7 Classifying Visual Attributes of Wetlands in the St. Lawrence–Eastern Ontario Region

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Introduction

The problem dealt with in this chapter is to produce a descriptive analysis based on visual values for wetlands that can be used by planning agencies in the land-use decision-making process. Richard Smardon's 1972 study dealing with visual assessment of wetlands developed an evaluative model to analyze the visual quality of inland wetlands in Massachusetts. His method, involving measuring many elements in the landscape and feeding this information into a data bank for processing, was adapted and modified using nonnumerical measures and applied to selected study areas using map interpretation and fieldwork. This study differs from Smardon's because it produces a descriptive analysis, based on classifying wetland types, instead of producing comparative aesthetic judgments of wetlands. It makes no attempt to compare the quality of one type with another by rating or ranking. Both kinds of methods, evaluative and descriptive, are commonly used in landscape assessment.

A classification of wetlands by visual character provides an understanding of the distribution, nature, and extent of different types of wetland landscapes in a given context, be it state, regional, or local. A descriptive system can be used by the St. Lawrence Eastern Ontario Commission to determine what different visual types of wetlands exist within the region. Coupled with an evaluation, this information could be used as a data base in the process of selecting wetlands for priority of protection. The wetland classification in this study draws upon the visual values Smardon identified for wetland assessment.

The physical attributes of wetlands found to be important to visual values are water bodies, landform, surrounding land use, and wetland vegetation (Smardon, 1972, p. 102). The key visual attributes identified are visual contrast and visual diversity of the wetland and its surroundings (ibid., p. 103).

Visual contrast and visual diversity are attributed to resource variables. Each of the variables is briefly defined below.

Water-body size is the existence and quantity of open water that borders, goes through, or is part of a wetland.

Surrounding land-use contrast is the difference in edges, or height contrast, of the surrounding land uses.

Surrounding landform contrast is the scale of the surrounding landform in relation to the size or scale of the wetland.

Internal wetland contrast is the differences in vegetation edges, or height and textural contrast, of the internal edges of the wetlands.

Water-body diversity is the types of associated water bodies adjacent to or part of a given wetland.

Surrounding landform diversity is the variety of landforms surrounding or adjacent to a wetland.

Surrounding land-use diversity is the number of different land-use types that border a given wetland.

Wetland-type diversity is the number of wetland types found within a wetland.

Wetland-edge complexity is the complexity of the physical boundary of the wetland where it meets a landform or vegetation edge.

Study Objectives

The following objectives were established based on the previous assumptions:

1. To clearly and systematically identify and describe visual attributes important to wetlands and their surrounding landscape context
2. To adapt and test a method of visual description in selected areas within the St. Lawrence-Eastern Ontario region
3. To ensure that the descriptive classification has utility to planners and designers so that the visual attributes of wetlands can be protected.

Study Procedure

The descriptive analysis began with a classification of land use and landform to develop *landscape units*. Wetland vegetation and water bodies were then classified to develop *wetland units*. The landscape units and wetland units were synthesized to form the final character areas. Figure 7.1 shows the overall process that was used to classify the visual attributes of the wetlands and their surroundings.

The specific method employed is one used in environmental assessment and has specifically been used for generating land-suitability maps (McHarg, 1969). The method begins with the identification of *factors* to be examined. In this case the factors are land use and landform, and wetland vegetation and water bodies. The first step was to map the distribution of *types* for each factor. Hopkins (1977, p. 388) defines factors as "distinct dimensions along which variations among parcels of land can be described" and types as "nominal labels of particular characteristics along a particular dimension." Types are the particular characteristics of the factors. For example, the landform "factor" includes many "types" such as valleys, plains, and islands. All the steps of the method are illustrated in Figure 7.2, using land use and landform as examples of the factors. In the actual study many more types are included than those in Figure 7.2, but they have been eliminated from the illustration to avoid confusion.

