recreational assets, as well as water supply resources. Not only Ulster, but New York City as well, is supplied by the high quality water of the County.

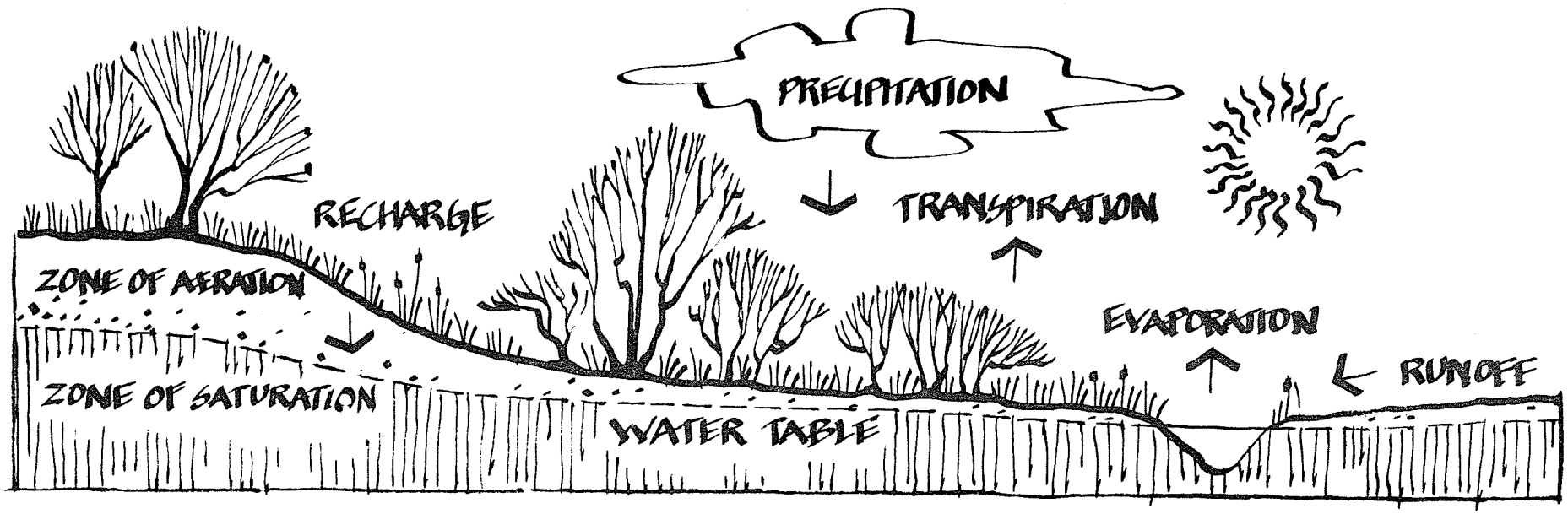
Where does all this water come from? Precipitation, mist, surface water and ground water are all part of one hydrologic system. The same water molecules have been circulating since water first appeared on the earth. The flow of these molecules from one part of the system to another is driven by sun energy and gravity. This circular energy is maintained because the sun causes the rise of warm water vapor into the cooler atmosphere:

(1) by evaporation of water molecules directly from surface water; and

(2) by transpiration of plants releasing moisture to the atmosphere.

As warm vapor meets the cold atmosphere, it condenses and the droplets fall back upon the earth as precipitation.

Some of this water hitting the earth surface becomes surface runoff. Under the force of gravity, following the slopes, runoff carves the drainage channels to the lakes and rivers. With evaporation from the surface water bodies, the hydrologic cycle is complete.


PRECIPITATION
TRANSPIRATION
RECHARGE
ZONE OF AERATION
ZONE OF SATURATION
WATER TABLE
EVAPORATION
RUNOFF

Not all precipitation becomes surface runoff. Water that infiltrates the ground is held as capillary water to be sucked up by plants and their transpiration again releases the water to the atmosphere. The excess water not held by the soil is pulled by gravity down into the zone of saturation.

Some water flows deep into rock crevices or under confining layers of clay.

The chemicals or organic compounds released to ground water through human development alter water quality. In addition, disruption of the flow of ground water may lower or make higher the water table. These are impacts that must be evaluated.

SOIL

Observe the County from a distance, as on an air photo. The patterns of rock that form the mountains, the net-like drainage channels that are the streams and rivers feeding the surface water bodies, and the dark blotches of wetland where the ground water sits close to the earth surface are recognizable systems.

Additional patterns lace the surface of Ulster County. Many of these, whether they are patterns of vegetation or land use, are directly related to the type of soil in the area. Erosion of bedrock has caused particles to blanket the bedrock and shift, as in glacial action, across the bedrock surface.

Weathering of bedrock is caused by physical forces such as frost heaving or exfoliation, and by chemical forces such as carbonic acid that break up the rock particles.

Soil types are determined by their origin: sandstone produces sandy soil, which has a coarse enough texture to allow good drainage; while shale weathers into clayey soils of small particles that inhibit drainage and erode easily. To predict where development will have the greatest erosional impact, it is necessary to evaluate comparative impacts on soil stability.

VEGETATION

The natural vegetation follows the soil, as well as the topography, slope, drainage, and moisture patterns. Plant communities develop, adapt, compete and diversify in specific responses to a site. Three types of plant succession can be generalized:

(1) Xerich succession begins on dry soil with lichens, followed by mosses, annuals, grasses, shrubs and trees such as pine and oak that have adapted to dry conditions;

(2) Mesic succession starts on moist soil with annuals, perenials, shrubs and trees, like hickory and beech, that have competed successfully for the moist location;

(3) Hydric or Wetland succession begins in open water with submergents, floating leaved plants, emergents, sedges, shrubs and water tolerant trees, such as the willow.

Vegetation communities further modify the environment. As roots penetrate and organic matter is added to the soil, fungi and microorganisms build up a rich layer of humus that increases nutrient availability and exchange. This in turn generates new and more diverse plant patterns.

Natural disturbances of vegetation, such as storms and fire, alter and renew the vegetation patterns by fertilizing the soil and by creating openings for new plants to enter the succession of species.

As primary producers, plants are at the bottom of the food chain. The diversity of the vegetation in Ulster County contributes to the high quality of wildlife habitat. To maintain wildlife habitat, it is necessary to measure the impact of removal or change in vegetation.

LAND USE PATTERNS

Human land use superimposes a development pattern upon the natural landscape. Settlements and transportation routes follow the topography and river patterns. Agricultural activity is situated in the fertile valleys, where the soils have developed rich humus.

This pattern of land use must be evaluated in order to produce an environmental plan for it. What is Ulster's land use history?

Until only 300 years ago, the County was inhabited by the Esopus Indians of the Delaware Tribe. The life style of the Indians produced almost no visible impact on the landscape. They did produce a frequent disturbance: fire. This practice of periodic burning contributed to the high quality landscape inherited by the European settlers:

(1) land was cleared without damage to soil structure, thus preventing erosion;

(2) debris was continuously removed and speedily reduced to nitrogen to fertilize the soil;

(3) specimen trees were cleared of understory competition and allowed optimum growth conditions;

(4) high plant species diversity was initiated by the periodic opening up of new growing space;

(5) high wildlife diversity was maintained through habitat maintenance due to the high interspersion of vegetative types;

(6) the resulting landscape, with its well maintained fields and managed forests was visually diverse.

Early European settlement patterns developed as trading posts along the major transportation routes, the rivers. Thanks to the natural resources of Ulster, trade boomed. The forests, game, stones, clays and agricultural soils provided the building blocks for economic growth in the County.

Railways supplemented water as a transportation route, and patterns of extraction, lumbering, manufacturing and agriculture shifted further inland. Now that a network of highways crisscrosses the County, development patterns are extending.

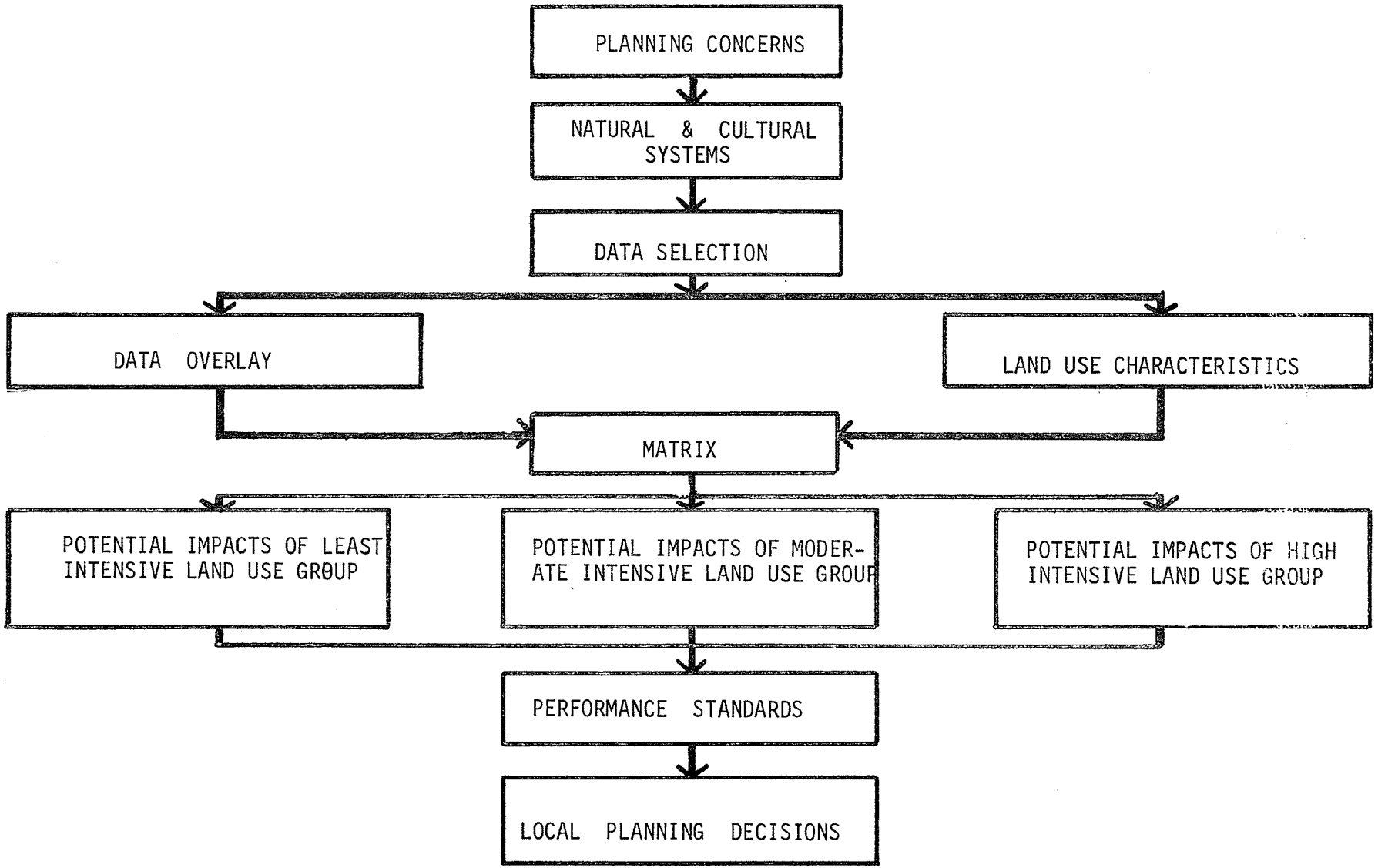
What impacts has land use history made on the environment of Ulster County? By the late 19th century, one change was obvious; most of the forests were gone, due to lumbering and clearing for agriculture. The State Forest Preserve was established in response to this loss.

What other systems have been impacted? What types of impact are likely to occur in the future? These are critical questions to ask while the County is still relatively unpolluted and rich in natural resources.

If a method can be established to pinpoint areas of potential impact on natural systems, and if the degree of those impacts is measured, human activity can be planned to operate in conjunction with, rather than in conflict with environmental processes.

methodology

flow chart


PLANNING CONCERNS
NATURAL & CULTURAL SYSTEMS
DATA SELECTION
DATA OVERLAY
LAND USE CHARACTERISTICS
MATRIX
POTENTIAL IMPACTS OF LEAST INTENSIVE LAND USE GROUP
POTENTIAL IMPACTS OF MODERATE INTENSIVE LAND USE GROUP
POTENTIAL IMPACTS OF HIGH INTENSIVE LAND USE GROUP
PERFORMANCE STANDARDS
LOCAL PLANNING DECISIONS

flow chart description

PLANNING CONCERNS:

Planning Concerns are the general problem areas that face individual towns. For example: loss of open space.

NATURAL AND CULTURAL SYSTEMS:

Natural and Cultural Systems are the specific measurable functions of the total environment that can be identified to further define the planning concerns.

DATA SELECTION:

The systems have physical characteristics that can be analyzed in order to predict potential impacts. Appropriate information for making the analyses must be selected from the natural resource and cultural base. This data may or may not be part of an already existing natural resource base.

DATA OVERLAY:

Data Overlay is the physical process of overlaying one data map over another to define the combination of sensitive areas.

LAND USE CHARACTERISTICS:

Land Use Characteristics are the physical characteristics of land use, which through phases of construction, maintenance and use, have different degrees of impact on natural and cultural systems.

MATRIX:

The Matrix is a graphic tool that displays the relationship of sensitive areas to land use groups.

POTENTIAL IMPACTS:

Potential Impacts are categorized by

(1) level of sensitivity (overlay of data) and

(2) general land use characteristics.

Areas of potential impact on each natural or cultural system by each land use group (incompatible, severe, moderate, compatible).

PERFORMANCE STANDARDS:

Performance standards are mitigating measures which can reduce levels of land use impacts through design specifications.

LOCAL PLANNING DECISIONS:

Local Planning Decisions can be made as a result of using this method to:

(1) predict potential impacts

(2) isolate appropriate performance standards

(3) select suitable areas for land use development or open space conservation.

flow chart components

PLANNING CONCERNS

Local Planning Concerns may include:

- water quality protection
- water supply protection
- flood control
- wetlands
- vegetation & wildlife protection
- agricultural land protection
- visual character preservation
- historic site preservation
- environmental education
- solid waste management
- technological development
- power plant siting
- power transmission
- open space protection

Although air pollution is an important planning concern, it is a special issue that cannot be addressed by the method described in this study.

NATURAL AND CULTURAL SYSTEMS

Natural and Cultural Systems affect each town's planning concerns. Examples of these systems may be:

- erosion
- sedimentation
- ground water quality
- wildlife
- visual character

Each of these systems is made up of several components. To provide a clear method, this study uses the three most important components, or variables. The method of overlaying the variables is designed to predict general potential impacts of land uses upon the natural systems.

The scale of the data used in this study is too gross for use in planning decisions. It is included only as an illustration of the methodology. Local planning bodies will require data of a type and scale that is adequate to define precisely areas of environmental concern.

Since this study is concerned with method, rather than specific data, existing natural resource inventories have provided the data base. Towns are referred to already gathered natural systems data. Information has been compiled by the Land Use and Natural Resource Inventory, Office of Planning Service, the Comprehensive Water Supply Study for County of Ulster, the New York Department

of Health, the Ulster County Planning Board maps and reports, the Geological Survey Study of the Ground Water Resources of Orange and Ulster Counties, Soil Conservation Service Survey, and the Ulster General Soil Map of the Temporary State Commission to Study the Catskills.

SELECTION OF APPROPRIATE DATA VARIABLES

Although this text does not contain a separate section on natural resources data, the importance of accurate data cannot be over-stressed.

Data is the base information (assumed, given or interpolated) upon which every analysis depends. The collection and organization of the data is directly related to the usefulness of the results obtained by the analyses. Data collection and its organization is usually the largest single task in any environmental analysis procedure. The data collection stage can require up to 2/3 of the time and expense involved in completing a project.

Before any data is collected a list of natural and cultural systems must be compiled, and from this list the appropriate data selected. The following information should be considered.

(1) What natural processes and impacts are under consideration?

(2) What are the expected results of the analysis? At what level of detail must the results be in order to make the desired planning decision? For example, should the results of the analysis be capable of predicting general areas of environmental concern for the County, or should the results have the ability to predict local impacts of specific land uses for such things as erosion, wildlife, or visual quality?

(3) What is the best scale for data acquisition? All data should be collected at the same scale.

DATA ORGANIZATION

Data is organized for reference and analysis in the following manner:

(1) Data Variables

This is the major data heading. It is for the general data information categories. Examples are: soils, slopes, land uses, vegetation, surface water types and wetlands.

(2) Data Sub-Variables

These are the sub-parts of the major data variables. Examples are:

VARIABLE: vegetation

SUB-VARIABLES: white pine
oak
birch
maple
orchard

THE SELECTION OF THE APPROPRIATE DATA VARIABLES FOR EACH SYSTEM BEING EVALUATED

After the list of processes has been defined, the specific data variables to be used must be determined. The following is a list of some of the important data variables and sub-variables used in this study as they relate to each natural or cultural system:

(1) EROSION

a. Soil

1 High Erodability
2 Medium Erodability
3 Low Erodability

b. Slope

1 Steep
2 Medium
3 Flat

(2) SEDIMENTATION

a. Erosion

1 High
2 Medium
3 Low

b. Proximity to Water

1 Close
2 Medium
3 Far

(3) GROUND WATER QUALITY

a. Soils by Hydrologic Group

1 High Infiltration
2 Medium Infiltration
3 Low Infiltration

b. Slope

1 0 - 5 Percent
2 5 - 15 Percent
3 15 Percent or Greater

c. Aquifer Recharge Areas & Drainage Zones

1 Aquifer Recharge Areas
2 Drainage Zones
3 Outside Drainage Zones

(4) WILDLIFE

a. Proximity to Water & Wetlands

1 Close to Water
2 Far from Water

b. Remoteness

1 Remote
2 Near Development

c. Edge

1 Natural & Development Edges
2 Forest & Agricultural Lands
3 Developed Areas

(5) VISUAL ABSORPTION

a. Slope

1 Steep
2 Moderate
3 Flat

b. Elevation

1 High
2 Medium
3 Low

c. Vegetation Density

1 Open
2 20 - 50 Percent
3 50 Percent or Greater

(6) SPECIAL CHARACTER

a. Visual Absorption

1 Slope
2 Elevation
3 Vegetation Density

b. Special Character Zones

1 Close
2 Medium
3 Far

LAND USE CHARACTERISTICS

Before a process can be evaluated or before potential impacts can be determined, the land use or activity that is causing the impacts must be defined by the characteristic that affects that process. For the purposes of analysis, land uses activities should be divided into groups that have similar characteristics affecting the specific process being evaluated. The groups should range from most intensive to least intensive. The land uses can be divided into any number of groups, but for this method of general analysis, three groups are sufficient:

Land Use Group I has the least impact on the specific process

Land Use Group II has a moderate impact

Land Use Group III is the most intensive, having the greatest effect on the process being evaluated.

For example, agriculture is in Land Use Group III for the evaluation of erosion due to plowing and the long periods of time without vegetative cover; but for evaluation of impacts on wildlife due to the creation of edges and food supply, agriculture is in Land Use Group I.

GENERAL LAND USE CHARACTERISTICS

Land uses can be divided into three major phases: construction, maintenance, and use.

A. CONSTRUCTION

The phase when the land use is being constructed, including clearing, building and landscaping

B. MAINTENANCE

The continued upkeep of the land use, such as snow removal, heating, or removal of solid and liquid waste

C. USE

The type and intensity of use, as determined by the users

A further breakdown for the three major categories is as follows:

1. Cover Characteristics
2. Building Characteristics
3. Consumption & Emission Characteristics

Each of these three land use characteristics can be further sub-divided:

1. COVER CHARACTERISTICS
   a. % Vegetation Cover
   b. % Lawn Cover

c. % Impervious Cover

d. % Construction Area (amount of Area Disturbed)

2. BUILDING CHARACTERISTICS

a. Duration of Construction

b. Building Height

3. CONSUMPTION/EMISSION CHARACTERISTICS

a. Water Consumption

b. Liquid Waste Generated

c. Noise Generated

d. Particulate Emissions

e. Carbon Monoxides

f. Sulfur Dioxides

g. Hydro-Carbons

h. Nitrous Oxides

For the evaluation of any potential impact the individual land use characteristics must be considered as they relate to the process being evaluated. The following is a list of the land use characteristics which pertain to the evaluation of each process:

1. Erosion

a. % of Area Disturbed (Cleared)

b. Time Duration of Construction Activity

2. Sedimentation

a. % of Area Disturbed (Cleared)

b. Duration of Construction Activity

3. Ground Water Quality

a. Liquid Waste Generated

b. Solid Waste Generated

c. % Impervious Cover

4. Wildlife

a. Noise

b. Air

c. Amount of Vegetation

d. % Impervious

5. Visual

a. Building height

b. Density

c. Preference (is it a Positive or Negative Land Use)

d. Degree of Dominance

LAND USES TO BE EVALUATED

Conservation Areas
Trails - Foot
Trails - Bicycle
Picnicking
Tent Camping
Trailer Camping
Open Field Sports
Golf Courses
Play Grounds
Recreation - Commercial
Transmission Right-of-Way
Two Lane Highway
Four Lane Highway
Limited Access Divided Highway
Residential Lot, 2 Acres or Greater
Residential Lot, 1 Acre
Residential Lot, 1/2 Acre
Residential Lot, 1/4 Acre
Trailer Park
Town House/Garden Apartment
Low Rise Apartments
Mid Rise Apartments
Elementary School
Junior/Middle School
High School
Extractive Industry
Warehouse, Storage
Trucking and Distribution
Office Head Quarters
Manufacturing
Neighborhood Commercial Center
Community Commercial Center
Regional Commercial Center
Public Buildings
Railroads
Wood Lots
Water Impoundments
Shore Line Activities (Marinas, etc.)
Outdoor Warehousing (Junk Yards)

matrix analysis procedure

There are many techniques for combining data variables to produce the desired analysis. For most techniques, the method used is to overlay one data map over another data map. These areas where two data variables overlap represent the combined effect of the two variables. The real problem then becomes what do these overlapped areas (combination of the variables) mean? What this process attempts to show is:

1. What the important data variables are.
2. When they are overlaid what the overlap means.
3. How to assign to these combinations, values that relate to predicting potential impacts.

The following example of the method takes two data variables (Variable I and Variable II) through the entire process, by first overlaying these variables and their sub-variables, by then showing how these overlapped areas can be assigned values, and finally by illustrating how these values can be reassigned to produce maps predicting potential impacts for all three land use groups.

FIGURE I

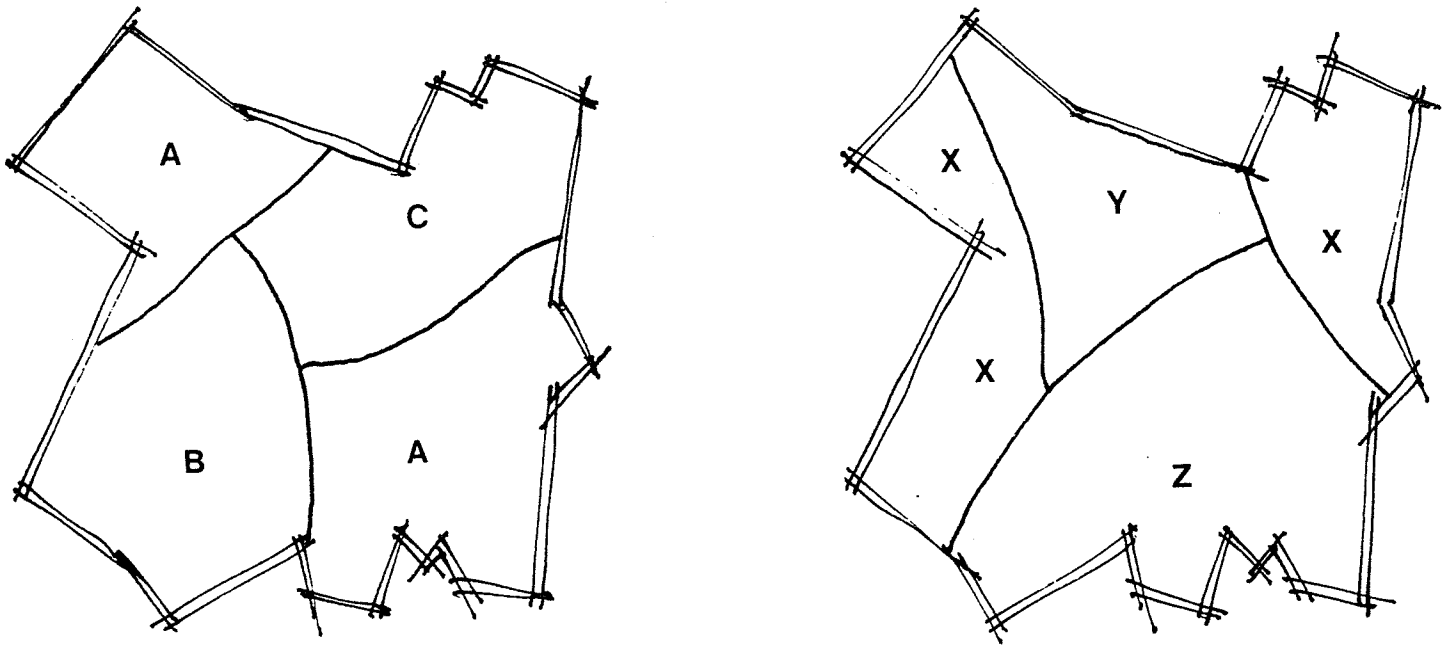


Figure I represents the maps of Variable I with its sub-variables A, B, C and Variable II with its sub-variables X, Y, Z.

OVERLAYING THE DATA VARIABLES

IF Variable I is on a clear plastic sheet, and Variable II is also in a clear plastic sheet, then when Variable I is placed on top of Variable II the results appear as in Figure 2.

FIGURE 2

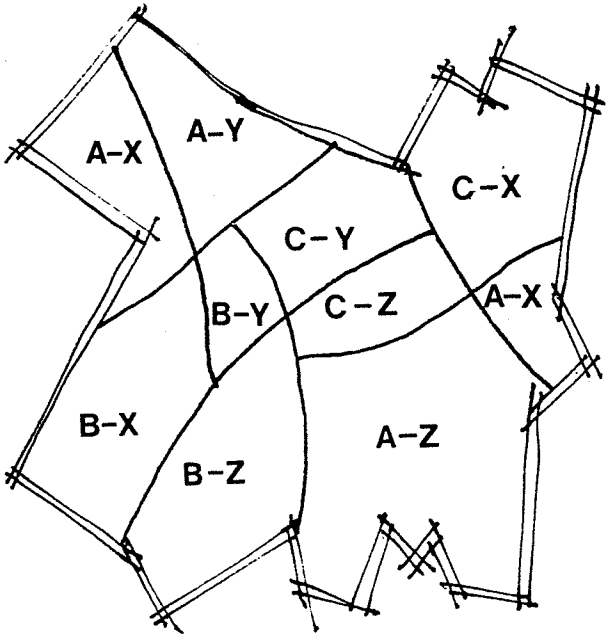


Figure 2 represents the areas of overlay between the sub-variables of Variable I and the sub-variables of Variable II.

ASSIGNING VALUES TO THE OVERLAYS

The next step is to determine what the overlay map (Figure 2) means. This problem can be solved by using a two sided matrix that graphically shows the relationships between the two variables.

FIGURE 3

VARIABLE II	VARIABLE I: A	B	C
X	A/X	B/X	C/X
Y	A/Y	B/Y	C/Y
Z	A/Z	B/Z	C/Z

Figure 3 represents a two sided matrix with Variable I on the top and Variable II on the side. The single largest advantage of using a matrix system is that the matrix allows the user to assign values to the combinations of the sub-variables. The boxes in the matrix (Figure 3) are filled in according to a given set of values. (The values used here have no meaning except for the sake of explanation.)

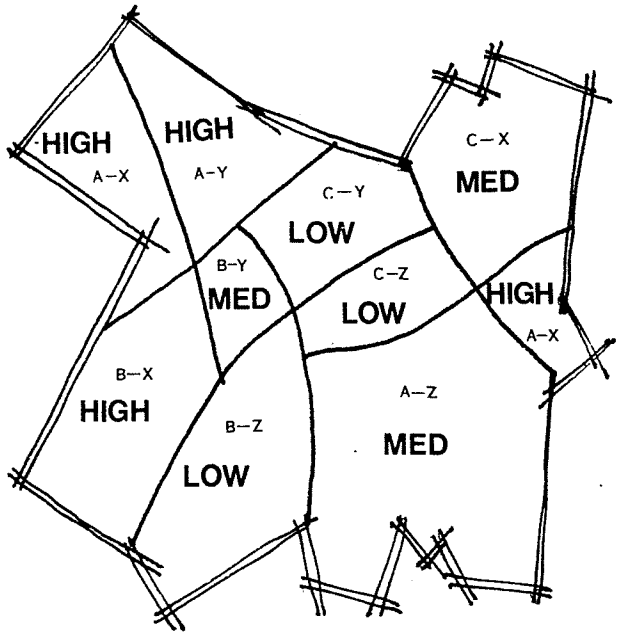
The combination of sub-variables A and X can be assigned the adjective "high." Likewise, sub-variables B and Y can be assigned the adjective "medium." The sub-variables C and Z can be assigned the adjective "low." The entire matrix can be completed in the same manner.

FIGURE 4

		VARIABLE 1		
		A	B	C
VARIABLE 11	X	High	High	Medium
	Y	High	Medium	Low
	Z	Medium	Low	Low

Figure 4 represents the matrix as it relates to assigning the adjectives of high, medium, and low to the overlap of sub-variables. The next step is to assign these adjectives to the overlap of the sub-variables on the map (Figure 2). If the overlap of A and X is "high" in the matrix, it becomes "high" on the map. The same procedure is followed for every overlap area on the map.

FIGURE 5



Figures 1 - 5 have shown the method used to overlay the two variables. Through a matrix system, the overlap of the sub-variables is assigned values. These values are then transferred to the corresponding map.

ADJUSTING THE RESULTS ACCORDING TO THE DEGREE OF EFFECT BY DIFFERENT LAND USE GROUPS

As stated earlier in the general description of land use characteristics, each land use or land use group has individual characteristics that have varying degrees of effect on different processes.

The same type of matrix that was used above to assign values to the overlap of Variables I and II can be used again to adjust the results of that analysis to represent the effect of the three land use groups. Again a two sided matrix is used, with the results of the first matrix (high, medium, low) placed across the top and the land use groups (I, II, III) placed along the side.

FIGURE 6

	HIGH	MEDIUM	LOW
LAND USE GROUP I			
LAND USE GROUP II			
LAND USE GROUP III			

Figure 6 shows the relationship between the combination of Variables I and II (high, medium, and low) and the three Land Use Groups. Figure 6 is developed in the same manner that Figure 4 was developed. The overlap of high with Land Use Group I can be assigned "moderate," the overlap of "medium" and Land Use Group I can be assigned "compatible." In the same manner the rest of the matrix can be completed as in Figure 7.

FIGURE 7

	HIGH	MEDIUM	LOW
LAND USE GROUP I (Least Intensive)	Moderate	Compatible	Compatible
LAND USE GROUP II (Moderately Inten.)	Severe	Moderate	Compatible
LAND USE GROUP III (Most Intensive)	Incompatible	Severe	Moderate

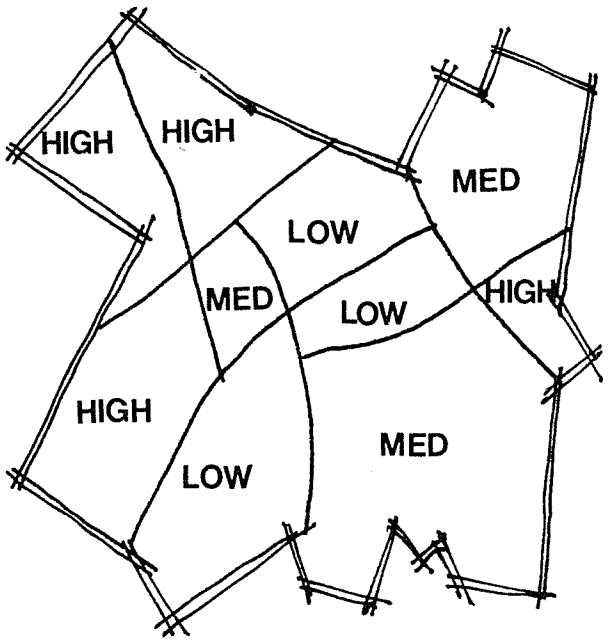
Incompatible:	No development
Severe:	Build with severe limitations
Moderate:	Build with some limitations
Compatible:	Compatible with development

PRODUCING MAPS FOR EACH LAND USE GROUP

The next step is to assign these adjectives (values) to maps, representing the effect of Land Use Groups I, II and III.

(a) The map (Figure 5) is then adjusted for Land Use Group I as it relates to the above matrix. (Figure 7)

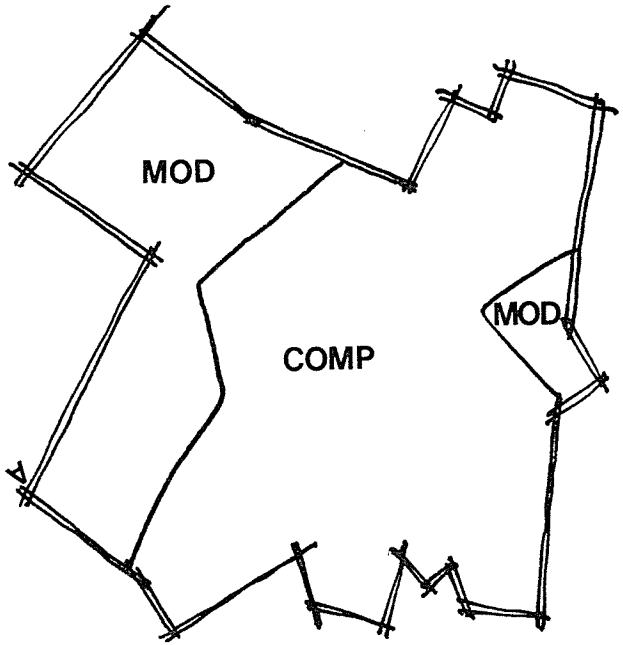
FIGURE 5



	High	Medium	Low
LAND USE I	M	C	C

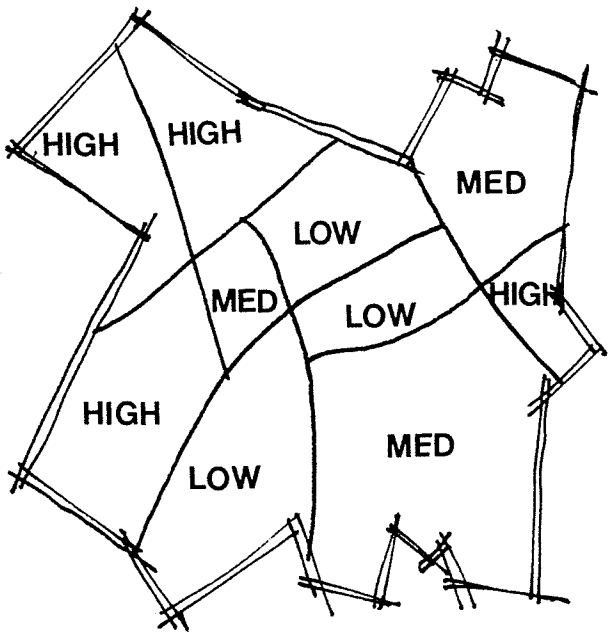
(b) Figure 8: Thus, anytime there is a high it is assigned a moderate, medium is assigned a compatible and low is also assigned a compatible.

FIGURE 8



(a) The map (Figure 5) is then adjusted for Land use Group II as it relates to the Matrix (Figure 7).

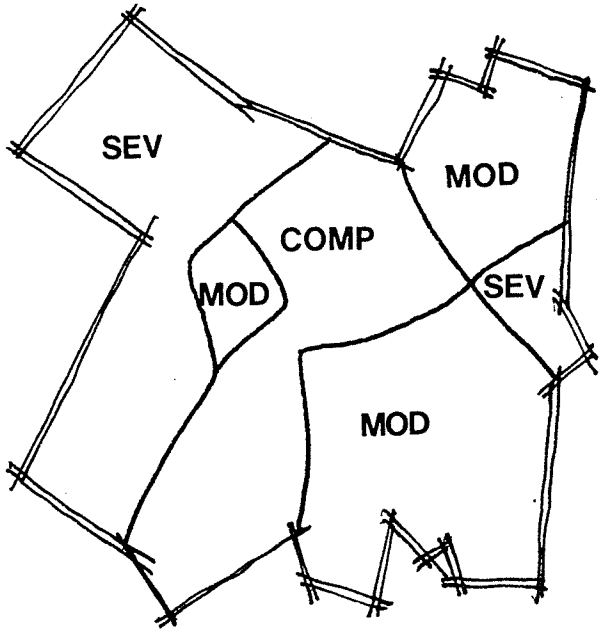
FIGURE 5



(b) Figure 9: Thus, anytime there is a high, it is assigned a severe, medium is assigned a moderate and low is assigned a compatible.

	High	Medium	Low
LAND USE II	S	M	C

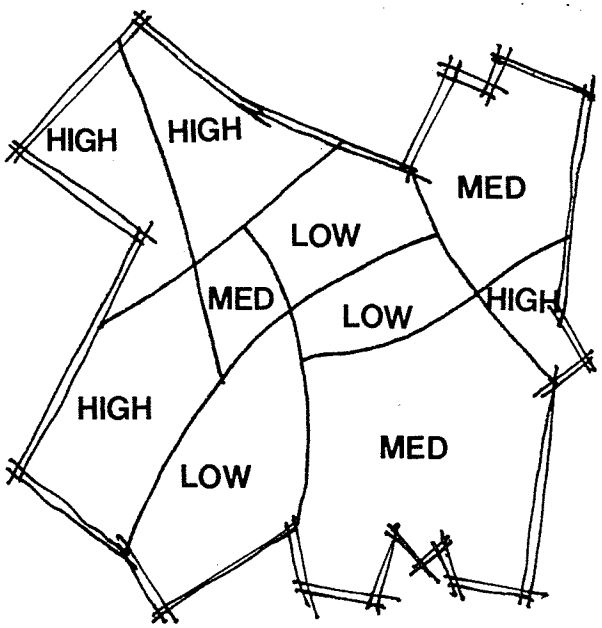
FIGURE 9



LAND USE GROUP II (Moderately Intensive)

(a) The map (Figure 5) is then adjusted for Land Use Group III as it relates to the matrix (Figure 7).

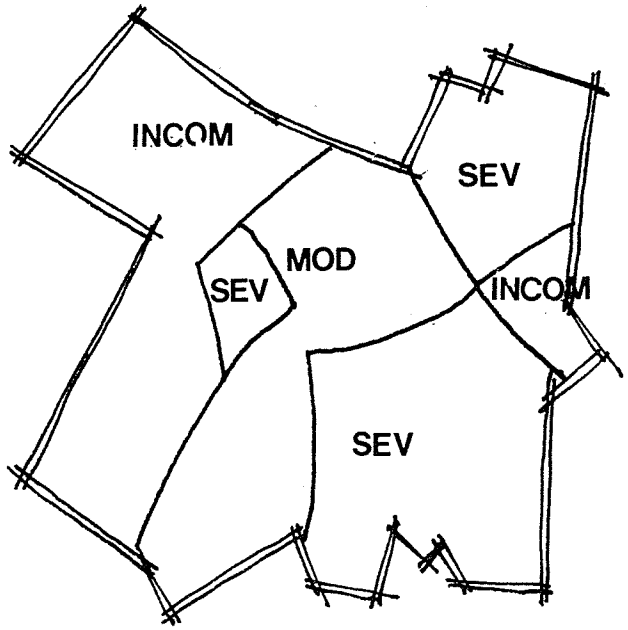
FIGURE 5



(b) Figure 10: Anytime there is a high, it is assigned an incompatible, medium is assigned a severe and low is assigned a moderate. The same procedure is followed for each process being evaluated. The results are three maps representing the impact of Land Use Groups I, II, III on each process.

	High	Medium	Low
LAND USE III	I	S	M

FIGURE 10



LAND USE GROUP III (Most Intensive)

For a working description of this process, see Appendix I

PERFORMANCE STANDARDS

Performance standards become critical in areas where potential impacts are incompatible, severe and perhaps moderate. Performance standards provide an alternative to prohibition of development for a given site. Conservation Commissions can recommend measures to lessen impact for development on incompatible, severe or moderate areas. Various government agencies, such as the Soil Conservation Service or the Health Department should be contacted for site specific recommendations.

impact evaluation

examples of impact evaluation

To illustrate the use of the matrix, impacts on several natural and cultural systems are evaluated. The impacts that have been selected are:

EROSION
SEDIMENTATION
WATER QUALITY
WILDLIFE
VISUAL QUALITY

Towns must establish their own criteria and select processes that apply to their specific goals. For each process that a town evaluates, the pertinent variables must be selected and the appropriate data gathered. This approach of determining the process and selecting essential variables is efficient in that it avoids wasting energy in gathering more than the necessary data.

erosion

Erosion is the transportation of soil caused by a number of distinct but interacting factors: wind, rainfall, surface water flow, soil characteristics, topographic relief and vegetation. In natural situations, erosion functions to transport nutrients to supply the needs of vegetation and animal life.

Land development has the potential to hasten the erosion process to the detriment of the land uses as well as the natural systems. Valuable top soil may erode from bare farm land; and structures such as buildings, roads and bridges are sometimes undermined.

If erosional effects are pre-analyzed as part of land use planning and development process, erosion impacts can be minimized. The major loss of soil by erosion in Ulster County is due to:

(1) Stream bank erosion - soil is lost through the cutting down of banks by stream and river flow.

(2) Road bank erosion - soil is lost from steep unprotected road embankments.

(3) Sheet erosion - thin layers of soil are removed from extensive areas. The impact is most severe if the soil is bare or unprotected.

Stream and road bank erosion is controlled naturally or may require engineering solutions.

Sheet erosion, however, is predictable and can be calculated before a land use is developed. Since sheet erosion occurs, to some degree, everytime a land use is constructed, it is important to identify areas of high erosion potential where improper management will result in the loss or degradation of the existing soil structure.

To produce a map showing erosion potential by general area, two variables, soil and slope, are used. Vegetation is, in fact, the most critical variable; but since this evaluation of erosion potential is for areas that will be cleared of vegetation for construction of various land uses, vegetation is not considered. The matrix is worked for a bare soil situation. The resulting map shows areas where clearing for development will produce an erosion problem. These areas will require more detailed analysis. See Appendix I.

VARIABLES

1. Soils

Soil type is critical since the size and consistency of particles determines how fast they will be transported by moving water. The most highly erodable soils are those with the largest content of fine clays and silts.

The Soil Conservation Service has classified soil types by "erodability factor," or the K factor. The K factor of a soil type is experimentally determined to establish erodability potential if all other factors, such as slope, rainfall and vegetation are equal. The K factors and their breakdown are defined in the Ulster County Soil Survey.

The soils are divided into three groups, based on their erodability factors:

a. High erosion potential:
K factors .37 - .41

b. Medium erosion potential:
K factors .24 - .32

c. Low erosion potential:
K factors .10 - .20

The K factors were determined by the Soil Conservation Service for use in the "Universal Soil Loss Equation," A = RKLSPC.

A = Tons per acre per year
R = Average rainfall for the area
K = Erodability factor
L = Length of the slope or the distance that water will run
S = Slope gradient
P = Soil cover
C = Erosion control

If the formula is calculated for the three sub-variables in the soil variable for a given set of equal conditions, it is possible to arrive at a relative tonnage per acre per year. Assuming a bare site, soil cover (P) and erosion control (C) have been ignored.

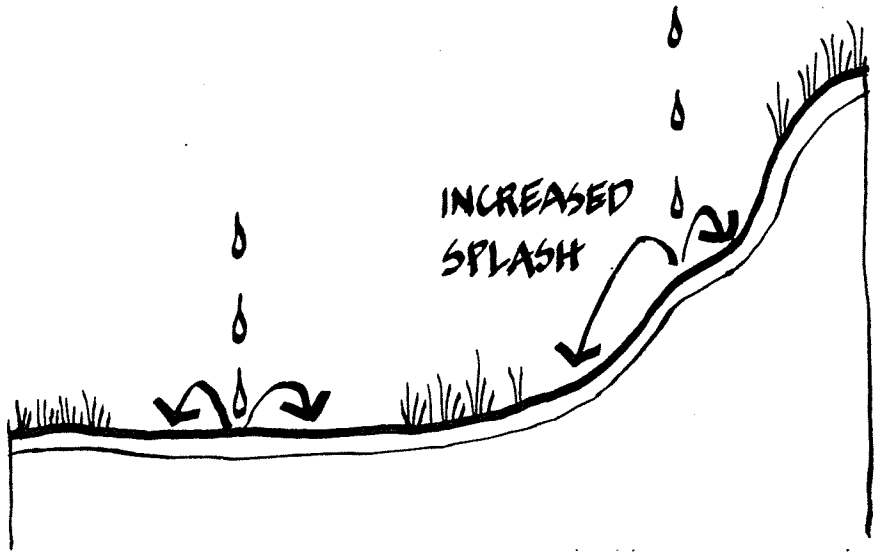
a. High: R = 125
K = .37 - .41
L = 360'
S = 10%
Erosion potential: 120-150 tons/acre/year

b. Medium: R = 125
K = .24 - .32
L = 360'
S = 10%
Erosion potential: 78-104 tons/acre/year

c. Low: R = 125
K = .10 - .20
L = 360'
S = 10%
Erosion potential: 32-65 tons/acre/year

2. Slope

Slope, which describes the steepness of the land, is a critical factor in analysis of erosion. Slope interacts with gravity to determine lateral stability of soils. The impact of rainfall and the velocity of runoff increases as the slope increases. Topographic variation produces differing degrees of erosion potential.



Slope is described in percentages. The percent of slope is derived by dividing the vertical rise of the slope by its horizontal distance.

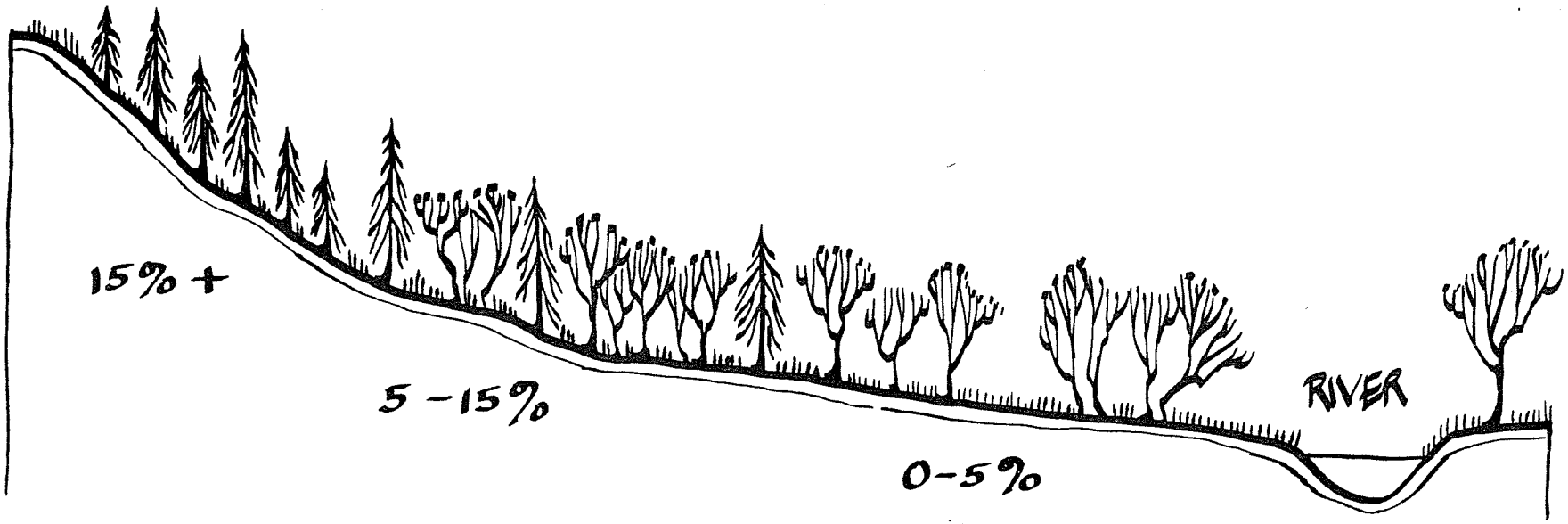
As an example, consider an area of land 200 feet square, and sloping from 250 feet to 350 feet above sea level on its opposite sides.

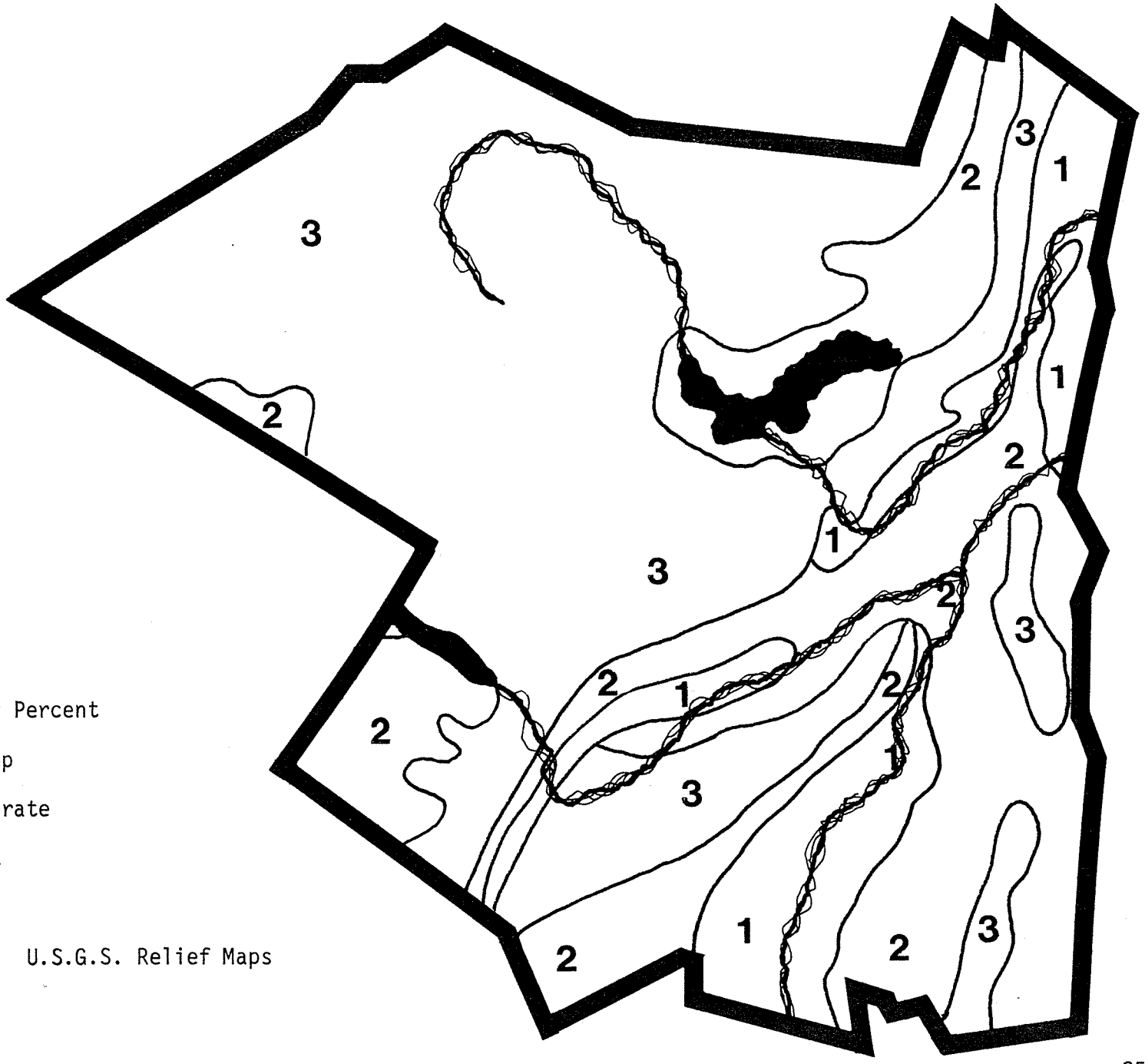
$$\frac{\text{vertical } (100)}{\text{horizontal } (200)} = \text{Slope}$$

$$\frac{100}{200} = .5 \text{ or } 50\% \text{ Slope}$$

To map slope as it relates to erosion potential, slope has been divided into three categories:

a. Flat: 0 - 5%
b. Moderate: 5 - 15%
c. Steep: 15% and up





EROSION

Slope by Percent

3 steep

2 moderate

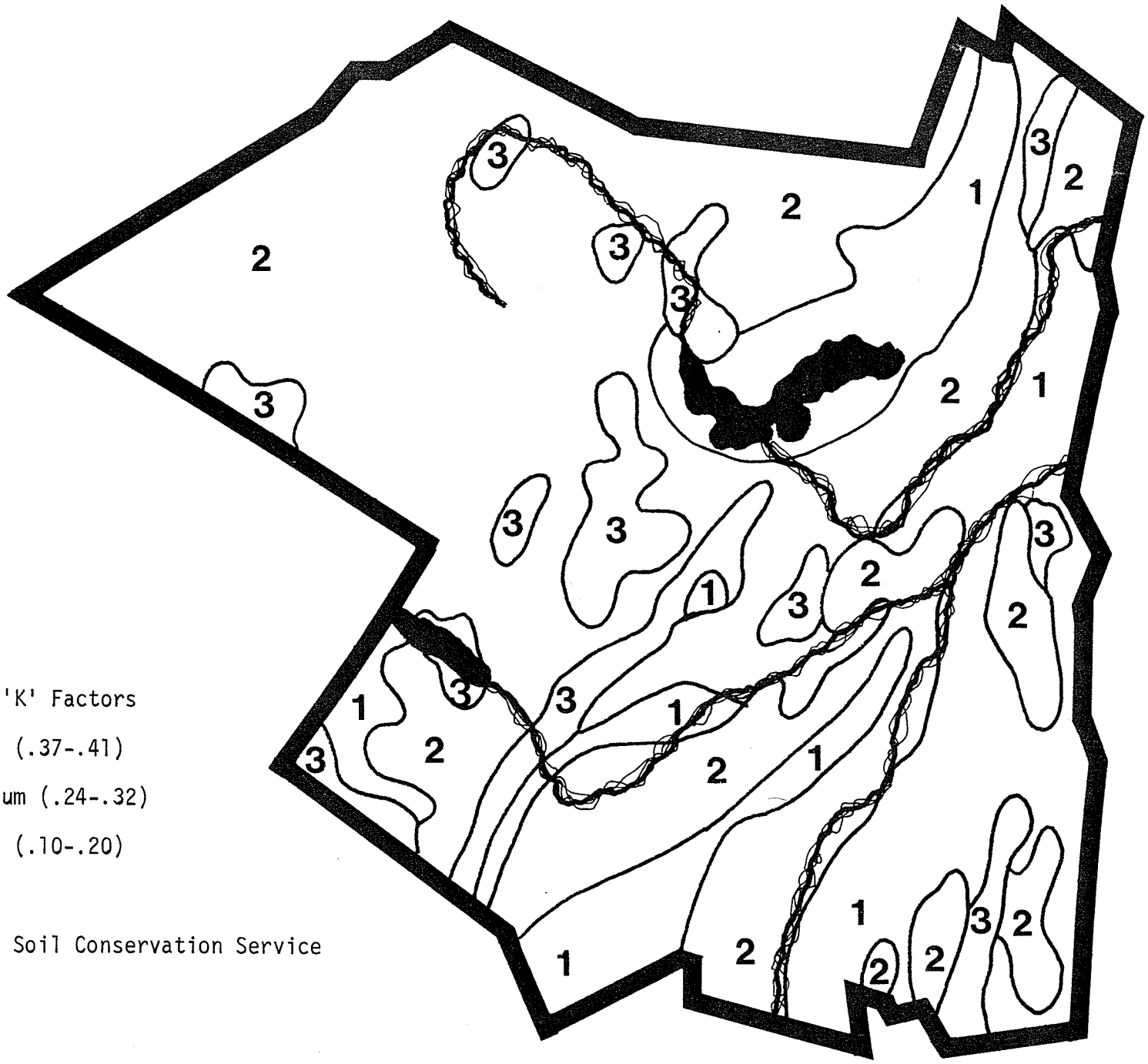
1 flat

Source: U.S.G.S. Relief Maps

north

scale 0 5 miles

ulster county



EROSION

Soil by 'K' Factors

3 high (.37-.41)