The second step consists of overlaying the individual factors maps to produce a composite map showing the spatial pattern of the types (see Figure 7.2). The potential number of combinations is enormous when overlaying a set of factors each with a number of types. Hopkins (1977, p. 394) states that "most of the possible combinations will not occur on a real site due to spatial correlation among ecological factors." However, a final composite map should represent those areas or regions that actually exist in a study area in a manner that is valid and is not unwieldy to use in a planning context. For this reason *decision rules* must be made to combine factor types into homogeneous areas (Step 3 in Figure 7.2). Decision rules are expressed in terms of verbal logic, and their function is to assign the initial composite types into realistic and workable sets of combinations. They are based on design theories that the authorities (designers and planners) agree upon and are substantiated by literature reviews. The result of the application of decision rules is a final composite map showing the spatial pattern of landscape units (Step 4 in Figure 7.2). A verbal description of each final landscape unit accompanies the final composite map.

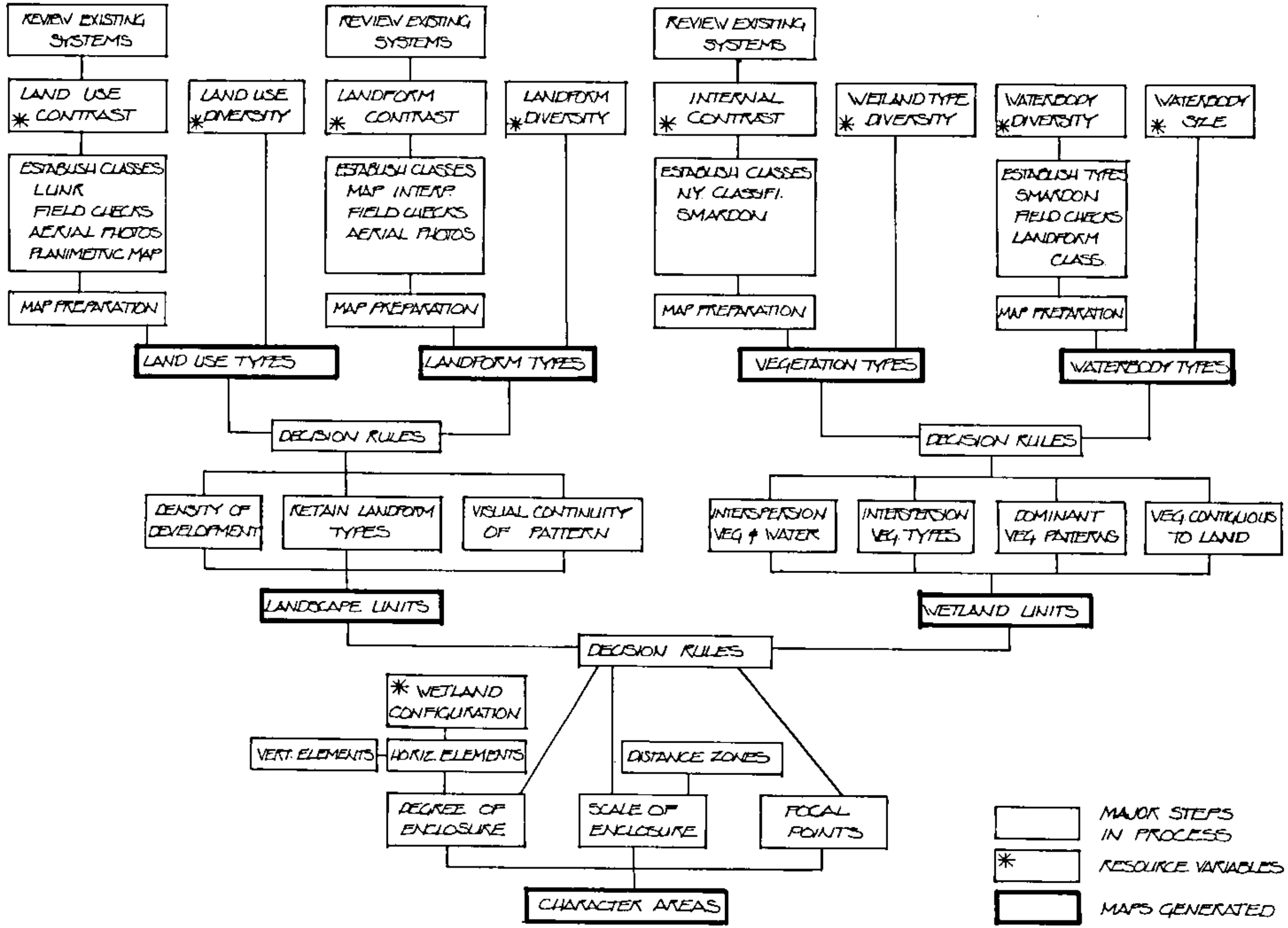

Figure 7.1. Organization of the process.