2 medium (.24-.32)

1 low (.10-.20)

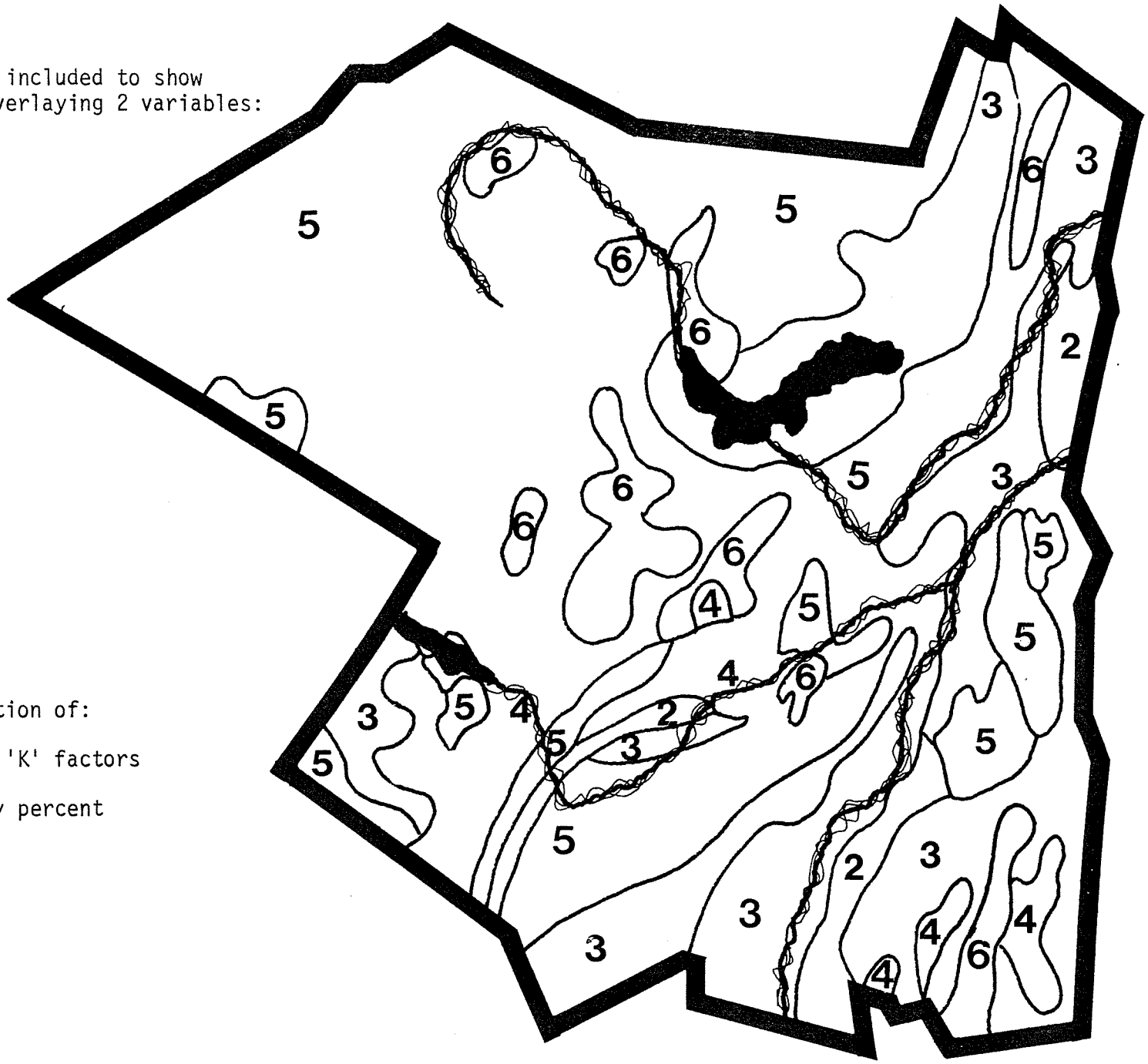
Source: Soil Conservation Service

north

scale 0 5 miles

ulster county

This map is only included to show
the results of overlaying 2 variables:
Slope
Soils



north

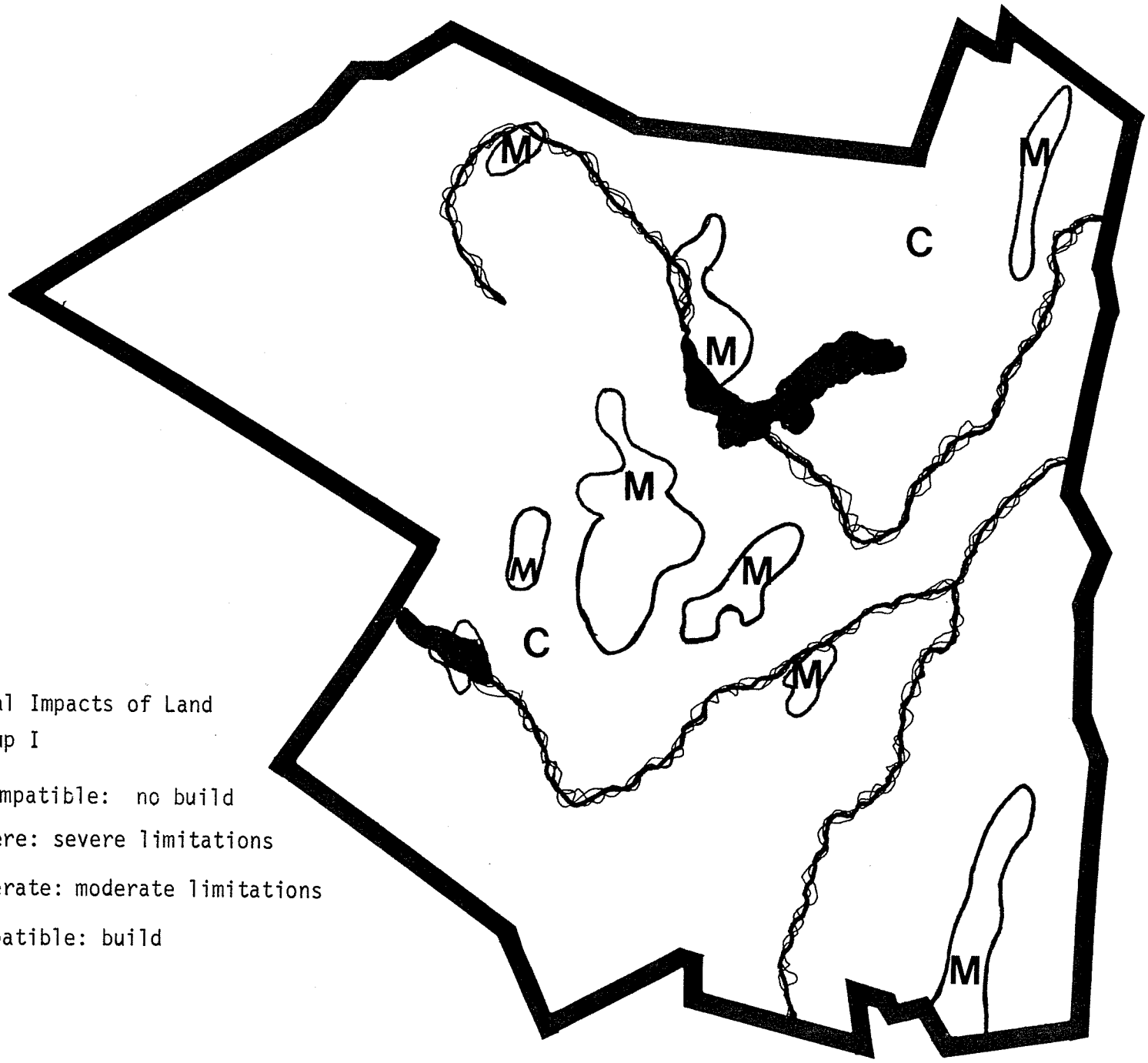
scale 0 5 miles

ulster county

NATURAL SYSTEM: EROSION

VARIABLES	SUB VARIABLES Most Sensitive 3	 Moderately Sensitive 2	 Least Sensitive 1	 Not Important 0
Slope by Percent	Steep	Moderate	Flat	
Soil by 'K' Factors	High	Medium	Low	

	6	5	4	3	2	1	0
Land Use Group I	M	C	C	C	C	C	C
Land Use Group II	S	S	M	C	C	C	C
Land Use Group III	I	I	S	M	C	C	C



EROSION

Potential Impacts of Land Use Group I

I incompatible: no build

S severe: severe limitations

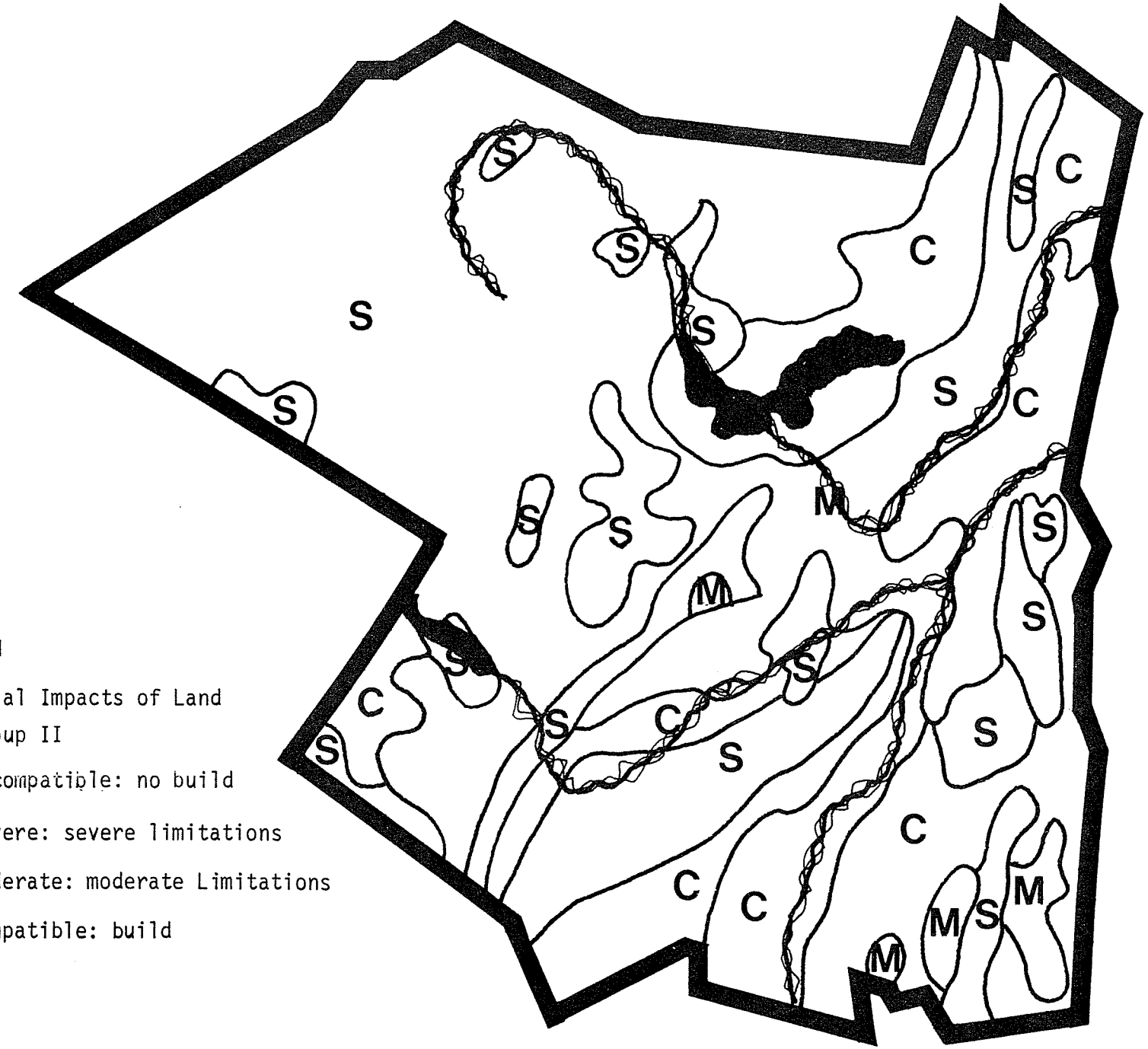
M moderate: moderate limitations

C compatible: build

north

scale 0 5 miles

ulster county



EROSION

Potential Impacts of Land Use Group II

I incompatible: no build

S severe: severe limitations

M moderate: moderate Limitations

C compatible: build

north

scale 0 5 miles

ulster county

EROSION

Potential Impacts of Land Use Group III

I incompatible: no build

S severe: severe limitations

M moderate: moderate limitations

C compatible: build

north

scale 0 5 miles

ulster county

sedimentation

The process of sedimentation is the result of erosion. If soil is eroded it has to be transported and deposited. Eroded soils are deposited:

(1) In areas of low topography

(2) Directly into standing water bodies such as wetlands, ponds, lakes or reservoirs

(3) Into moving water of streams and rivers

Sedimentation has its most noticable impact when soil accummulates in a standing water body or when it is washed away by moving water. Whether or not sedimentation is a problem is determined by:

(1) Vegetation type and density between source and water

(2) Distance to water

(3) Slope of the land between source and water

(4) The type of soil

(5) Water body type (standing or moving)

The energy and time required to map these factors is high, so this type of analysis should be handled on a site by site basis as development becomes an issue.

When vegetation remains undisturbed, the natural process of sedimentation occurs on a moderate level to maintain vegetation and wildlife habitats. Problems arise when natural rates are greatly increased. Clearing of land for development is the primary cause of increase in sedimentation. It is important to map areas of high potential for sedimentation, in order to recommend safe building and maintenance practices.

VARIABLES

1. Erosion Evaluation

The output of the erosion map summarizes the potential for erosion by the three major land use groups. Since soil "K" factors and slope determine how much sediment reaches the water, this map provides the basic sedimentation potential information.

2. Proximity to Water

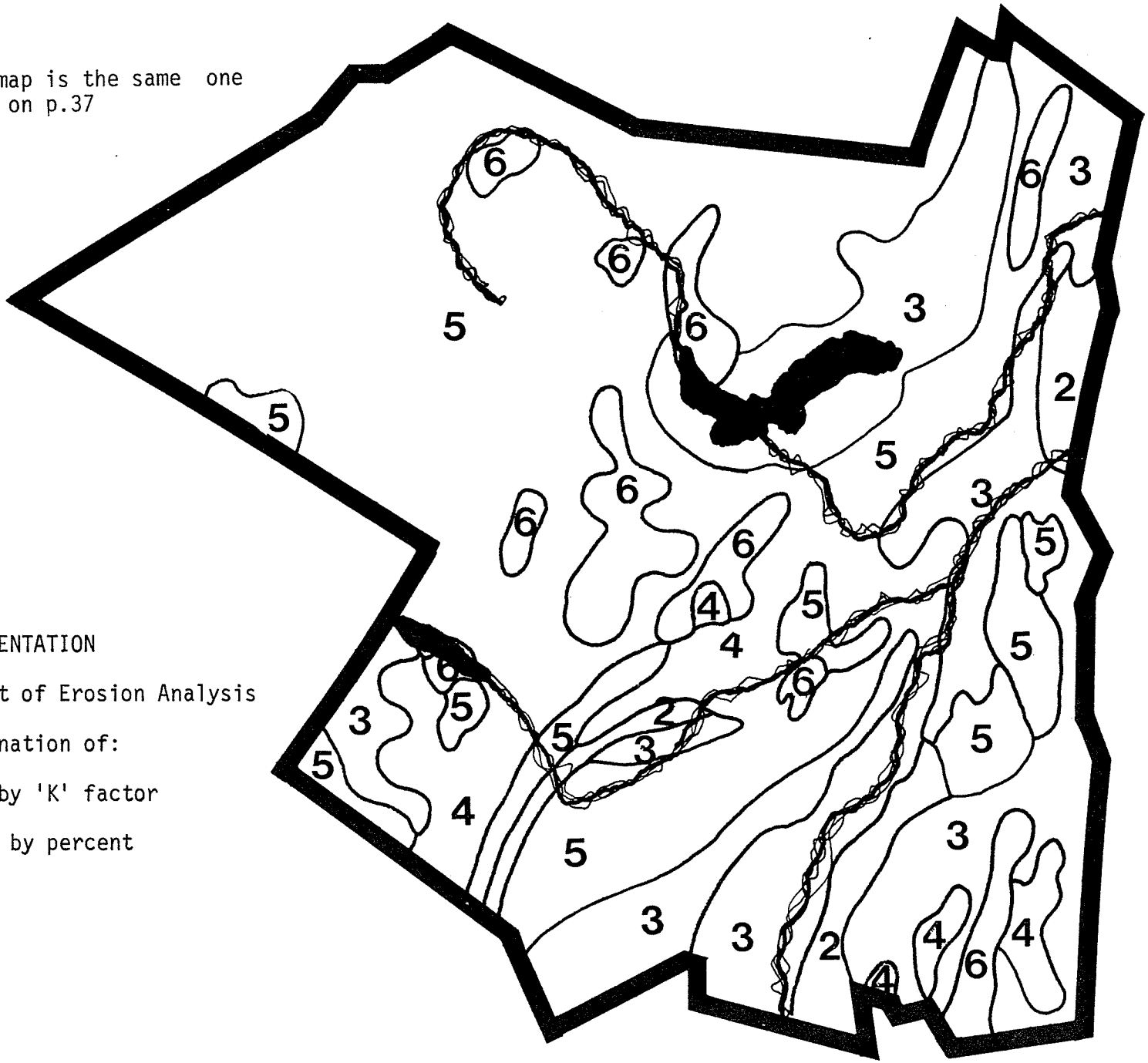
The closer an area is to water, the greater are the chances of sediment from that area reaching the water body.

a. Close: 0 - 50' from water
b. Medium: 50 - 150' from water
c. Far: 150' and up

Other factors will determine potential for sedimentation and should be determined on a site by site basis.

The mapping of proximity to water bodies shown here is grossly generalized to illustrate the concept rather than the actual potential impact of siltation.

this map is the same one shown on p.37



SEDIMENTATION

Output of Erosion Analysis

Combination of:

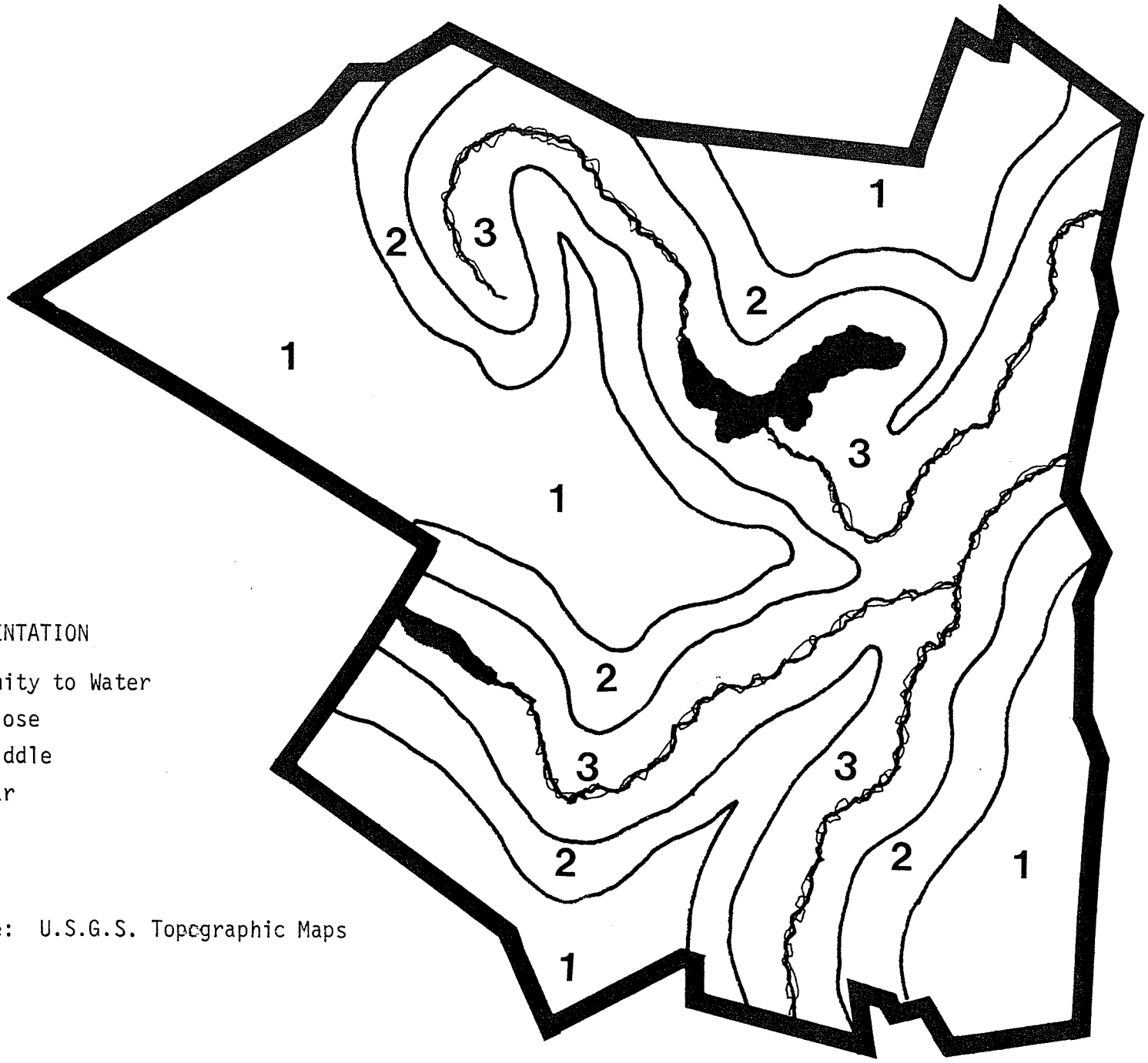
soil by 'K' factor

slope by percent

north

scale 0 5 miles

ulster county



SEDIMENTATION

Proximity to Water

3 close

2 middle

1 far

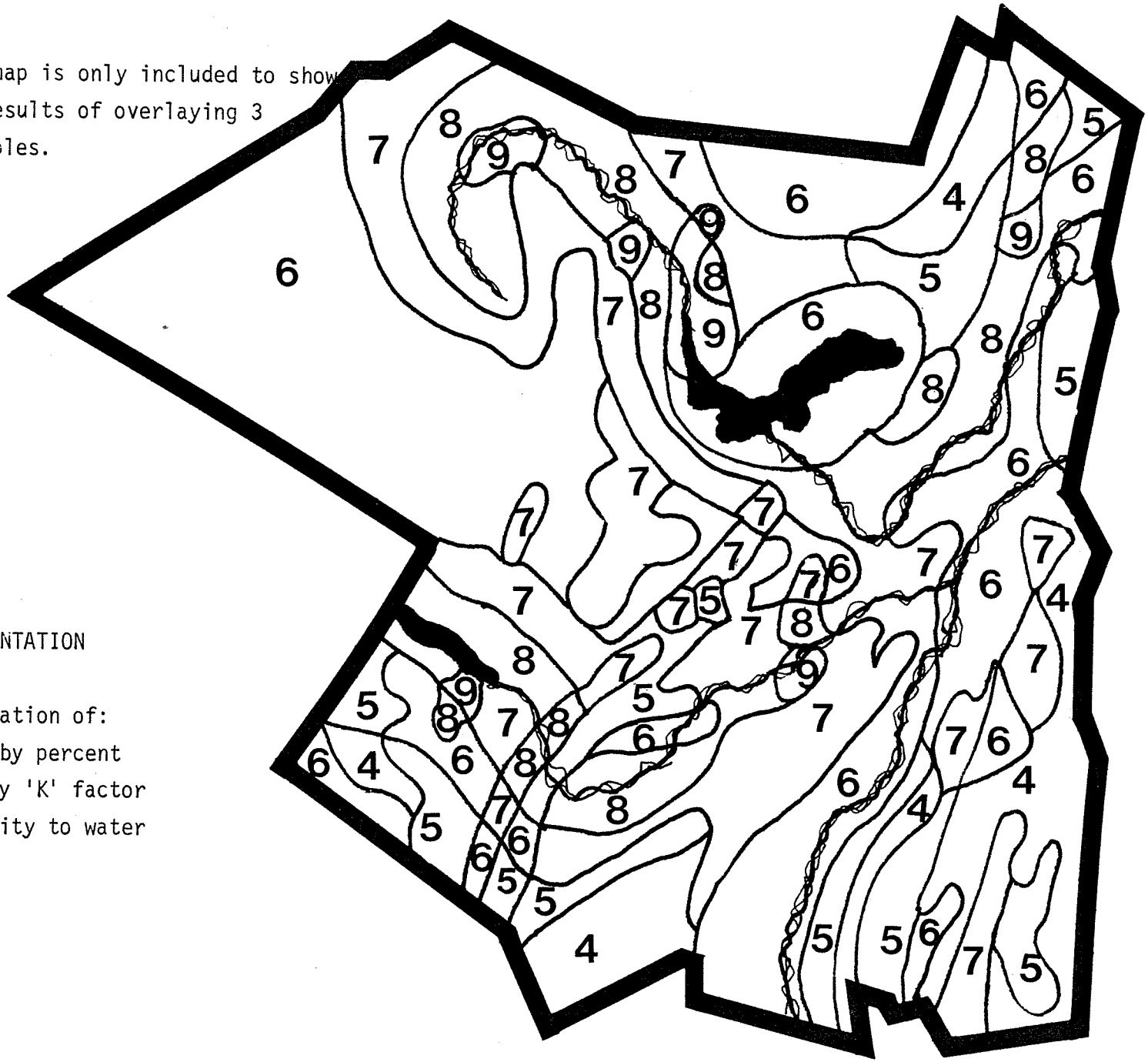
Source: U.S.G.S. Topographic Maps

north

scale 0 5 miles

ulster county

This map is only included to show the results of overlaying 3 variables.



SEDIMENTATION

Combination of:
slope by percent
soil by 'K' factor
proximity to water

north

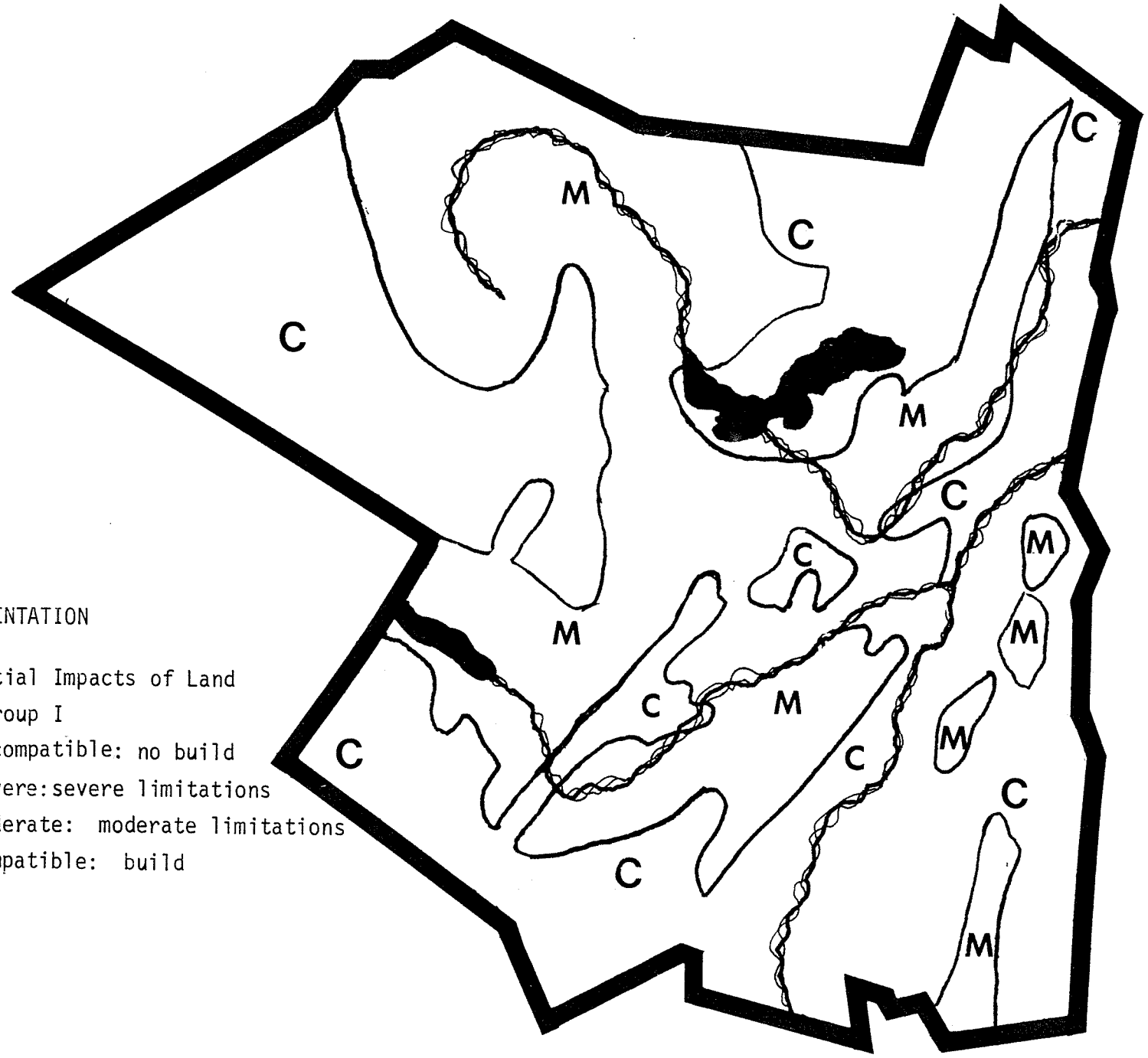
scale 0 5 miles

ulster county

NATURAL SYSTEM: SEDIMENTATION

VARIABLE	SUB VARIABLES Most Sensitive 3	 Moderately Sensitive 2	 Least Sensitive 1	 Not Important 0
Slope by Percent	Steep	Moderate	Flat	
Soil by 'K' Factors	High	Medium	Low	
Proximity to Water	Close	Medium	Far	

	9	8	7	6	5	4	3	2	1	0
Land Use Group I	M	M	M	C	C	C	C	C	C	C
Land Use Group II	S	S	S	M	M	C	C	C	C	C
Land Use Group III	I	I	I	S	S	M	C	C	C	C



SEDIMENTATION

Potential Impacts of Land Use Group I

I incompatible: no build

S severe: severe limitations

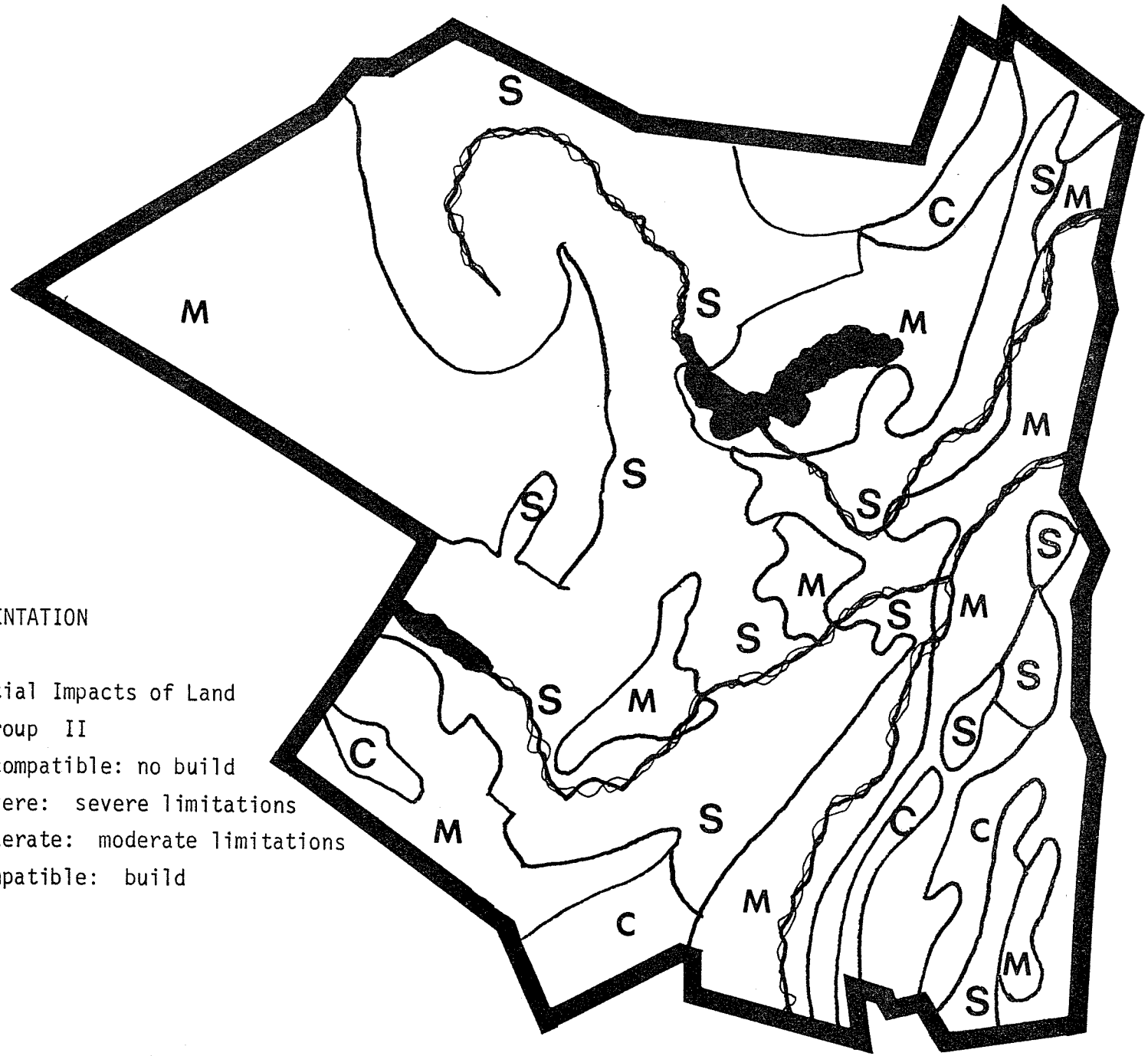
M moderate: moderate limitations

C compatible: build

north

scale 0 5 miles

ulster county



SEDIMENTATION

Potential Impacts of Land Use Group II

I incompatible: no build

S severe: severe limitations

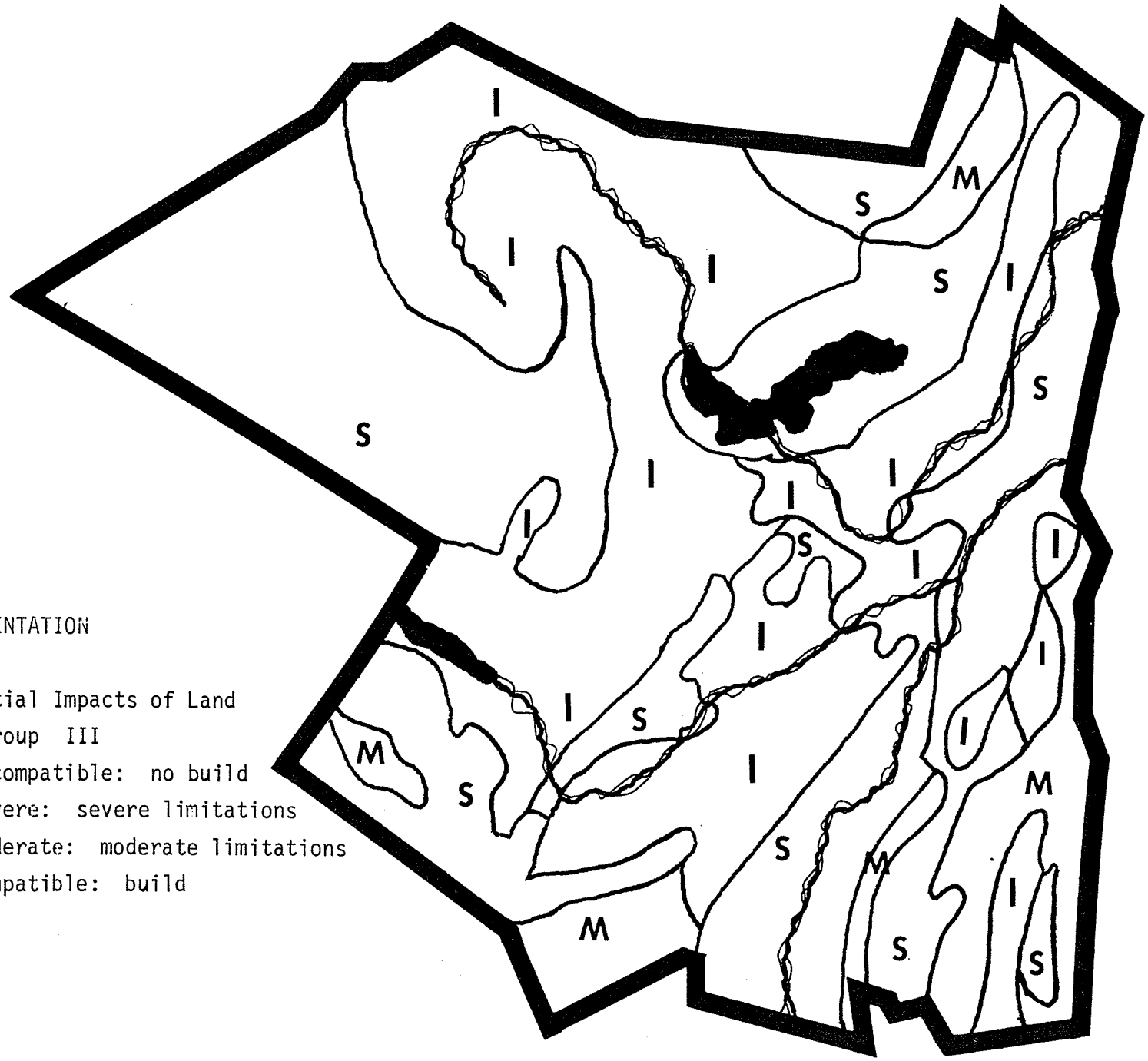
M moderate: moderate limitations

C compatible: build

north

scale 0 5 miles

ulster county



SEDIMENTATION

Potential Impacts of Land Use Group III

I incompatible: no build

S severe: severe limitations

M moderate: moderate limitations

C compatible: build

north

scale 0 5 miles

ulster county

EROSION/SEDIMENTATION: A DESCRIPTION OF IMPORTANT LAND USES AND THEIR CHARACTERISTICS

Erosion is greatly increased by removing the vegetation and disrupting the soil structure. Therefore, the more area cleared for the building of a land use the more potential for erosion/sedimentation to occur. Another factor is the time during which the land is cleared. This involves the time between clearing the land and the final landscaping. It is usually the case that, through ordinary practices of seeding and planting, new vegetation takes at least three months to establish itself before it begins to reduce erosion. For these purposes, land uses can be divided into two groups:

1. Amount of land cleared
2. Length of time the land is exposed

LAND USE GROUP I

These land uses are those that do not clear any land or only clear a very small percentage. Examples of land uses are:

Conservation areas
Low intensity recreation (trails, tent camping, cross country skiing)
Low density housing 1 acre or greater in lot size (This type of housing disturbs very little of the site and, on the average, requires about six months to build.)

LAND USE GROUP II

These land uses disturb over 30% of the land parcels and take over six months of construction time. Examples of this land use group:

1/2 Acre housing
1/4 Acre housing
Commercial recreation facilities
Two lane highways
Neighborhood commercial centers
Elementary schools
Trailer camping (all facilities)
Open field sports (baseball, football, etc.)

LAND USE GROUP III

These land uses generally disturb over 50% of the area and require over nine months of construction time. Examples are:

Trailer park
Golf course
Transmission line right-of-way
Four lane highway
Limited access divided highway
Town house/garden apartment
Low rise apartment
Mid rise apartment
Junior high school
High school
Extractive industry
Warehouse
Office headquarters
Manufacturing
Community commercial center
Regional commercial center

PERFORMANCE STANDARDS FOR EROSION/SEDIMENTATION

Performance standards are available as an alternative to the prohibition of development on areas of potential threshold and severe impact. Even areas of moderate impact require measures to lessen erosion and sedimentation effects. The Soil Conservation Service and City or Town Engineers should be contacted for site specific performance standards such as:

(1) Mechanical techniques including:

- Sedimentation basins
- Shoulder dikes
- Bench Terracing
- Mulching
- Drop inlets
- Rock cribs
- Rip-rap
- Drop structures
- Sub surface drains
- Fiber mats
- Asphalt emulsion

(2) Natural techniques such as:

- Grass sod
- Legumes
- Groundcovers
- Hydroseeding
- Mulching
- Corn residue

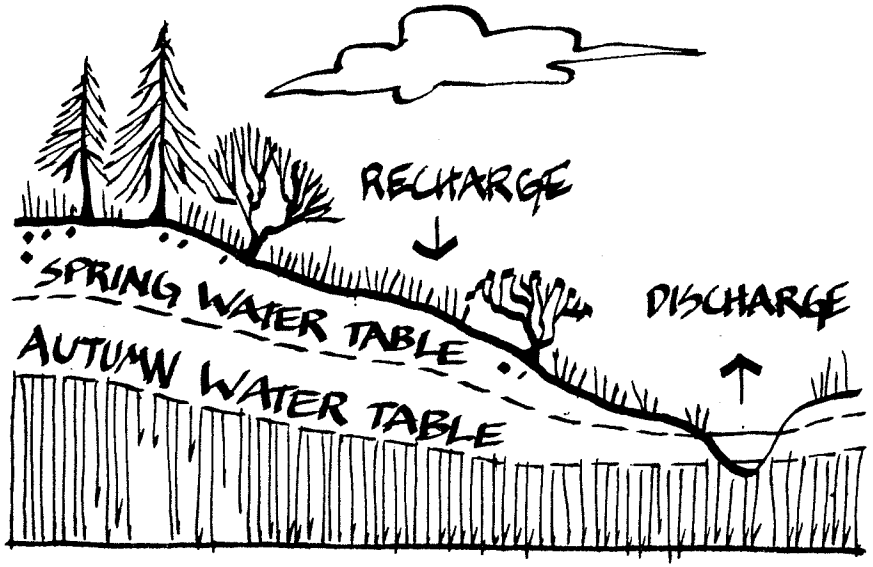
hydrology

GROUND WATER

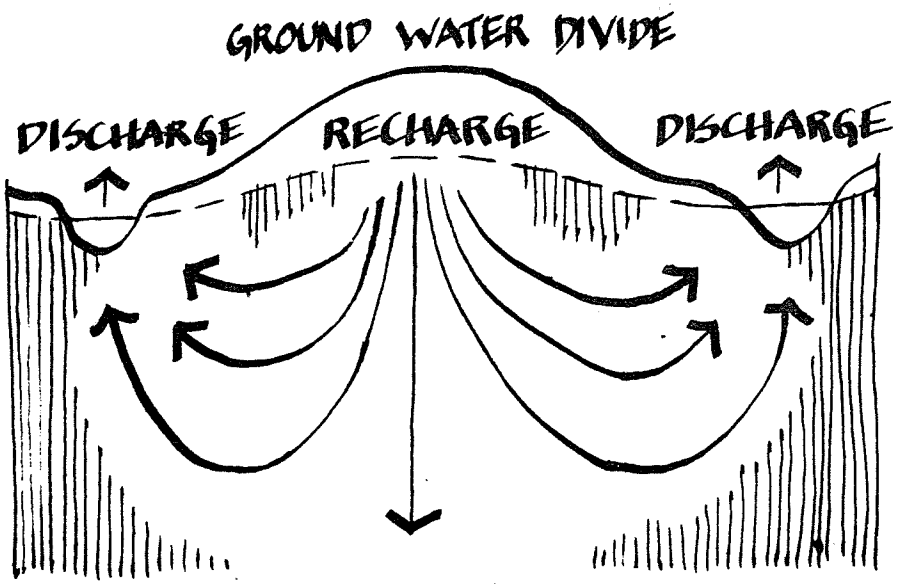
Ulster County's primary source of ground water is precipitation. Of the 40 to 50 inches of precipitation that falls on Ulster County annually, between 1/2 and 3/4 is lost by evapotranspiration. Most of the remaining water flows as surface runoff into streams and rivers. Only a small percentage actually enters the ground-water system to be eventually discharged into streams.

Water available for development is that ground water which lies within the zone of saturation. In Ulster County the depth to the top of this zone, called the water table, is generally within 100 feet of the surface.

The water table elevation parallels the contours of the land surface because precipitation falls fairly evenly over the land surface. The level of the water table fluctuates with the seasons. In the spring, the water level is high due to increased precipitation combined with melting snow which recharges the ground water supply. The high rate of transpiration that occurs during the growing season combines with evaporation to discharge water at a rate sufficient to lower the water table.



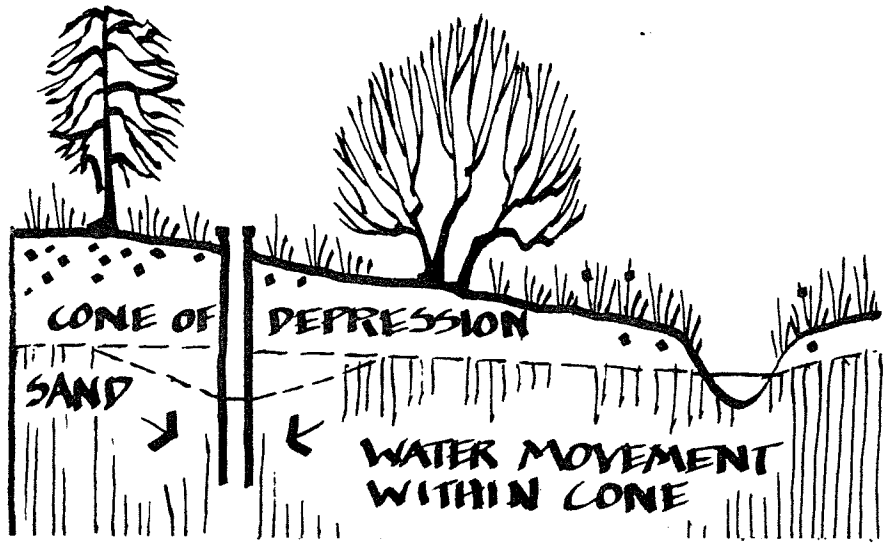
To be aware of the potential movement of pollution introduced to ground water, it is useful to understand the general flow pattern of ground water. Water that percolates into the zone of saturation does not remain in a static position. It flows basically downward in relation to topography and follows U shaped upward curved flow paths. At the watershed divide, flow lines go straight to great depths from which they recurve upward to points under streams. Deep path flow is slow, while near surface flow is more rapid. Maximum flow occurs at discharge points.



Water is withdrawn from the zone of saturation by means of wells. About half of Ulster County's population relies on this method of water supply. Three types of wells are used in Ulster County.

1. Water Table Well

The contour of the water table is altered immediately around a pumping well as a cone of depression develops. With consistent withdrawal, the drawdown or depth of the cone stabilizes. Because water moves toward the well within a cone of depression, any pollutants that enter the ground water within the perimeter of the cone of depression will eventually be drawn into the well.



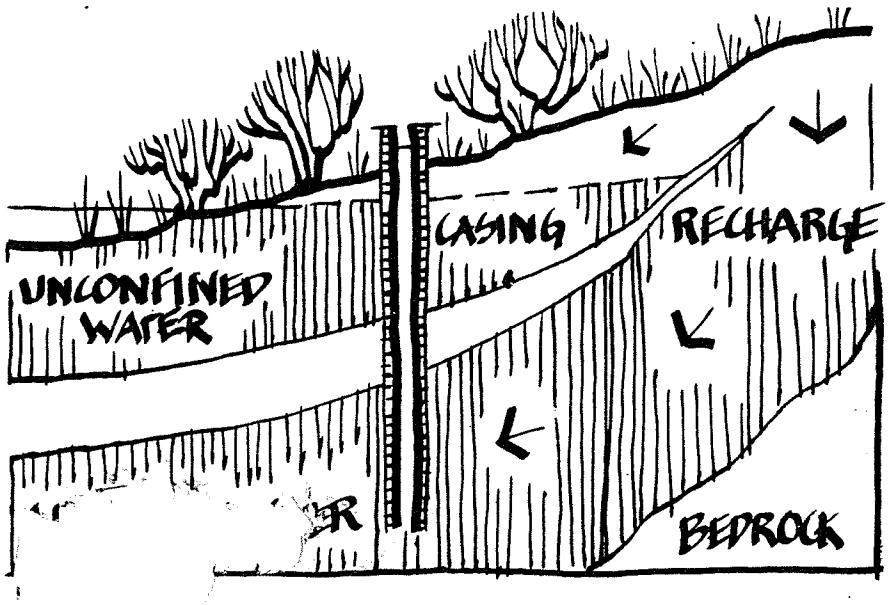
If a well is pumped at an excessive rate the water table may be lowered below the pumping level of neighboring wells, thus cutting off their ground water supply.

2. Artesian Well

Wells may be drilled through confining beds to penetrate an artesian aquifer that is confined under pressure. The recharge area is usually remote from the impermeable beds that confine the artesian aquifer If the artesian supply has a recharge source of high transmissivity, the aquifer has high water supply potential.

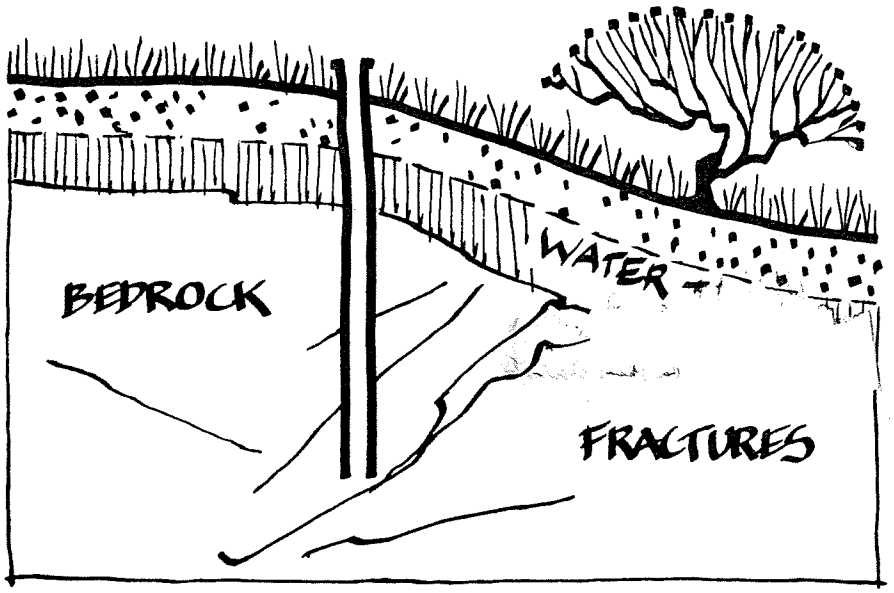
Because the artesian supply is under pressure, the water level in an artesian well may be higher than the unconfined water table. In this situation the water pressure is great enough to cause the well to flow above the level of confining bed.