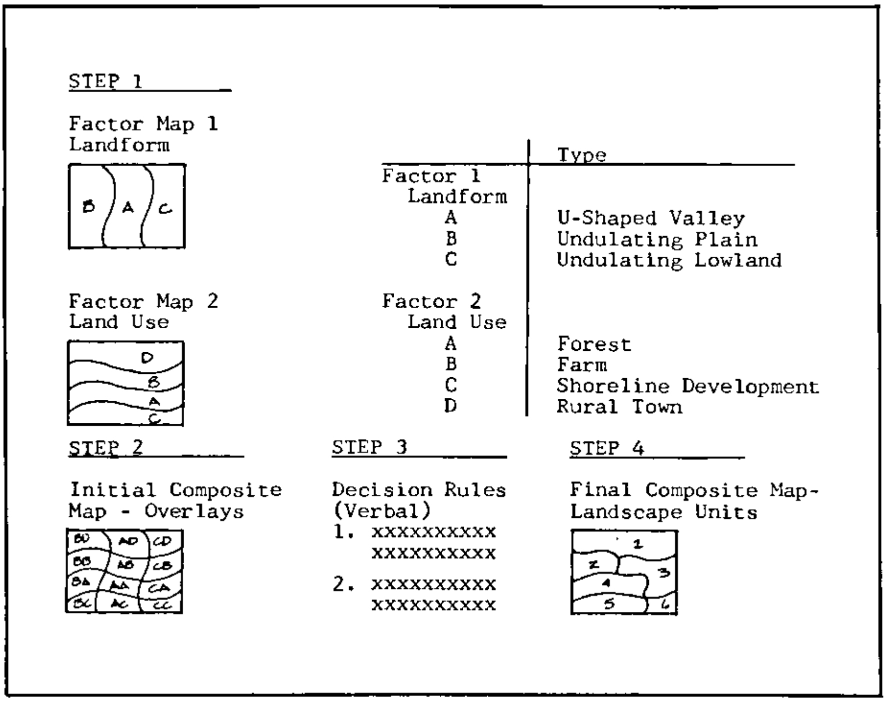

Figure 7.2. Example of methodology.

The Study Areas

Study-Area Selection

Three study areas were selected along the shoreline of Jefferson County, New York. The Jefferson County shoreline contains numerous wetlands of various size that have been influenced by conflicting pressures for shoreline use. More than 51 percent of the land along the shoreline had been converted to some form of agricultural or developed land use by 1972 (Geis and Kee, 1977, p. 5).

What follows is a discussion of the criteria established for selecting the study areas. The criteria are based on consideration of the users of wetlands, or those most likely to view wetlands and their surrounding landscapes. Three steps were involved in selecting the study areas:

1. Determining the number of study areas
2. Determining the size of the study areas
3. Determining which wetlands to study within each study area

1. The number of study areas was determined by the number of physiographic coastal provinces, or landform patterns that were delineated in a visual assessment study by Felleman (1975) in Jefferson County. It was decided that each of the three physiographic provinces in Jefferson County should be represented.

2. The size of the study area was determined by the limits of the most critical distance from which an observer would view a landscape. The middleground, or intermediately distant landscape, is the most critical because linkage between separate parts of the landscape can be seen (Litton, 1968, p. 4).

Since middleground usually does not exceed five miles, the size of the study areas was limited within a five-mile radius of the selected wetlands, but it was not less than three miles.