The silt and clay confining beds that overlay sands and gravels in the southern Wallkill Valley are conducive to artesian wells. It is essential to seal drilled wells with metal casings to prevent leakage that could permit pollution of the supply by a polluted surface supply.



3. Bedrock Well

In Ulster County wells are sometimes drilled into bedrock, where water is supplied via rock fractures. Bedrock wells frequently yield water in sufficient quantities for domestic use.



SURFACE WATER

Surface water is the source of water for the 50% of Ulster County's population not served by wells. Surface water is stored in natural and man-made areas of blocked drainage where low topography intersects the ground water table. Lakes and reservoirs are recharged by the ground water; but the most important source of replenishment is runoff, which drains surrounding poorly-permeable upland areas.

VARIABLES

Three variables are used for this evaluation of the potential impact of pollution on ground and surface water supplies:

(1) SOILS BY HYDROLOGIC GROUP:

The degree to which a soil is impervious to the flow of water through it determines the importance of that soil in water recharge. A soil that percolates rapidly, while filtering out pollution, quickly replenishes ground water for artesian and surface water supplies. Soils with a low infiltration rate retard water recharge. Water draining these areas of impermeable soil runs across the surface, increasing erosion and sedimentation at the same time that it washes surface pollutants into surface water bodies.

The Soil Conservation Service has placed the soils in four hydrologic soils groups:

A High Infiltration Rates

B Moderate Infiltration Rates

C Slow Infiltration Rates

D Very Slow infiltration

Soils are classified by runoff potential:

a. High Infiltration - Low Runoff Rate (A)

b. Moderate Infiltration - Moderate Runoff Rate (B)

c. Low Infiltration - Highest Runoff (C & D)

(2) SLOPE

As in the erosion and sedimentation process, slope determines the speed at which water will run into surface water bodies.

Slopes are categorized by degree of potential impact.

a. Steep - 15% and up

b. Moderate - 5 - 15%

c. Flat - 0 - 5%

(3) PROXIMITY TO RECHARGE AREAS AND AQUIFERS

Glacial ice produced and deposited the unconsolidated sands and gravels that provide aquifers and recharge areas for the County. The glacial deposits may be (a) stratified, that is, laid down by glacial rivers and lakes; or (b) unstratified moraine deposits, or till, which cover most of the county and have low permeability.

The stratified, unconsolidated glacial deposits of Ulster County provide the highest yield aquifers. These are the areas of maximum ground water availability, where pollution will rapidly enter the water system and easily move through it to wells.

The quality of the water feeding wells is affected by nearby dumps, gasoline storage stations and septic systems. Although organic pollution may be filtered out, chemicals, such

as phosphates and nitrates, have unlimited travel potential in an aquifer or its recharge area.

The value of a given aquifer is determined by:

a. the depth of unconsolidated material

b. the transmissivity of that material

Transmissivity is dependent on soil particle size. Small grain size, as in silt and clay, decreases and slows the amount of water that drains from between the grains, because most of the water adheres to the particle surfaces. Sand and gravel has a reduced ability to hold water at the same time that open space between the grains allows rapid flow of water.

Sub-variables included on the aquifer and aquifer recharge map:

a. All areas outside immediate drainage zone of recharge areas and aquifers

b. Drainage zones where runoff has the potential ability to reach the recharge area or surface water body

c. Major recharge areas and aquifers of Ulster County.

NATURAL SYSTEM: HYDROLOGY

VARIABLES	Most Sensitive 3	Moderately Sensitive 2	Least Sensitive 1	Not Important 0
Slope by Percent	Steep	Moderate	Flat	
Soils by Hydrologic groups	Low infiltration	Medium	High	
Aquifer and Recharge areas	Aquifers	Drainage zones	Out of Zones	

	9	8	7	6	5	4	3	2	1	0
Land Use Group I	M	M	M	C	C	C	C	C	C	C
Land Use Group II	S	S	S	M	M	C	C	C	C	C
Land Use Group III	I	I	I	S	S	M	C	C	C	C

HYDROLOGY: A DESCRIPTION OF IMPORTANT LAND USES AND THEIR CHARACTERISTICS

The effect of development on water quality is related to the following land use characteristics:

(1) Amount of impervious cover (runoff of pollutants)

(2) The quantity and type of wastes emitted

The land uses are divided into the three groups by the intensity of these characteristics.

LAND USE GROUP I (Least Intensive)

These land uses have little or no impervious cover and emit little waste.

Examples:
- conservation areas
- recreation (camping, trails)
- open field sports
- golf course

LAND USE GROUP II (Moderately Intensive)

These land uses have up to 20% impervious cover and generate moderate amounts of liquid and solid waste materials.

Examples:
- 2 acre residential or larger
- 1 acre residential
- transmission lines
- trailer camping
- extractive industry

LAND USE GROUP III (Most Intensive)

Examples:
- 1/2 acre residential
- 1/4 acre residential
- commercial recreation
- 2 lane highway
- 4 lane highway
- limited access divided highway
- neighborhood commercial center
- elementary school
- junior high school
- high school
- trailer park
- town houses/garden apartments
- low rise apartments
- mid-rise apartments
- warehouses
- office headquarters
- manufacturing
- commercial community center
- regional commercial center
- sanitary land fill

PERFORMANCE STANDARDS FOR HYDROLOGY

Standards for maintenance of water quality in potential critical areas should be obtained from the Health Department, the U.S.G.S. Water Resources Division and the E.P.A. General mitigating measures include:

1. Classification of stream water quality
2. Recommendations for siting dumps and wells
3. Information on the comparative degree of impact of insecticides and herbicides.

Site-specific performance standards include measures to:

1. Maintain infiltration to reduce runoff:

   dutch drains
   porous paving
   terraces
   recharge basins
   dry wells
   seepage beds
   detention basins
   pressure injection wells

2. Reduce flood damage:

   dikes
   levees
   floodwalls

3. Minimize runoff pollution:

   street cleaning
   elimination of de-icing salts

4. Minimize pollution from sewage effluent:

   septic tank regulations
   anaerobic treatment
   aerobic treatment
   package waste
   water treatment
   oxidation pond
   spray irrigation
   dosing systems
   seepage beds
   sand filters
   underdrains

5. Minimize pollution from agriculture, industry and commerce:

   earthmoving & sediment control
   runoff control
   detention & disposal of runoff
   sewer system design
   flood protection
   disposal of cooling water
   use of livestock waste for feed, fertilizer, composting
   application rates of washing wastes

wildlife

The wildlife of Ulster County is a significant and rich natural resource. The County fulfills habitat requirements for a wide variety of wildlife types:

Large upland mammals such as bear, fox and deer

Smaller upland mammals including hare, rabbit, racoon, squirrel and opossum

Wetland mammals, especially otter, beaver, muskrat, and mink

Upland birds such as turkey, pheasant, owl, hawk and diverse songbirds

Waterfowl including black duck, loon, heron, mallard and wood duck

Reptiles

Amphibians

Fish, such as trout and bass

Patterns of land use, vegetation, and water types influence the dispersion of wildlife throughout the County. Each species has a slightly different habitat requirement, but certain basic criteria provide the components for evaluating habitat type. As an example, bear require remote forested areas for cover, open shrublands for feeding, and water; while wood ducks require woodland for nesting, marshes for feeding and open water. The requirements vary but the basic considerations of water type, patterns of vegetation diversity, remoteness, and adjacent land uses provide a key for wildlife habitat evaluation.

VEGETATION

Forest is essential in providing refuge for mammals and birds. The soils of Ulster County support an extraordinary diversity of tree types; deciduous: oak, maple, beech, walnut, hickory, birch, larch, willow, elm; and a wide variety of coniferous: pine, cedar, spruce, hemlock and fir. The resulting diverse forest provides excellent cover and bedding or nesting locations for the numerous wildlife species.

Open land is equally essential to wildlife habitat as the primary location of food. Fields or scrublands provide grazing areas as well as seed and berry crops. Many small animals require dense shrubby vegetation for cover or nesting sites. Since open land is critical to wildlife, but usually does not occur except after a disturbance, policies such as clearing, thinning, or introducing of beavers to create marshland, might be considered.

Marsh vegetation is the third significant vegetative type. The widest possible variety of wildlife species is found in marshes adjacent to forest and open land. For some wildlife species such as ducks, the abundant food supplies and nesting areas of marshlands may meet the total habitat requirements.

In addition to remoteness and edge, separately mapped as sub-variables, two aspects of vegetative pattern must be considered. Diversity of vegetative types is critical to an abundance of wildlife. Most species require more than one type of vegetation for survival: the greater the variety of plant life, the greater the variety of animals. Linkages provide travel routes between range areas. The value of an isolated habitat type is increased if it is linked to a dissimilar type. This allows wildlife to move safely between different areas to meet various habitat requirements.

VARIABLES

Variables used to evaluate potential impact on wildlife are:

1. Remoteness

Isolated areas are critical for certain wildlife species. Species such as deer, fox and bear require remote areas for rest and cover. They will remain in Ulster only as long as large parcels of land remain undeveloped. Although remoteness occurs by degrees, and varies according to the needs of different species, it is generalized here into zones that are either remote or not remote from development.

a. remote
b. not remote

2. Edge/Land Use

Edge is an additional aspect of vegetation pattern important enough in itself to be separately mapped. Two types of edge must be considered:

(1) Edges within a vegetated area

(2) Edges between natural & developed areas

In a vegetated area, measurement of edges between vegetative types (forest/open) provides a method for evaluating the habitat based on how the types are juxtaposed. The longer the lines of contact between types of vegetation, the greater the area providing cover, resting places and food for wildlife. Therefore, maximum interspersion of vegetative types creates maximum edge conditions and a more valuable wildlife habitat.

The type of edge created between a natural habitat and adjacent developed areas is critical to the value of the habitat. Edge conditions increased by development disturbances may be beneficial, as when power line cuts function as wildlife feeding areas, or detrimental, as in the case of a highway or industrial development.

Adjacent Land Uses must be considered not only for the edges they create, but for their intrinsic wildlife value. For instance, agricultural lands surrounding forest and wetland not only create excellent edge conditions, but provide food and a buffer between wildlife habitat and human activity.

The edge map includes the following zones:

a. Developed areas
b. Natural areas (forest, wetlands, open fields)
c. Natural edges within the vegetation: open/forest/wetland

3. Proximity to Water

All wildlife requires fresh water. Open water, including lakes, resevoirs, ponds, streams and brooks, is found throughout Ulster County and provides the central element for every type of

habitat. Wetlands are areas of maximum wildlife production due to the presence of water in conjunction with diverse vegetation providing cover, nesting areas and food sources for numerous animal species.

Towns evaluating their wetlands as water-related components of a wildlife habitat may wish to classify the wetlands by vegetative type.

(1) Deep Marsh - usually develops adjacent to open water where there is 6" - 3' of water. The deep marsh is characterized by open water interspersed with vegetation that includes submerged plants, floating-leaved plants and emergent broad and narrow leaved plants.

(2) A Shallow Marsh - is located in less than 6" of water. Grassy vegetation is dense and includes emergent broad and narrow leaved plants as well as floating-leaved plants. A shallow marsh, with its concentration and diversity of food producing vegetation, is the prime wildlife habitat.

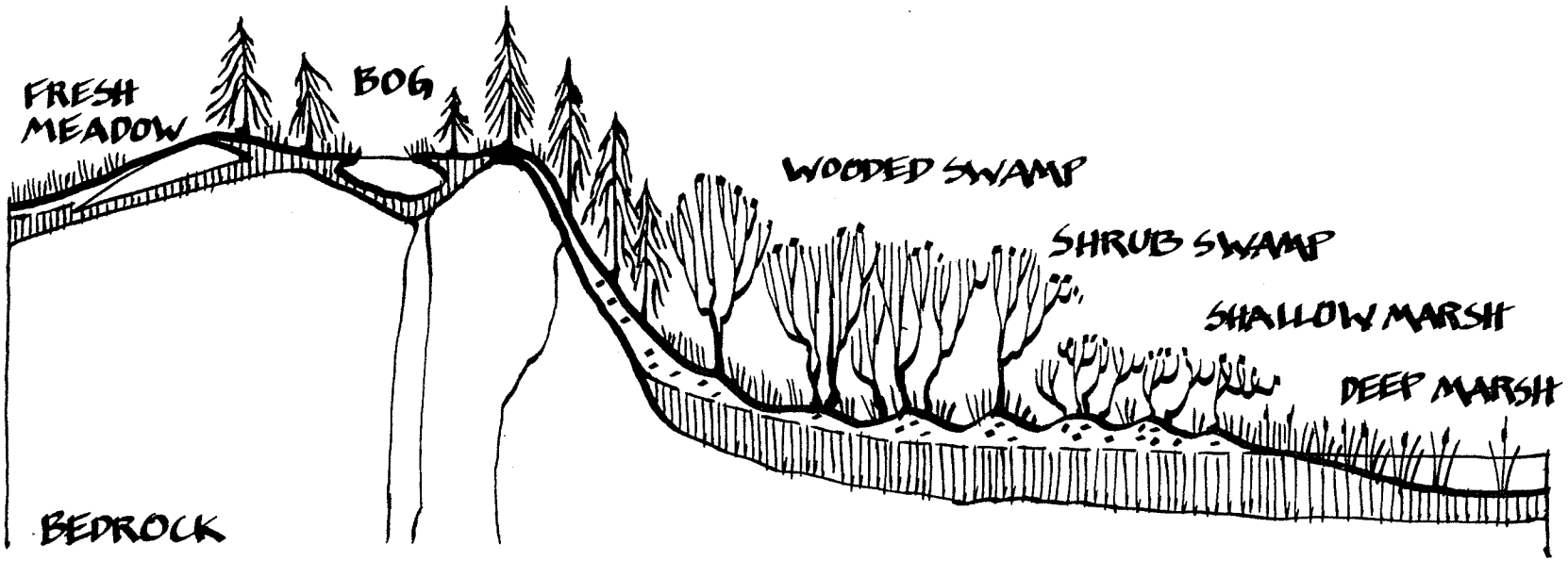
(3) A Shrub Swamp - is situated in less than 12" of water and is recognized by shrubby vegetation such as blueberry, alder, azalea, and laurel growing on hummocks.

(4) A Wooded Swamp - grows in up to 12" of water. Trees, such as red maple, black ash and willow, grow on mounds. Wooded swamp is the final stage of wetland development, which starts with open water. As organic sediment accumulates, deep marsh is initiated and develops into shallow marsh, followed by shrub swamp and finally by wooded swamp.

(5) Seasonally Flooded Flats - occur in river floodplains covered with 12" or more of water annually. Marsh vegetation is predominant although shrubs and trees may occur.

(6) A Fresh Meadow - is covered by up to 6" of water during the spring. For the rest of the year there is no surface water, but the soil is saturated. Fresh meadows are frequently grazed or plowed for agricultural purposes. In a natural situation, vegetation may include marsh grasses, sedges and rushes, as well as wetland shrubs.

(7) A Bog - is situated in a self-contained depression where acid conditions have prevented decay of organic debris. A sphagnum mat grows on the surface of the water and supports such vegetation as larch, cranberry, and unique insectiverous plants and orchids.



Proximity to water is ranked by benefit to wildlife:

a. wetlands
b. standing water
c. moving water

NATURAL SYSTEM: WILDLIFE

VARIABLE	SUB VARIABLES Most Sensitive 3	 Moderately Sensitive 2	 Least Sensitive 1	 Not Important 0
Edges	Natural	Forest and Agriculture	Development	
Remoteness	Remote			Near Development
Proximity to Water	Close to Water		Far from water	

	9	8	7	6	5	4	3	2	1	0
Land Use Group I	M	M	M	C	C	C	C	C	C	C
Land Use Group II	S	S	S	M	M	C	C	C	C	C
Land Use Group III	I	I	I	S	S	M	C	C	C	C

WILDLIFE: A DESCRIPTION OF IMPORTANT LAND USES AND THEIR CHARACTERISTICS

Wildlife is impacted by development and its characteristics in three ways: 1) presence of human activity; 2) predatory activity of domestic animals, such as cats and dogs; and 3) general intensity of development due to such things as noise or number of people. The land uses are divided into the three groups according to these characteristics:

LAND USE GROUP I (Least Intensive)

Examples:
- conservation areas
- recreation (tent camping, trails)
- agriculture
- 2 acre residential and larger
- transmission lines

LAND USE GROUP II (Moderately Intensive)

Examples:
- 1 acre residential
- 1/2 acre residential
- 2 lane highway
- trailer camping
- open field sports (baseball, football)
- golf courses

LAND USE GROUP III (Most Intensive)

Examples:
- residential 1/4 acre
- commercial
- neighborhood commercial center
- elementary school
- junior high school
- high school
- trailer park
- 4 land highway
- limited access highway
- town house/garden apartments
- low rise apartments
- mid-rise apartments
- extractive industry
- warehouses
- office headquarters
- manufacturing
- community commercial center
- regional commercial center
- sanitary land fill

PERFORMANCE STANDARDS FOR WILDLIFE

The Department of Environmental Conservation and the Bureau of Sport Fisheries and Wildlife should be contacted for wildlife species requirements and management practices.

Approaches to be considered by towns include:

1. Wilderness Protection

Maintenance of remote areas, such as the Forest Preserve.

2. Maintenance of Open Space/Edges

   a. Cutting and/or point application of herbicide.

   b. Conservation Commission management of power line cuts to maintain scrub vegetation.

   c. Preservation of Pasture Lands:

      1. Monitoring of trend of pasture land abandonment to avoid letting pastures go into secondary succession.

      2. Establishment of subsidy or exchange system between farmers and conservation commission.

3. Management of Tree Cutting

   a. Establishment by Conservation Commission of tree cutting clean-up procedures to dispose of brush in such a way as to provide animal shelters.

   b. Establishment of rotational clear cuttings of moderate-sized areas to create patches of open space in different stages of succession.

      (If these patches are cut near a stream, optimum wildlife habitat is created.) This approach requires cooperation between the Conservation Commissions and the commercial tree cutters.

4. Thinning of Forest

   a. Removal of diseased trees.

   b. Thinning of young stands to create optimum growing conditions.

   c. Thinning of cover story trees to allow sufficient growth of understory to fulfill habitat requirements for most species.

5. Creation of Wetlands

   a. Damming to raise water level of existing wetlands that have reached final successional stage (wooded swamp).

   b. Introduction of beavers.

visual quality

The high visual quality of Ulster County is a basic resource. The citizens of the County are concerned with maintaining views that enhance their everyday living, as well as provide a continued resource for the tourist industry.

In order to incorporate the visual resource into planning for land use locations, it is necessary to determine:

1. The existing character of an area that is worthy of preservation within the county: urban, town and country, and rural.
2. The important features that contribute to the prefered urban, town and country or rural character: historic sites, well designed homes, major ridges, wetlands, or rivers.
3. Methods of enhancing existing character: compatible styles of architecture, screening of undesirable land uses, placement of undesirable land uses where they can be seen by a minimum number of people, and opening up of positive views along highways and public areas.

If a component of the landscape can be identified as positive (most of Ulster's citizens agree that they value their historic stone buildings, farms and mountains), it is possible to determine to what extent that component is utilized as a visual resource.

The questions that must be asked are:

(1) Can the land use or view be seen?

(2) If so, from where?

(3) By how many people?

(4) How often or how long?

A maximum viewing time (most number of people for the longest time) indicates good use of the visual resource.

The approach to visual analysis, used here, is not conclusive, but it is simple and effective. The first stage addresses the issue of determining which areas have the potential to screen or absorb new land uses. These are the relatively flat, low and densely vegetated areas. Steep slopes at a high elevation with little or no vegetation are most sensitive.

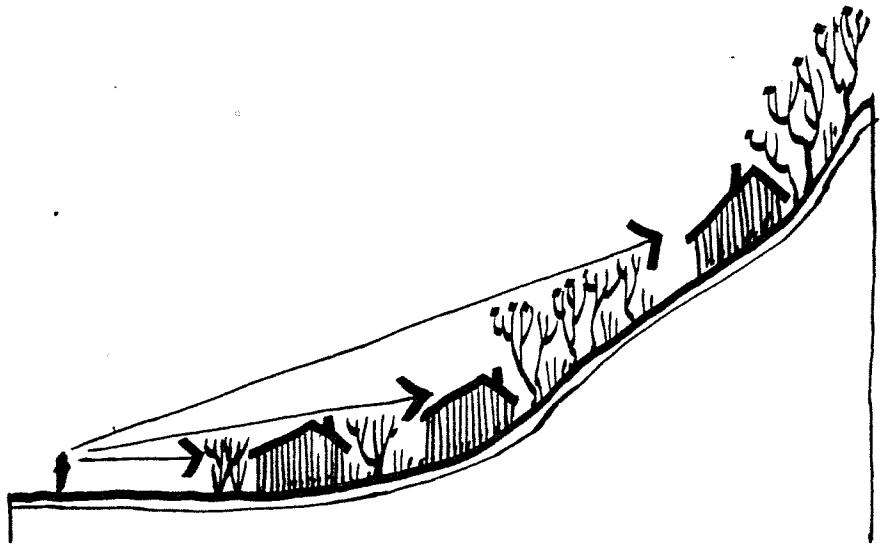
The second stage identifies those areas where special features are sensitive to visual change. It is necessary to determine if changing the views of these areas will alter the desired character of the County.

PART ONE:

VARIABLES

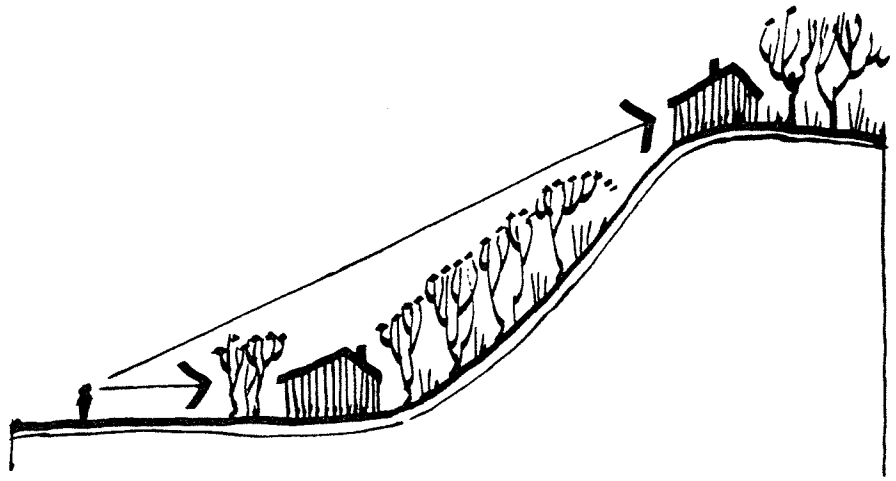
1. Slope

Slope is an essential consideration because of its affect on the viewer's angle. A steep slope is usually visible from many points. The gradient of the slope makes screening difficult.



2. Elevation

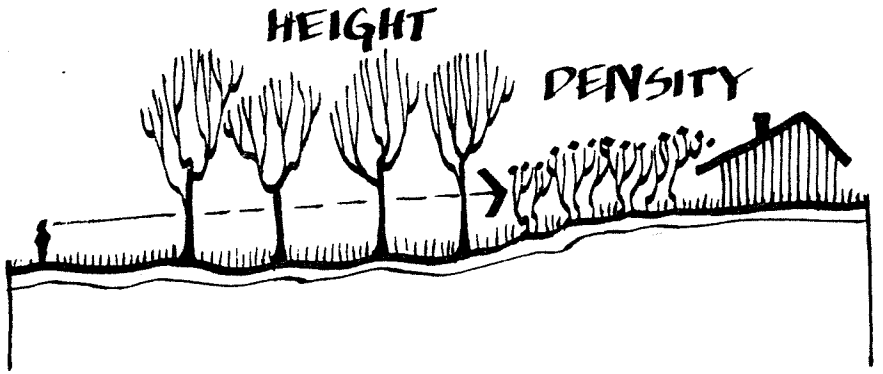
Areas at high elevations have maximum visibility. Screening is difficult so any land use will be seen from surrounding points.



3. Vegetation

Vegetation is critical for screening: the blocking effect is determined by vegetation height and by vegetation density.

Height and density interact to screen land uses by providing vegetation tall enough to hide and dense enough to break up the line of vision or block the view completely.



CULTURAL SYSTEM: VISUAL ABSORPTION

VARIABLES	SUB VARIABLES Most Sensitive 3	 Moderately Sensitive 2	 Least Sensitive 1	 Not Important 0
Topographic Elevation	High	Medium	Low	
Slope by Percent	Steep	Moderate	Flat	
Vegetation Density	Open	0-50 Percent	50-100 Percent	

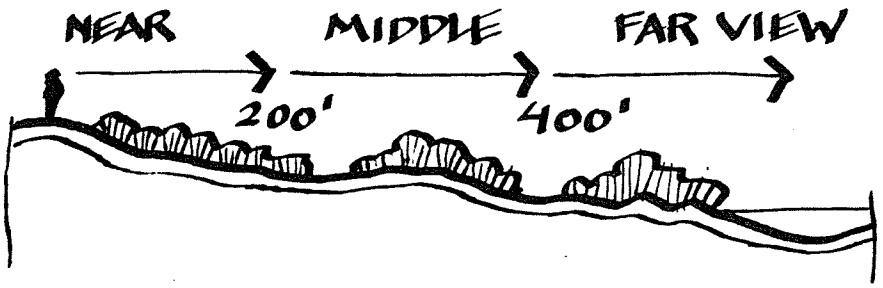
	9	8	7	6	5	4	3	2	1	0
Land Use Group I	M	M	M	C	C	C	C	C	C	C
Land Use Group II	S	S	S	M	M	C	C	C	C	C
Land Use Group III	I	I	I	S	S	M	C	C	C	C

PART TWO:

SPECIAL CHARACTER

Each town must identify those areas critical to its special character: historic sites, farms, mountains and water bodies.

Distance can be a measure of visual change. The closer an object is the more dominant it becomes. A close object has the greatest potential effect on a view, while the farther an object is from the viewer, the smaller the effect on the character of the view.



Distance factors can be organized into three major zones: foreground, middle ground and background.

1. Near View: 0 - 200 feet from a special site.

This is the most sensitive zone. Any new land use within it will be instantly recognized. If these areas occur on lands where screening is difficult, any new land use causes a major impact.

As an example, consider the Huguenot settlement in New Paltz with an industrial park 200 feet away. The historic character of the area would be severely disrupted.

2. Middle View: 200 feet to 400 feet.

This is the zone of moderate sensitivity. Land uses are recognizable, but detail and size are of lesser impact. The decision to locate a land use within the middle view of an important site should be affected by the visual absorptive ability of the area.

For example, the Huguenot Settlement would no longer be dominated by the industrial park, but the character of the historic site would be affected.

3. Far View: 400 feet or greater.

This zone is least sensitive. Detail is lost completely and only silhouettes can be perceived. Except in extreme instances, vegetative screening can be used to preserve visual quality.

If the industrial park is located far from the Huguenot Settlement, the historic character of the area is not destroyed.

The map of distance zones used here is gross in order to illustrate the concept of distance: it should not be interpreted as actual delineation of observer distance zones.

CULTURAL SYSTEM: VISUAL SPECIAL CHARACTER

VARIABLES	SUB VARIABLES Most Sensitive 3	Moderately Sensitive 2	Least Sensitive 1	Not Important 0
Topographic Elevation	High	Medium	Low	
Slope by Percent	Steep	Moderate	Flat	
Vegetation Density	Open	20-50 Percent	50-100 Percent	
Distance from Special Areas	0-200 Feet	200-400 Feet	400-600 Feet	600 feet Plus

	12	11	10	9	8	7	6	5	4	3	2	1	0
Land Use Group I	M	M	M	M	C	C	C	C	C	C	C	C	C
Land Use Group II	S	S	S	S	M	M	M	C	C	C	C	C	C
Land Use Group III	I	I	I	I	S	S	S	M	M	C	C	C	C

VISUAL QUALITY

A DESCRIPTION OF IMPORTANT LAND USES AND THEIR CHARACTERISTICS

Land uses can have three general effects on visual quality:

1. Building height, or how much of the building can be seen above the existing landscape and vegetation

2. Blocking size of the land use, or the size of the structure

3. The preference of the population for the land use; is it considered by a majority of the people of Ulster County to be ugly or desirable

LAND USE GROUP I

These land uses do not change the existing character. They are small land uses in size, considered low in density, and positive in their preference category. Examples are:

Conservation Area
Agriculture
Trails
Picnicking
Tent Camping
Open Field Sports
Golf Course
Residential (2 acre lots or greater)

LAND USE GROUP II

These land uses are larger in structure and are usually considered neutral in their preference category. Examples are:

Trailer Camping
Ski Lodge and Ski Run
Playground
Transmission Line Right-of-way
Two Lane Highway
Residential (1/2 Acre and 1 Acre)
Town House/Garden Apartment
Elementary School
Junior High School
High School
Neighborhood Commercial Center

LAND USE GROUP III

These land uses are usually large in structure and are considered negative in the preference category. Examples are:

Recreation - Commercial
Transmission Line Right-of-way
Limited Access Divided Highway
Trailer Park
Low Rise Apartment
Mid Rise Apartment
Extractive Industry
Warehouse
Trucking Distribution
Office Headquarters
Manufacturing
Commercial Community Center
Regional Commercial Center

PERFORMANCE STANDARDS FOR VISUAL QUALITY

The Historic Society provides a reference for areas critical to the County's visual character. Performance Standards for maintenance of visual quality are not available from any government agency. Neither can a Conservation Commission prohibit ugly land uses. However, the Conservation Commission can inforce:

Screening

Setbacks

Mounding to hide land uses

Performance standards such as uniform signage and compatible architectural design and materials can be implemented through zoning.

open space/conservation

open space/conservation

Open space/conservation/recreation planning is an essential component of environmental planning.

Conservation Commissions are presently faced with the task of resolving such issues as:

1. Which woodlands, rivers, or wetlands should receive highest priority for restriction
2. What are the best locations for bicycle trails or wildlife preserves?

Such decisions are not a simple matter. Many factors are involved: budget, overall planning concerns and the demand for recreation areas. The total situation must be understood before individual decisions are made.

One method for weighing the immediate planning concerns against the long range planning goals is the multi-benefit analysis. This is accomplished by using a two sided matrix. Long range environmental goals are arranged across the top, and critical environmental resources along the side.

This matrix is useful in helping decision making bodies visualize the relationship between protection of environmental resources and the fulfilling of goals. The matrix analysis provides a tool for making financial decisions that produce the greatest return. It indicates where money should be spent for maximum benefit according to the Conservation Commission's values and priorities.

GOALS

MULTI-BENEFITS MATRIX

Protection of Water Qualtiy	Protection of Water Supply	Flood Control	Protection of Vegetation/Wildlife Habitats	Protection of Historic Sites	Protection of Agricultural Lands	Protection of Visual Character	Maintainance of Undisturbed Wild Areas	Creation/Protection of Neighborhood Parks	Creation/Protection of Water Access Recreation	RESOURCES	TOTALS
+	+	+	+			+	+	+	+	Wetlands	8
+	+	+	+			+	+	+	+	Flood Plains	8
+			+			+	+			Unstable Soils	4
+	+	+	+		+	+	+	+	+	Unique Wildlife Habitat	9
		+	+	+	+	+				Agriculture Lands	5
+	+		+			+				Recharge Areas	4
				+	+	+			+	Historic Sites	4
			+	+	+	+	+	+	+	High Visual Quality	7
+	+	+	+			+	+	+	+	Undeveloped Open Areas	8

GOALS/ENVIRONMENTAL RESOURCES

Goals vary from town to town. Those used in this matrix may or may not apply to individual towns in Ulster County. They are included to illustrate use of the matrix as a tool for selecting prime conservation areas.

The resources are any environmental element important to the community. The list may include data variables such as wetlands, agricultural lands, floodplains or historic sites; or it may include those areas that have the highest potential for impacts (as developed in the prior analysis of natural processes), such as visually sensitive areas, highly erodable soils or optimum wildlife habitats.

MATRIX EXPLANATION

The goals across the top and the resources along the side provide the mechanism for determining what resources help in fulfilling a goal. Each time that preservation of a resource helps to satisfy a goal, a (+) mark is placed in the appropriate box.

For example, the resource being considered is wetlands. By wetland protection the following goals are satisfied: Protection of water quality, protection of water supply, flood control, protection of visual character, maintenance of wild areas, creation/protection of water access recreation.

Therefore, each resource that helps satisfy a goal receives a (+). If the number of (+)'s is added horizontally, the total number indicates the number of goals that the resource, if protected, helps satisfy.

This matrix, which represents an overlay of resources, can be transfered to a map to locate those areas which contain the greatest number of resources. This is accomplished by physically overlaying each resource map. Each resource, such as wetlands, is assigned a 1. Each of the other resources is also assigned a 1. When the maps are overlaid the numbers are totaled.

For example, if an area has a wetland (1), is in a floodplain (1) and in a recharge area (1), the total number is 3 (1 + 1 + 1 = 3). On a map corresponding to the matrix used here, an area with all the resources within it totals 9.

WEIGHTING OF THE GOALS

The results of the above map and matrix assumes that all goals are equal. This is very seldom the case. Therefore, goals with high priority are given higher values. This is accomplished by giving the list of goals a numerical weighting. Weights may range between 1 - 4. A four is assigned to the goals that are the most important and a 1 to the goals that are the least important.

The second matrix is an example of an assumed weighting scheme. Each community must develop its own goals, important resources and weights

that apply to its priority system. For this example the weights on the following matrix are arbitrarily assigned to each goal. Protection of water quality is given a 4. This means that any time the goal of protecting water quality has a (+) in its boxes, the (+) is assigned a 4. The same applies to other goals; every time a (+) occurs in a box under that goal, it receives the appropriate weight.

This procedure allows a community to weight its goals according to its own priorities. The numbers are added vertically to produce the total value of each resource relative to the weighing scheme.

In the example used here, the resource unstable soil receives 4 (+)'s. The first (+) is allocated to protection of water quality, which is weighted 4; the second (+) is allocated to protection of vegetation/wildlife habitats, which is weighted 1; the third (+) to protection of visual character which is weighted 2; and the final (+) to maintenance of undisturbed wild areas, weighted 1. The total of the weights is 4 + 1 + 2 + 1 = 8.

The matrix can be transfered to the map by assigning each resource its total score. For this example, all wetlands are assigned 21, floodplains assigned 20 and unstable soils assigned 8. Since the large numbers are awkward, it is simpler to total the weight for each resource and divide by a common number in order to reduce the totals to smaller units. The number 4 is used in this example, which reduces the numbers to range between 5 and 1. (The divided numbers are rounded off.) When the resource maps are overlayed the numbers are totaled. For example, if an area has a wetland (5), is in a floodplain (5), and on an aquifer recharge area (3), the total is 5 + 5 + 3 = 13.

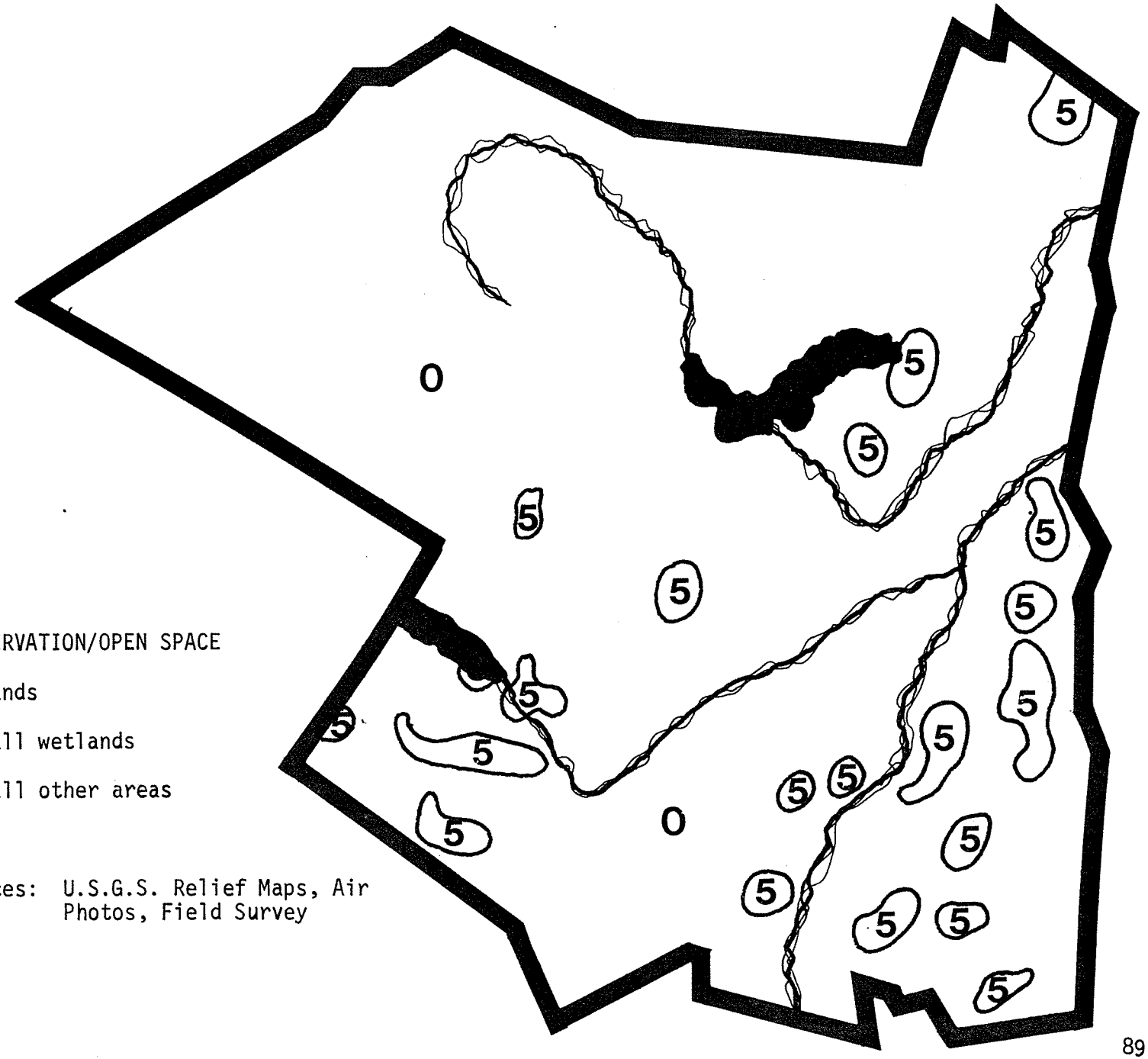
The final map represents areas which are of highest priority according to the given weighting scheme. The areas with the highest numbers are those areas with the most multiple benefits for conservation/recreation. Therefore, if a conservation group or town has a limited budget for purchase of open space/conservation lands, the areas with higher numbers can be purchased first. If some of the already existing conservation/recreation areas fall within these "best" zones they can be managed according to their actual significance to the town's goals and natural resources.

WEIGHTS	4	4	3	1	2	1	2	1	4	1
GOALS	Protection of Water Quality	Protection of Water Supply	Flood Control	Protection of Vegetation/Wildlife Habitats	Protection of Historic Sites	Protection of Agricultural Lands	Protection of Visual Character	Maintenance of Undisturbed Wild Areas	Creation/Protection of Neighborhood Parks	Creation/Protection of Water Access Recreation
RESOURCES										
Wetland	4 +	4 +	3 +	1 +		1 +	2 +	1 +	4 +	1 +
Flood Plains	4 +	4 +	3 +	1 +			2 +	1 +	4 +	1 +
Unstable Soils	4 +			1 +			2 +	1 +		
Unique Wildlife Habitat	4 +	4 +	3 +	1 +		1 +	2 +	1 +		1 +
Agriculture Lands			3 +	1 +	2 +	1 +	2 +			
Recharge Areas	4 +	4 +		1 +			2 +			
Historic Sites					2 +	1 +	2 +			1 +
High Visual Quality				1 +	2 +	1 +	2 +	1 +	4 +	1 +
Undeveloped Open Areas	4 +	4 +		1 +			2 +	1 +	4 +	1 +

RESOURCES	TOTALS	TOTALS REDUCED BY DIVIDING BY 4
Wetland	21	(5)
Flood Plains	20	(5)
Unstable Soils	8	(2)
Unique Wildlife Habitat	17	(4)
Agriculture Lands	9	(2)
Recharge Areas	11	(3)
Historic Sites	6	(1)
High Visual Quality	12	(3)
Undeveloped Open Areas	17	(4)

CONSERVATION/OPEN SPACE

RESOURCES	VARIABLES USED	WEIGHTS
Wetlands	All Wetlands	5
Flood Plains	100 year Flood Plains	5
Unstable Soils	Erosion Analysis levels 5 and 6	2
Unique Wildlife Habitat	Wildlife Analysis levels 9,8 and 7	4
Agriculture	All agricultural lands	2
Recharge Areas	Aquifer and Recharge Areas	3
Historic Sites	Important Historic Sites	1
High Visual Quality	Visual Analysis levels 10,11 and 12	3
Undeveloped Areas	All Undeveloped Forests	4