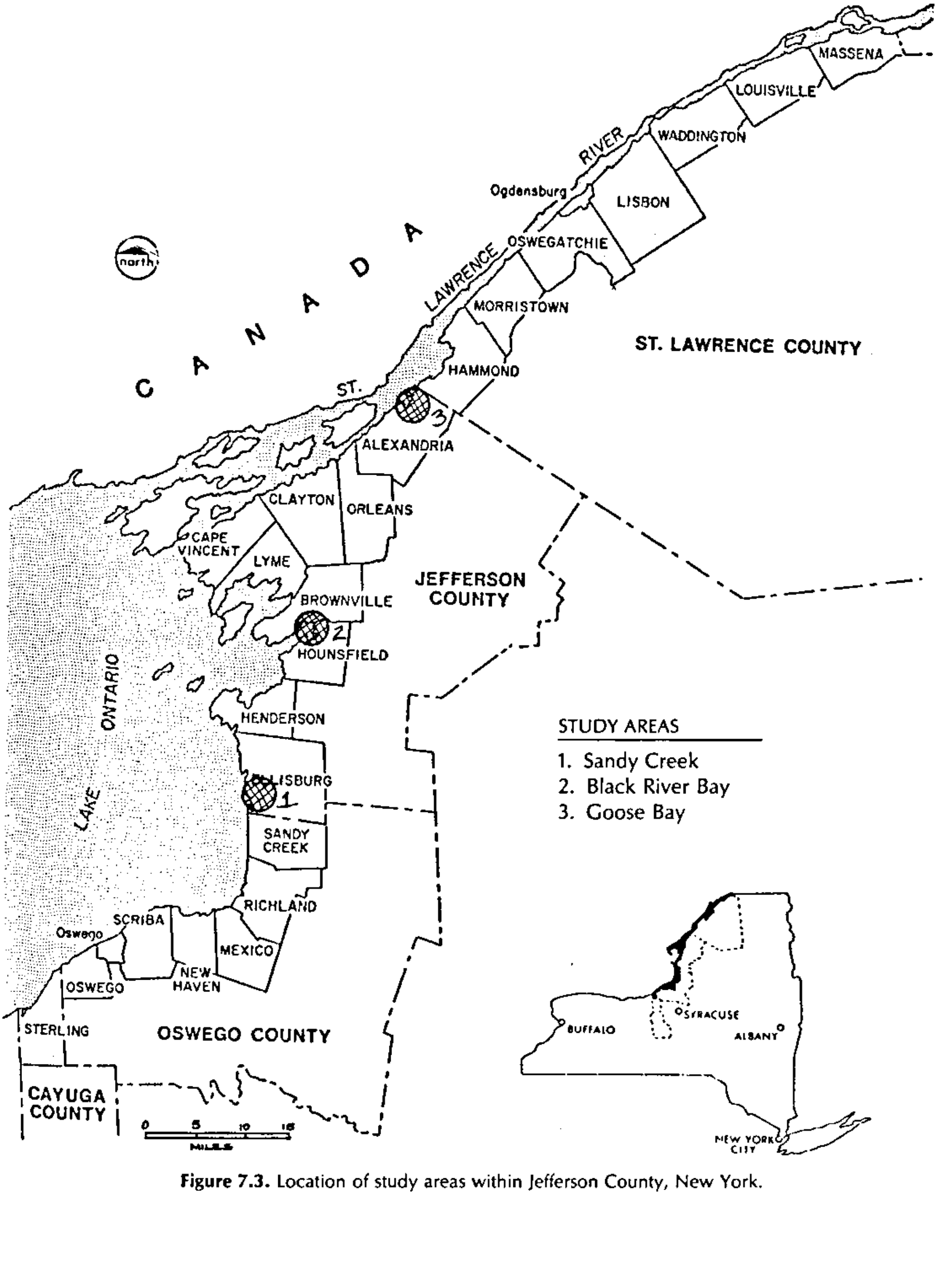

Figure 7.3. Location of study areas within Jefferson County, New York.

3. Determining the wetlands to be studied in each area had to satisfy the following criteria:

a. That wetlands with a great amount of physical access be represented
b. That wetlands with a variety of cover types be represented
c. That wetlands associated with rivers suggested for study as Wild, Scenic, and Recreational Rivers be represented
d. That each of the three typical wetland types identified in a study by Geis and Kee (1977) be represented

Description of Study Areas

The following is a brief description of the study areas that were selected. Figure 7.3 shows the location of the areas.

Sandy Creek

Sandy Creek is a large flood-pond complex occurring in a depressional area physically separated from the lake by a beach barrier. Two major streams drain through the complex. The wetlands here are associated with creeks that may eventually be designated as recreational rivers.

Black River Bay

The Black River complex occurs on shallow sediments at the mouth of the Black River in Black River Bay. Wetlands occurring in the bay are associated with Black River, which may be designated a recreational river in the future.

Goose Bay

Goose Bay is the largest bay along the St. Lawrence River. Islands and upland peninsulas constrict the mouth of the bay and protect it from the main body of the river.