CONSERVATION/OPEN SPACE

Wetlands

5 all wetlands

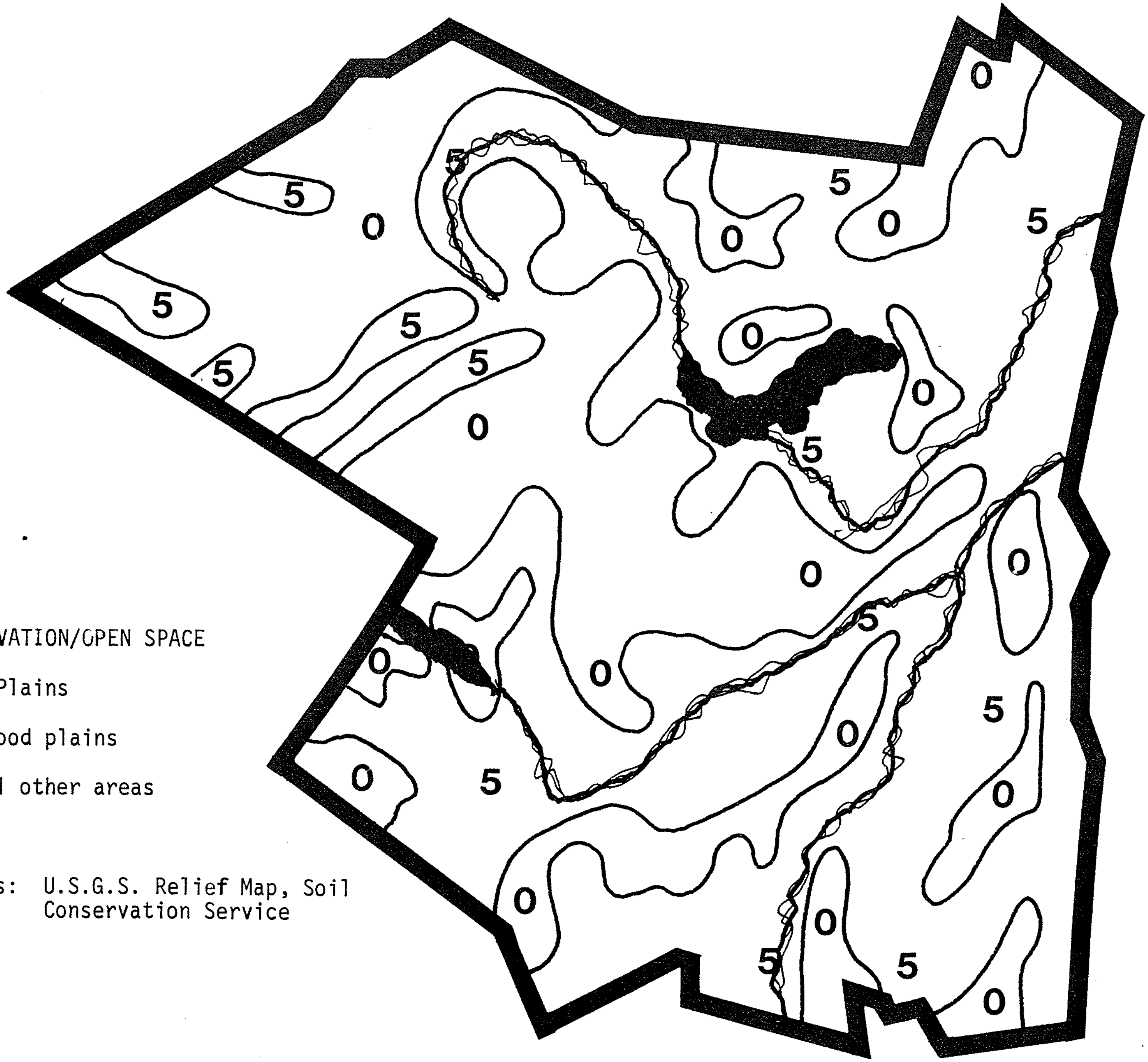
0 all other areas

Sources: U.S.G.S. Relief Maps, Air Photos, Field Survey

north

scale 0 5 miles

ulster county



CONSERVATION/OPEN SPACE

Flood Plains

5 flood plains

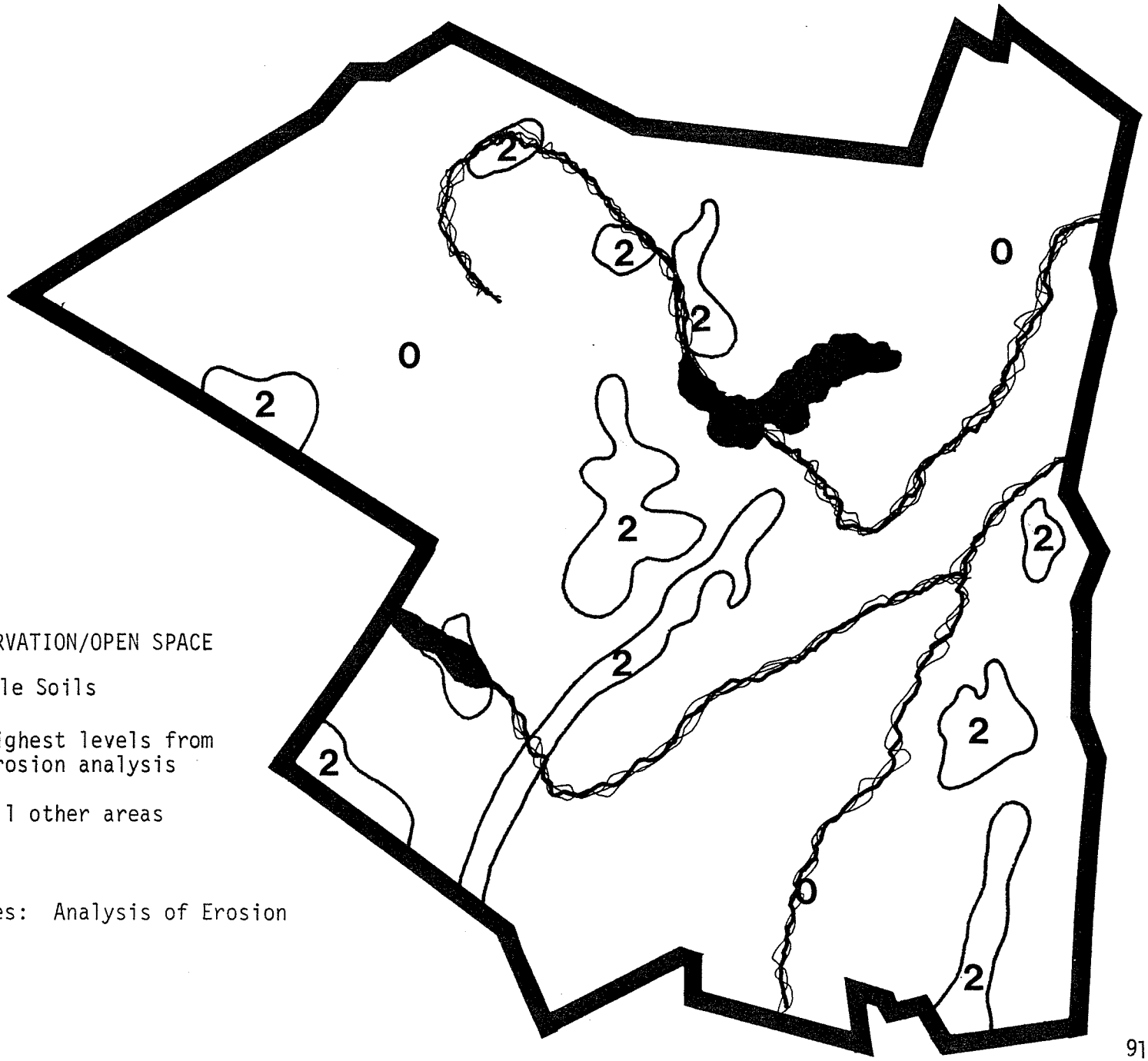
0 all other areas

Sources: U.S.G.S. Relief Map, Soil Conservation Service

north

scale 0 5 miles

ulster county



CONSERVATION/OPEN SPACE

Unstable Soils

2 highest levels from erosion analysis

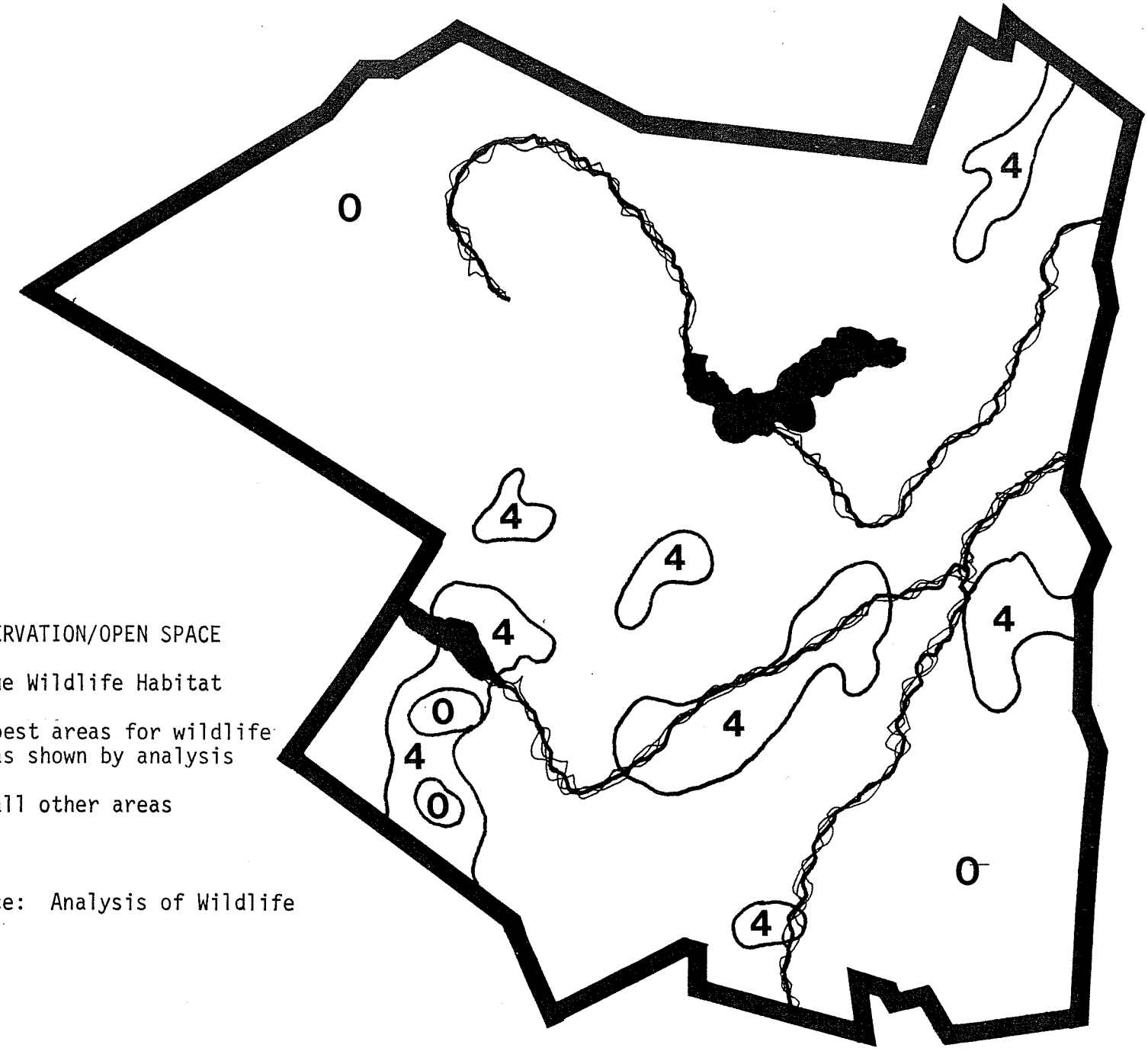
0 all other areas

Sources: Analysis of Erosion

north

scale 0 5 miles

ulster county



CONSERVATION/OPEN SPACE

Unique Wildlife Habitat

4 best areas for wildlife as shown by analysis

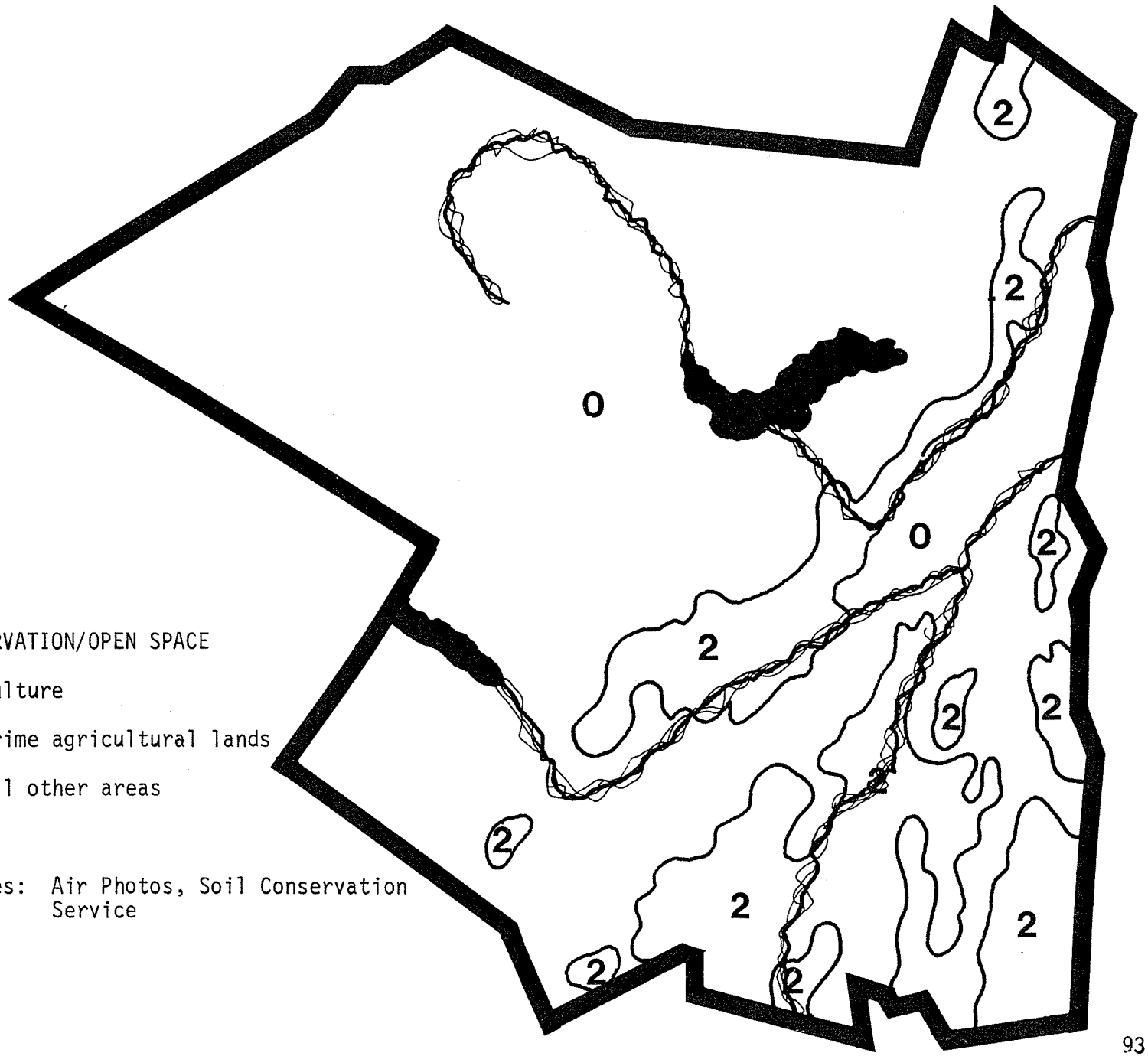
0 all other areas

Source: Analysis of Wildlife

north

scale 0 5 miles

ulster county



CONSERVATION/OPEN SPACE

Agriculture

2 prime agricultural lands

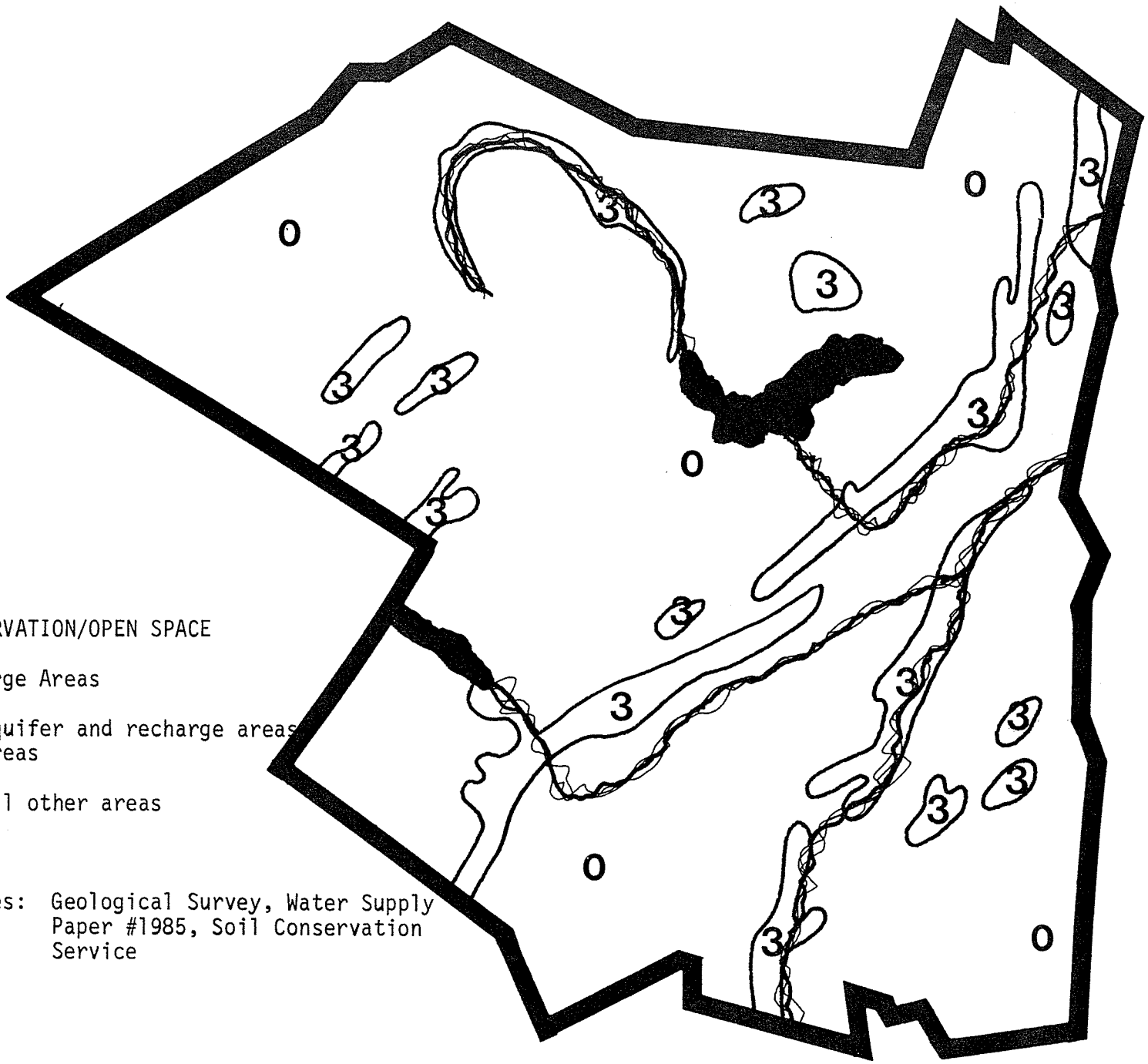
0 all other areas

Sources: Air Photos, Soil Conservation Service

north

scale 0 5 miles

ulster county



CONSERVATION/OPEN SPACE

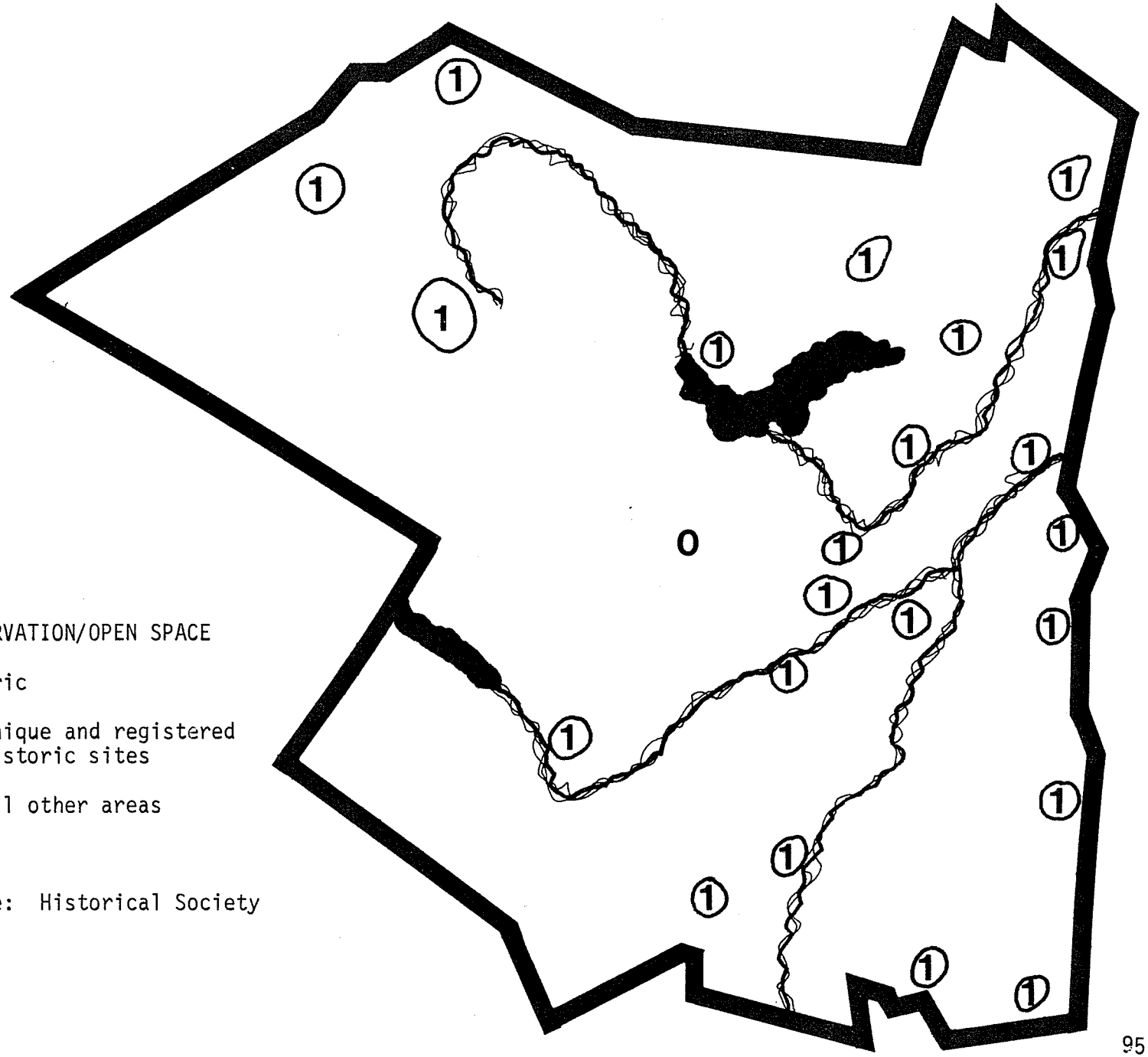
Recharge Areas

3 aquifer and recharge areas
areas

0 all other areas

Sources: Geological Survey, Water Supply Paper #1985, Soil Conservation Service

ulster county



CONSERVATION/OPEN SPACE

Historic

1 unique and registered historic sites

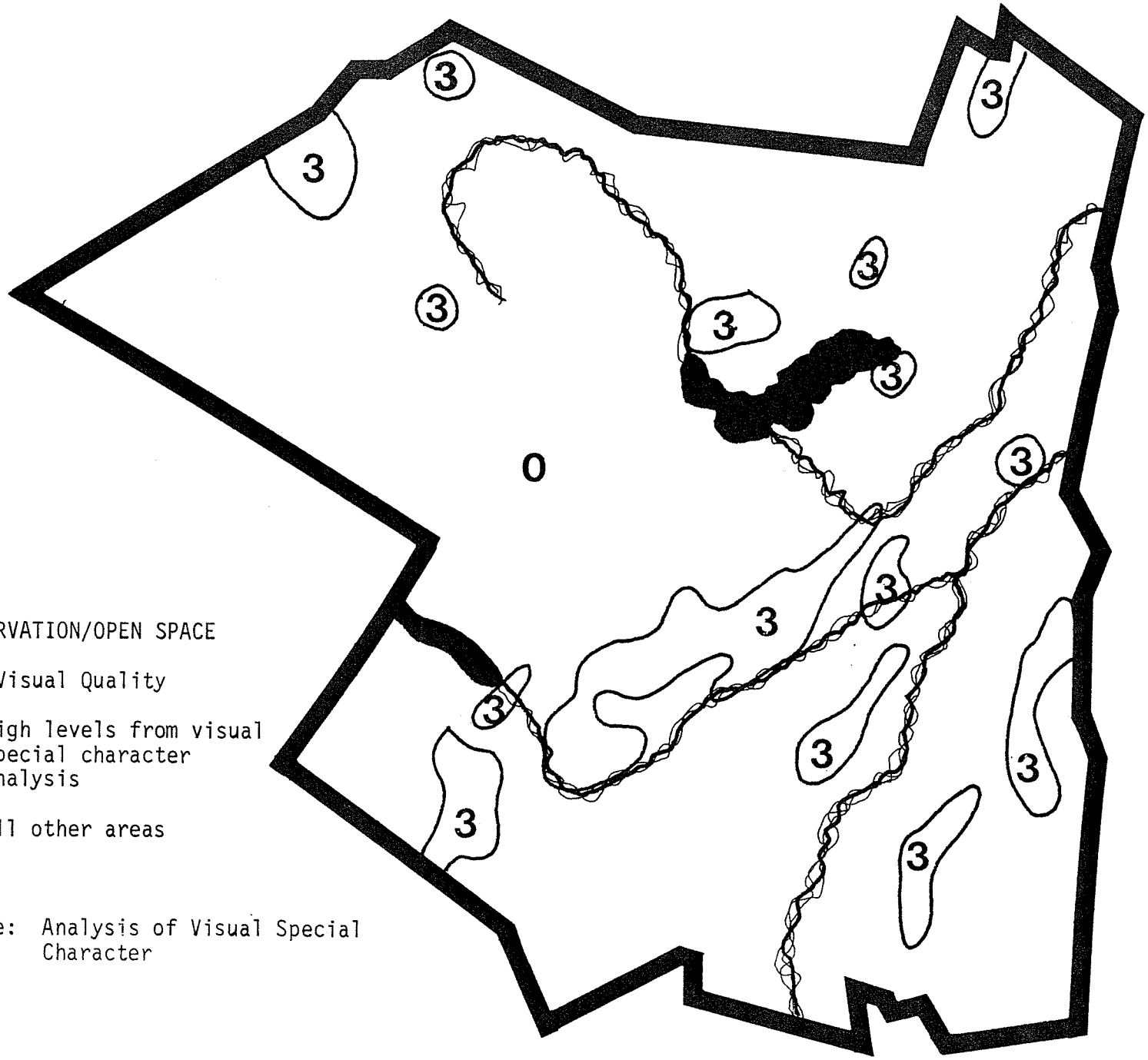
0 all other areas

Source: Historical Society

north

scale 0 5 miles

ulster county



CONSERVATION/OPEN SPACE

High Visual Quality

3 high levels from visual special character analysis

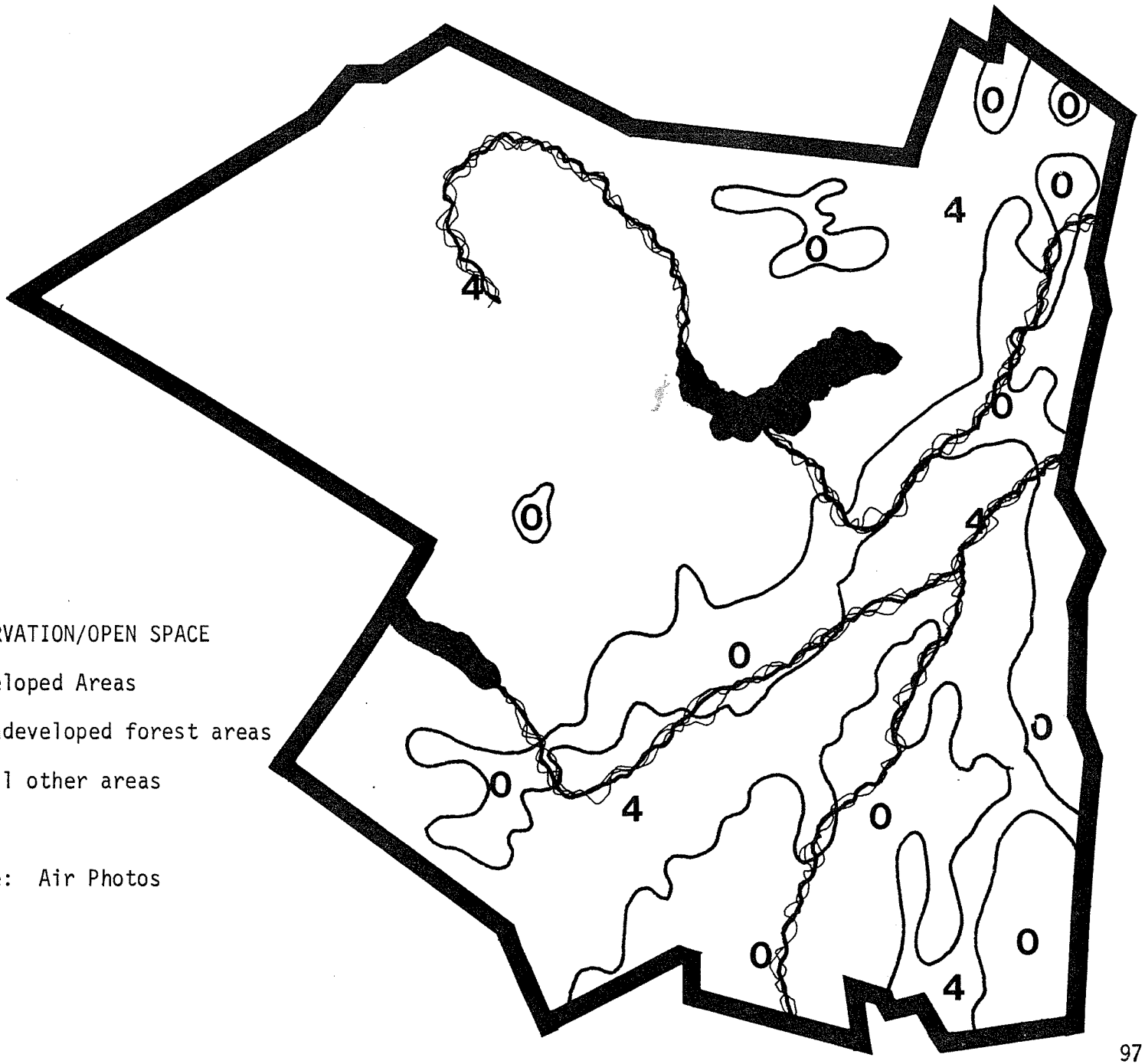
0 all other areas

Source: Analysis of Visual Special Character

north

scale 0 5 miles

ulster county



CONSERVATION/OPEN SPACE

Undeveloped Areas

4 undeveloped forest areas

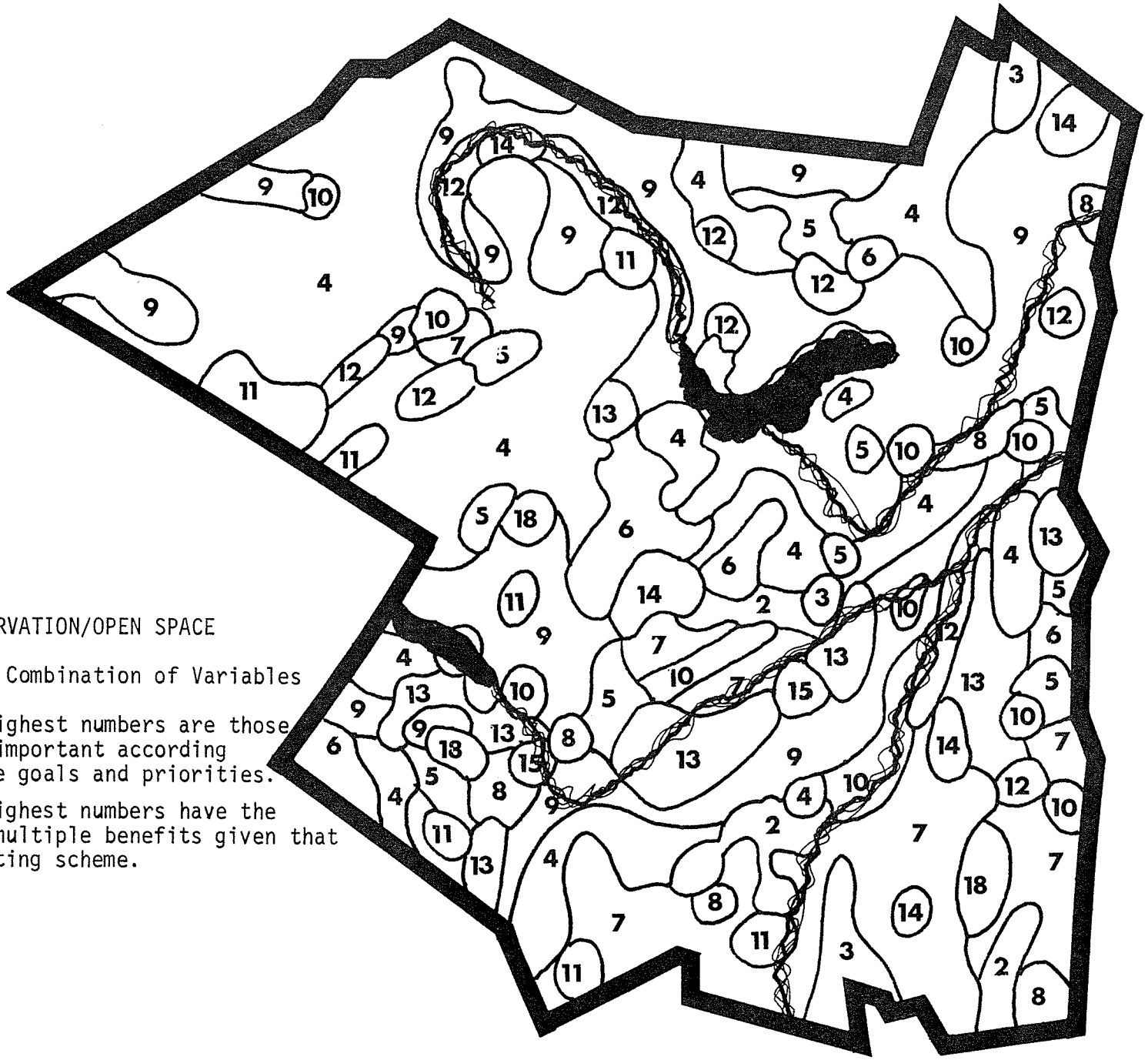
0 all other areas

Source: Air Photos

north

scale 0 5 miles

ulster county



CONSERVATION/OPEN SPACE

Total Combination of Variables

The highest numbers are those most important according to the goals and priorities.

The highest numbers have the most multiple benefits given that weighting scheme.

north

scale 0 5 miles

ulster county

local planning decisions

local planning decisions

Planning is a system that should be capable of incorporating goals and means into a course of action directed towards a desired future. Planning should also be considered a tool in organizing the decision making process. One major concern that faces all of us today is how to make the right planning decisions. This text has tried to describe a method of analysis that can help local communities make their planning decisions.

There are three implications of this system.

1. The development of special maps that generally predict areas of potential impacts.
2. The development of a procedure for defining conservation/open space areas that have a multiple benefit effect for a given set of goals and priorities.
3. The impact maps can be used in reverse, or as a means of developing land use suitability maps.

The first two implications are the most appropriate uses of this type of analysis.

1. EVALUATING POTENTIAL IMPACTS

The analysis and subsequent maps for predicting potential impacts should be used to evaluate proposed land use activities. This type of analysis has its major advantage in determining the potential impacts of land uses before, instead of after, the land use has occurred. For example, if a developer proposes a scheme for an apartment complex, the Conservation Commissions can evaluate the apartment complex by the following method:

a. For each potential impact of each process, find what land use group the apartment complex has been assigned.

b. Find the level of impact that has been assigned to the area where the development has been proposed. If the area has been assigned a compatible, there is no problem. If the area has been assigned a moderate, severe, or incompatible value, then the developer has two alternatives:

    1. To change the location
    2. To state, preferably in writing, what conservation measures will be used to reduce these impacts; or the Commission may recommend some.

The advantages here lie in the fact that the conservation groups have maps for each process so that the developer faces the issues individually. Also, the maps give further validity to the issue

by having the right information to assess the development. The conservation groups can not only say that impacts may or may not occur but can site the specific impacts and at what level (severity) they might occur.

2. CONSERVATION/OPEN SPACE

This analysis can help Conservation Commissions develop a procedure for defining areas of critical environmental concern. These areas represent the most critical resources to be protected. If a developer proposes to develop in one of the higher zones, the maps of conservation/open space can be produced to show why the development should not occur there. But more important, it is a tool for protecting critical environmental zones through conservation measures.

3. LAND USE SUITABILITY

The third or indirect implication is one that has a number of advantages and disadvantages. To provide maps that show the compatible areas for each land use for each process requires a good deal of time and effort. This can be accomplished by overlaying the impact maps that represent the land use group that the specific land use has been assigned. For example, if an area is compatible for commercial, housing and recreation, the area can be assigned a multiple use title for those three land uses.

ADVANTAGES: This type of procedure can create a land use suitability map. This map gives the user the advantage of being able to recommend to a developer an alternative location to develop. It can also be used as a tool for drawing up or modifying a zoning plan.

DISADVANTAGES: Most Conservation Commissions are not usually consulted for the best areas to develop. The location of a land use is a very complex system. Elements such as land value, the economic requirements for the land use, and many others have to be considered. Also, most master plans or suitability plans are not flexible enough to withstand a community's growing pains. Therefore, it is recommended that more emphasis be placed on predicting the impact of development. This is a more flexible system because the results are not aggregated into one plan. Impact maps have more validity than one plan that tries to represent the entire picture.

There is one very important issue that has not yet been addressed: the relationship between economic growth and environmental impacts. There is a large body of literature on the subject, which can be summed up by saying that trade-offs are directly affected by community goals, values and priorities. There are two issues that must be emphasized:

1. Growth and environmental "quality" are not necessarily in opposition.
2. Local interest groups do have the abilities to make the two compatible.

It can never be over stated that goals are the basis from which planning evolves. Goals provide the direction and context that make impersonal planning tools more understandable. It is these long range goals that must be understood and emphasized before a decision is made about filling in a wetland, building a new school or defeating a zoning variance.

As this method has tried to stress, a list of goals and the desired results must be established before further steps are taken. No method developed can decide whether a new land use that might supply new jobs and boost the tax base of the community is better or worse than losing some prime agricultural land or prime animal habitat areas. Only predetermined goals, and a system that can help evaluate those impacts and/or benefits, can help answer that question.

In essence, this text has tried to develop a method in which environmental impacts can at least be qualified, if not quantified, in order to address these ever present trade-offs.

appendix I & II

appendix I

DESCRIPTION OF THE ANALYSIS PROCEDURE

Step One:

Define the specific process to be analyzed.

Step Two:

Select the appropriate data variables.

Step Three:

Group the sub-variables into three groups from the most sensitive to least sensitive.

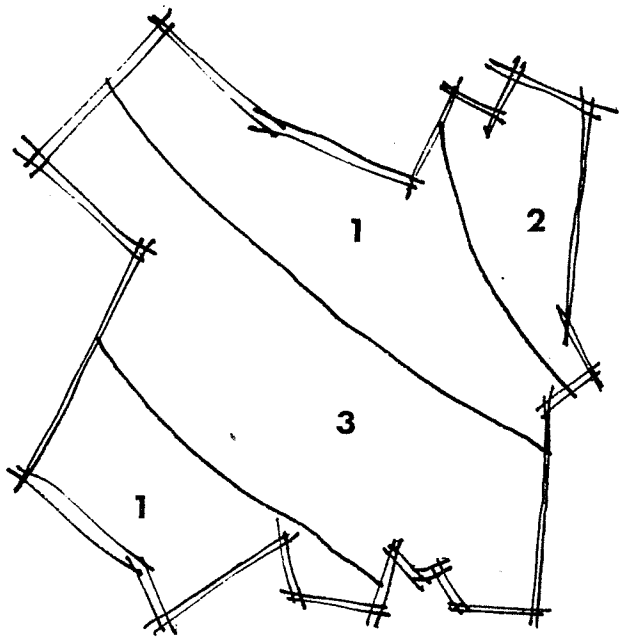
EXAMPLE: If the process is erosion and one of the variables is slope, then the sub-variable steep is assigned to the most sensitive box, while medium steep slopes are assigned to the moderate and flat slopes are assigned to the least sensitive box.

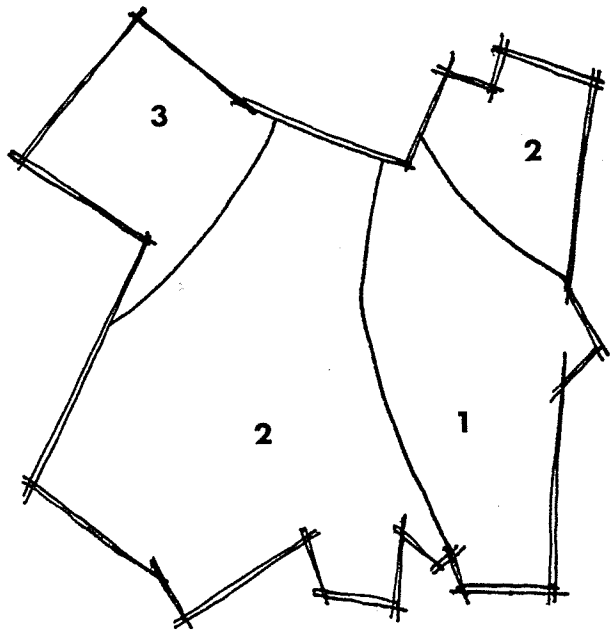
	SUB VARIABLES			
VARIABLES	Most Sensitive 3	Moderately Sensitive 2	Least Sensitive 1	Not Important 0

Step Four:

Take the maps of data variables 1, 2, and 3, and, if necessary, redraw the maps on tracing paper to group the sub-variables as they were grouped in Step Three. Assign a 3 to the sub-variables on the map that were grouped as the most sensitive. Assign a 2 to the sub-variables on the map that were grouped in the moderate box, and assign a 1 to the sub-variables in the least sensitive box.

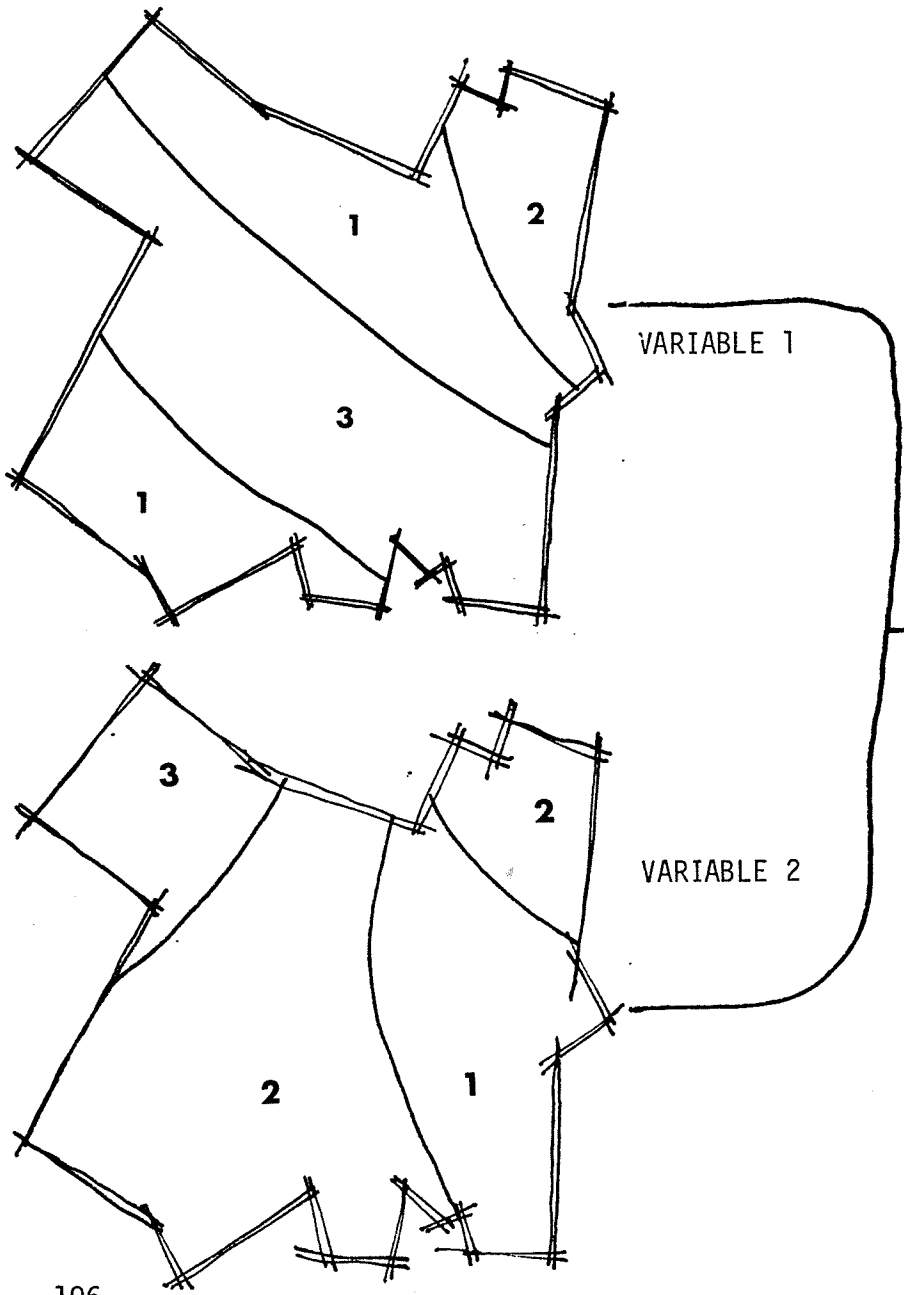
EXAMPLE: If the variable is slope and the sub-variable steep slopes is the most sensitive, then all steep slopes are assigned a 3, all moderately steep slopes are assigned a 2, and flat areas are assigned a 1.



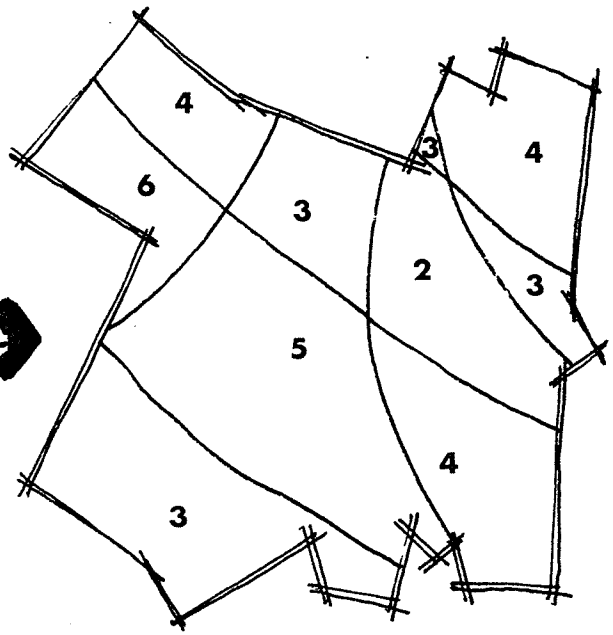


Step Five:

Map the ranking of the data sub-variables.



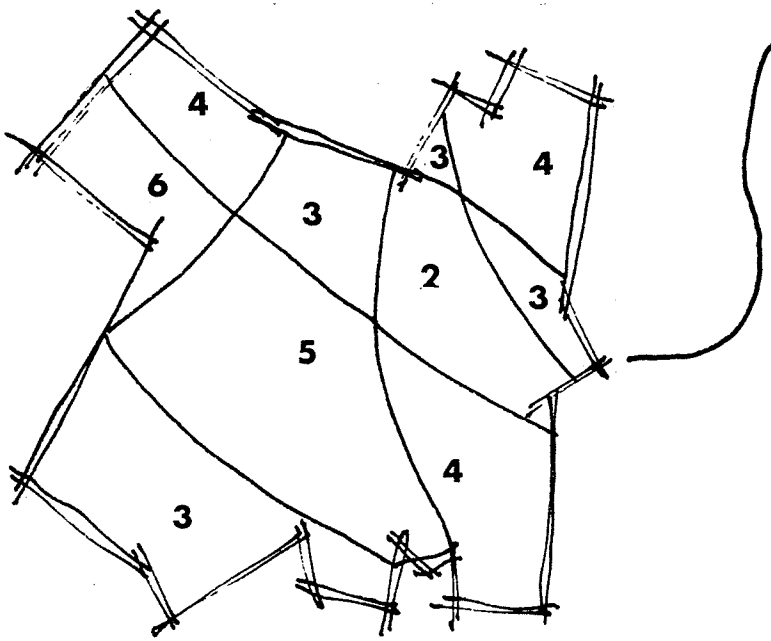
If the two maps (Variables 1 and 2) are overlaid, the results appear as in the following example:



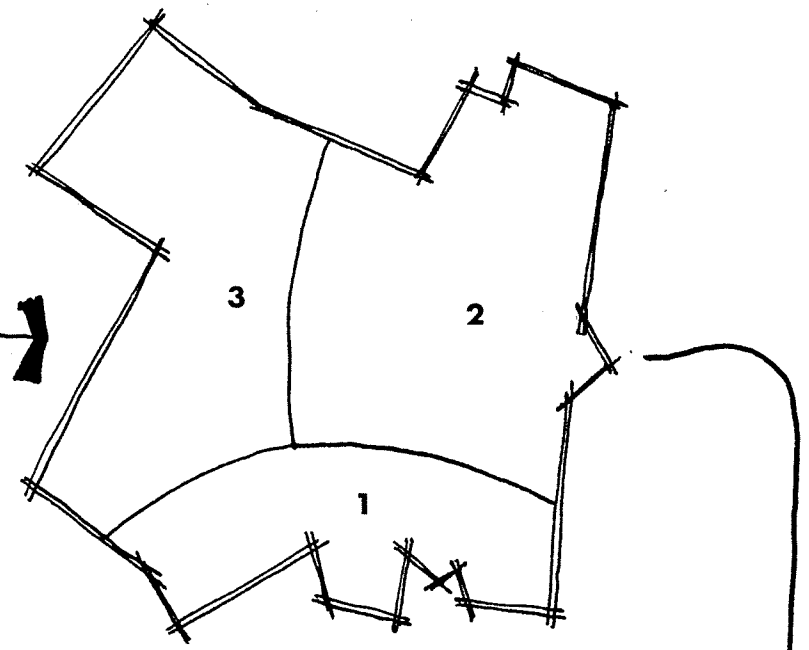
If the process being analyzed has only 2 variables (e.g. erosion: soil and slope), then skip to Step Seven.

Step Six:

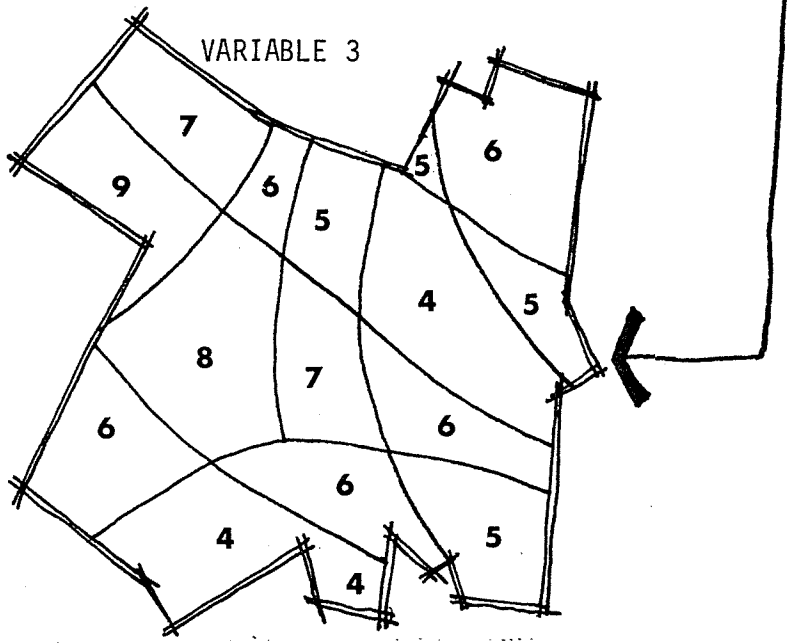
If the process being evaluated has 3 or more variables (e.g. visual absorption: slope, elevation and vegetation) then the third variable should be overlaid with the results of combining the first 2 variables.



OVERLAY OF VARIABLES 1 AND 2 FROM STEP 5



VARIABLE 3



OVERLAY OF VARIABLES 1, 2, AND 3

Step Seven:

Predicting potential impacts: Land Use and Data Variables Matrix.

This matrix combines the effect of the land use group with the overlaid variables. The results of combining variables, 1, 2, and 3 (Step Seven) are placed across the top of a matrix and the land use groups are placed along the side.

	9	8	7	6	5	4	3	2
Land Use Group I								
Land Use Group II								
Land Use Group III								

This matrix allows the user to assign values to the results of combinations of the variables as they are affected by the intensity of the land use groups.

<u>LAND USE GROUP I</u> (Least Intensive)

A. When only two variables are used:

	6 Moderate	5 Moderate	4 Compatible	3 Compatible	2 Compatible
Land Use Group I					

B. When 3 variables are used:

	9 Moderate	8 Moderate	7 Moderate	6 Compatible	5 Compatible	4 Compatible	3 Compatible
Land Use Group II							

These land uses, due to their least intensive characteristics, have a moderate impact on the most sensitive areas. The remainder of the areas would be compatible.

LAND USE GROUP II (Moderate Intensity)

A. When only 2 variables are used:

	6 Severe	5 Severe	4 Moderate	3 Compatible	2 Compatible
Land Use Group I					

B. When three variables are used:

	9 Severe	8 Severe	7 Severe	6 Moderate	5 Moderate	4 Compatible	3 Compatible
Land Use Group II							

These land uses, due to their moderately intensive characteristics, have a severe impact on the most sensitive areas.

LAND USE GROUP III (Most Intensive)

A. When only two variables are used:

	6 Incompatible	5 Incompatible	4 Severe	3 Moderate	2 Compatible
Land Use Group III					

B. When three variables are used:

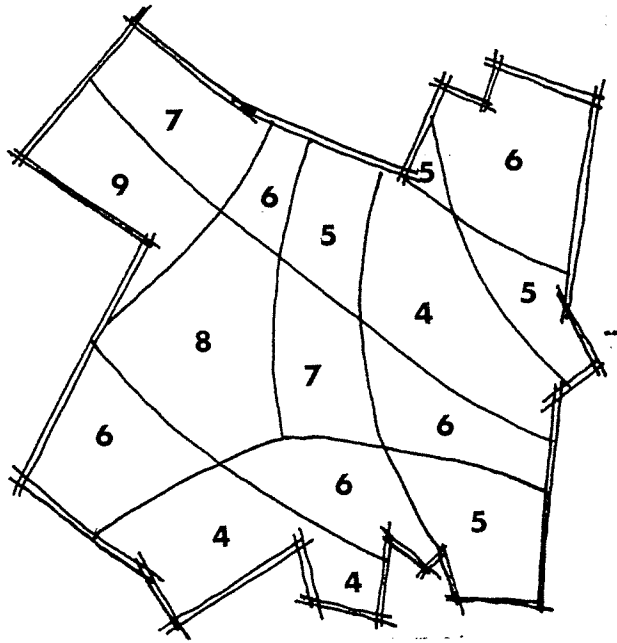
	9 Incompatible	8 Incompatible	7 Incompatible	6 Severe	5 Severe	4 Moderate	3 Compatible
Land Use Group III							

These land uses, due to their high intensity characteristics, have the greatest impact. Therefore, areas with the highest numbers would have an incompatible impact.

Step Eight:

Mapping the areas of potential impacts for each land use.

The following examples will use all three variables as they were overlaid in Step Six. Therefore, the land use/variable matrix for using three variables is used.

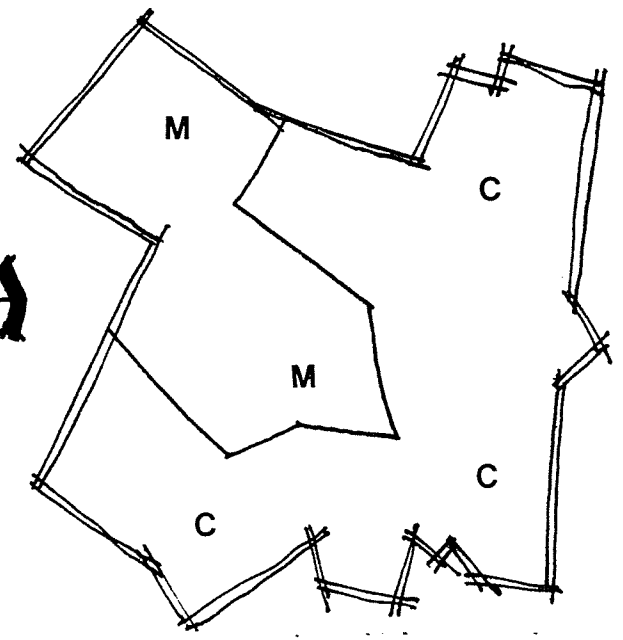


MAP OF VARIABLES 1, 2 AND 3

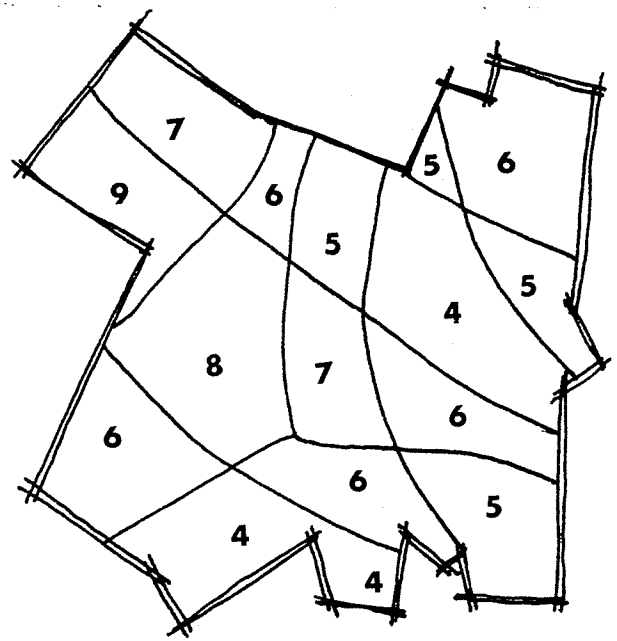
LAND USE GROUP I

Land Use/Variable Matrix:

	9	8	7	6	5	4	3
Land Use Group I	M	M	M	C	C	C	C



MAP OF POTENTIAL IMPACTS OF LAND USE GROUP I

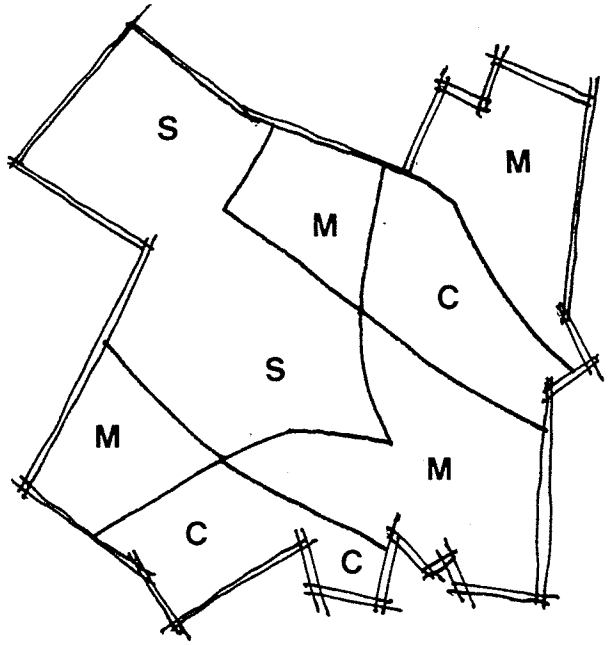


MAP OF VARIABLES 1, 2 AND 3

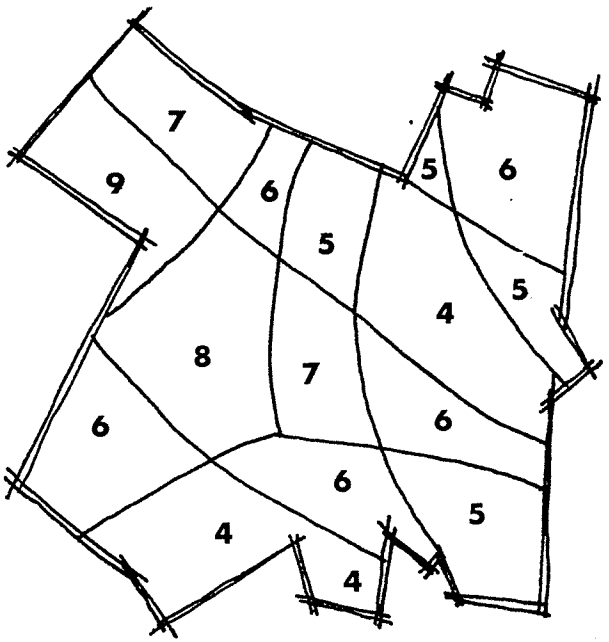
LAND USE GROUP II

Land Use/Variables Matrix:

	9	8	7	6	5	4	3	2
Land Use Group II	S	S	S	M	M	C	C	C



MAP OF POTENTIAL IMPACTS
FOR LAND USE GROUP II

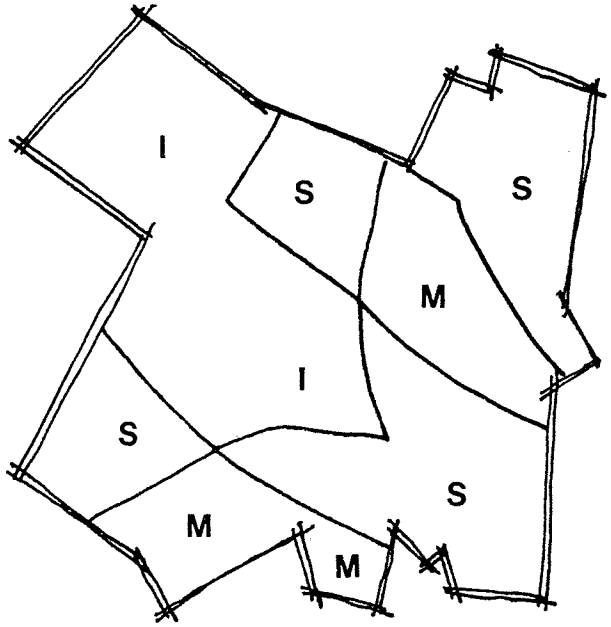


MAP OF VARIABLES 1, 2 AND 3

LAND USE GROUP III

Land Use/Variables Matrix:

	9	8	7	6	5	4	3
Land Use Group III	I	I	I	S	S	M	C



MAP OF POTENTIAL IMPACTS
FOR LAND USE GROUP III

FOR VARIATIONS IN THE PROCESS SEE APPENDIX II

appendix II

VARIATIONS IN THE EVALUATION PROCESS

The evaluation process described in this text is fairly arbitrary. This is not a shortcoming of the method, but a result of simplifying the process for the sake of explanation. The process includes variations that range from organization of data to changes in the land use impact matrix.

1. Organization of Sub-Variables

Data can be organized in several ways. The method used in this text organizes the data sub-variables into three categories, plus an additional one for sub-variables that are not important.

In many instances, data requires more than three categories. For example, the variable slope is divided into three sub-variables: flat (0 - 5%); moderate (5 - 15%); and steep (15% +). Slope could have been divided into 4 or more categories such as: 0 - 3%, 8 - 12%, 12 - 15%, 15 - 25%, and 25% +. To reduce these sub-variables to a manageable three, the percentages can be grouped:

1. Flat: 0 - 3% and 3 - 8%
2. Moderate: 8 - 12% and 12 - 15%
3. Steep: 15 - 25% and 25% +

Slopes can also be reduced to two categories:

1. Flat: 0 - 3%
2. Steep: 3% +

If steep slopes are the only concern in an elevation process, the sub-variables may include:

1. Steep (15% +) - Most Sensitive
2. Flat (-15%) - Not Important (0)

2. Weighting of Sub-Variables

For the process described in this text, sub-variables are evenly weighted:

3 - Most Sensitive

2 - Moderately Sensitive

1 - Least Sensitive

0 - Not Important

The implication is that the sub-variables have a decreasing range of values (3, 2, 1 and 0). This is not always the case.

For example, an erosion evaluation may require that steep slopes receive a much more sensitive ranking than moderate or flat slopes. Steep slopes can be assigned 4, instead of 3, in order to stress their importance. Weighting, in this case is:

4 - Most Sensitive

2 - Moderately Sensitive

1 - Least Sensitive

0 - Not Important

3. Large Number of Variables

Frequently, four or more variables contribute to the evaluation process. The conservation/ open space analysis procedure is an example of the use of nine variables.

To use more than three variables for impact analysis, the land use matrix must be altered. For example, if four variables are used, and the sub-variables are ranked 3 for most sensitive, the total equals 12 (instead of 9 for 3 sub-variables). The highest numbers indicate highest sensitivity.

	SUB-VARIABLES			
	3	2	1	0
VARIABLES 1				
2				
3				
4				
TOTAL	12	8	4	0

The subsequent assigning of values (imcompatible, severe, moderate and compatible) to the numbers is subjective. The simplest approach is to assign the highest numbers an incompatible impact and the lowest numbers a compatible. The middle numbers can then be evenly divided between moderate and severe.

bibliography

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