Landscape Units

Landform and land-use types were identified and then synthesized to form landscape units, which describe the visual character of the study areas. This process started with a review of existing pertinent classification systems (visual and nonvisual) and selection of data sources that would be used. Two things were considered important when analyzing classification systems for their utility: (1) the classifications must be representative of landscape types found in the study areas, and (2) systems developed according to visual characteristics and for visual assessment should be reviewed.

Land Use

The source selected to classify land-use types was the Land Use and Natural Resource Inventory of New York State (LUNR), a system that provides more than 130 land-use characteristics. Supplementary sources included aerial photographs, New York State Planimetric Maps, and field checks.

The two resource variables for land use, land-use contrast, and land-use diversity were applied. *Land-use contrast* was determined by delineating height classes and visual continuity. Height classes were determined by comparing land uses occurring in the LUNR system with the land uses in each height class identified in the classification used by Smardon (1972). From this, height classes assigned by Smardon could be applied to various land uses in New York State. Visual continuity was determined in the field by driving the roads in each study site and simply noting which elements were visually continuous because of their use, form, color, surface, and/or nearness of parts. Surrounding *land-use diversity* was determined by locating the different land-use types bordering the wetlands.

Map Preparation for Land-Use Types

The process of mapping the data required making a map of each study site that showed all of the LUNR information, then overlaying this map on aerial photos and the planimetric maps to pick up the supplementary information and update obvious changes. The field checking required driving the roads in each study area and comparing the information on the map with firsthand observation in the field. Any discrepancies found between the mapped information and field observation were noted. The field observation was most useful for describing the general appearance and condition of the various land uses. Forty-one types of land use as defined by LUNR were found. These types were

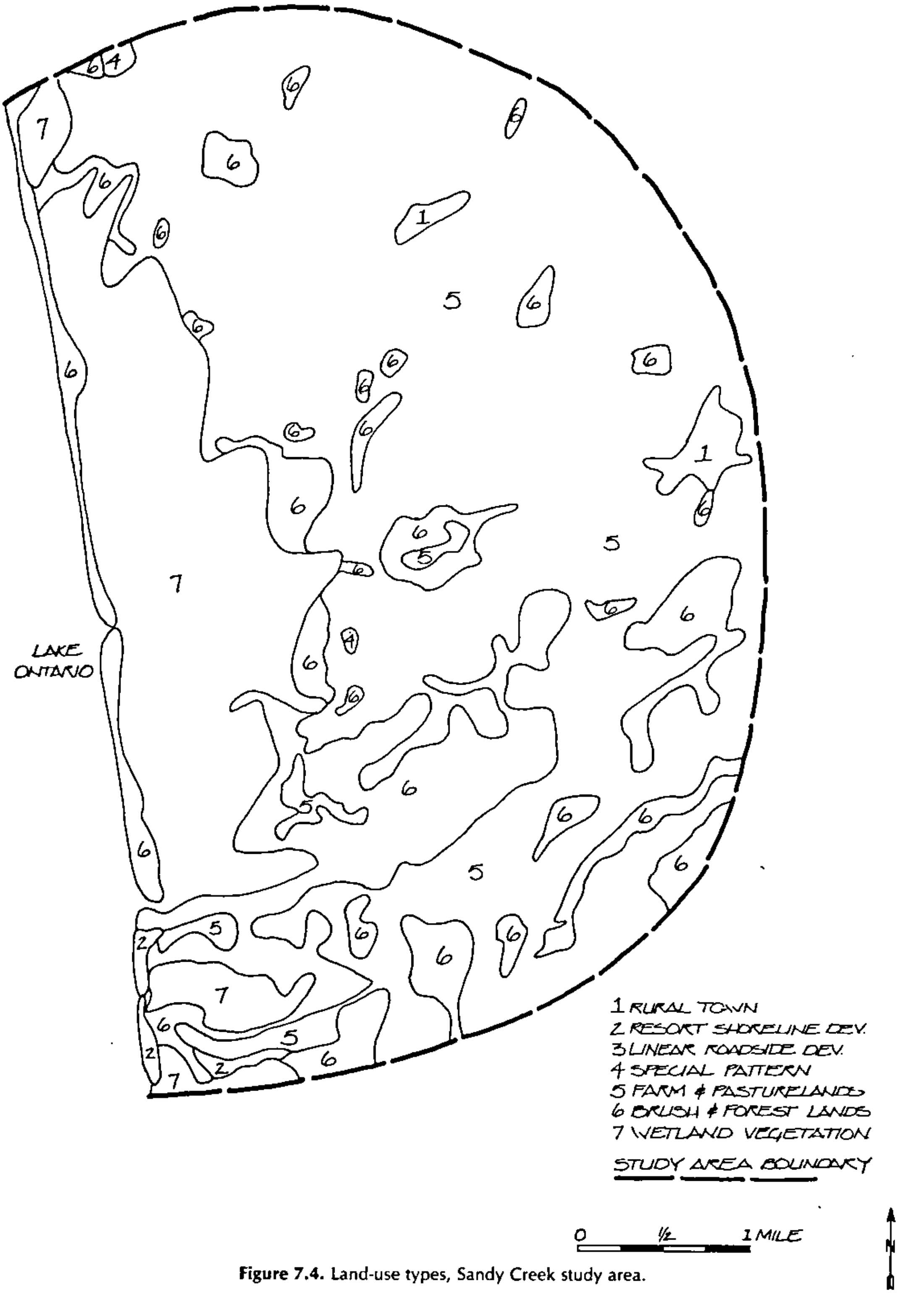

Figure 7.4. Land-use types, Sandy Creek study area.

aggregated by drawing lines around and lumping together those uses defined as one "type" according to the height classes and continuity of use. The types were listed in order from most developed to least developed; the description was simply a listing of each of the LUNR uses. The aggregate land-use types determined were (1) rural town, (2) shoreline resort development, (3) linear roadside development, (4) special pattern, (5) farm and pasture lands, (6) brush and forest lands, and (7) wetland vegetation. Land-use types for the Sandy Creek study area are shown in Figure 7.4.

Land Form

A landform classification system of the New York State coastal zone was developed for use in visual assessment by Felleman (1975) and was applied in this study. Felleman's method used topographic map interpretation to identify landform patterns and developed a list of shoreforms found within the coastal zone. Additional sources included aerial photographs and field checks. The two resource variables, landform contrast and landform diversity, were applied. *Landform contrast* usually refers to the variable of landform relief (Smardon, 1972, p. 126). The St. Lawrence–Eastern Ontario region is relatively flat (the greatest height difference is 200 feet), so, based upon height differences, very little contrast existed. However, definite landform patterns did stand out and were delineated based upon the principle of visual continuity defined and used for land-use types. This was done on topographic maps by drawing lines around areas that appeared continuous or to contain many of the same elements (i.e., a flat plain with a number of linear hills). Questionable areas were flagged and checked in the field by driving the roads and noting if the areas in question were visually continuous or not. *Landform diversity* refers to the different landforms on and around wetlands. The assumption is that wetland diversity increases as the number of landform types increase. The number of different types can be located on the landform maps.

Map Preparation for Landform Types

The process of classifying landform patterns required overlaying a sheet of paper on the topographic maps and identifying patterns according to the list of shoreforms defined by Felleman (1975). The maps were then overlaid on aerial photographs and adjusted to show any recent changes in landform patterns. The field checking was done by driving the roads and viewing the study area from a variety of locations to confirm the topographic map interpretation. The landform types identified were (1) undulating plain, (2) undulating lowland, (3) U-shaped valley, (4) island/river, (5) wetland areas, (6) beach barrier/dunes, (7) open bay, (8) river, and (9) lake. Landform types for the Sandy Creek study area are shown in Figure 7.5.

Landscape Units: Synthesis of Land Use and Landform

Because the relationship of landform and land use creates the visual character, they were synthesized to form units. When landform and land-use types are overlaid for a given site, many combinations or mixtures of land use and landform occur. An observer would not necessarily perceive so many individual and separate characters, nor is it workable for a designer or planner to use too many sets of combinations. Thus the landscape units were formed by aggregating areas based on decision rules.

Decision Rule 1: Different densities of development create different identifiable landscape characters. Density of development was the important factor used to identify locations within the landscape continuum, or to define differences among areas.

Decision Rule 2: All landform types should be represented in the final landscape units. Few landform patterns emerged within the study areas, and it was decided not to aggregate them further.

Decision Rule 3: The visual continuity of land-use and landform types determines a particular pattern.

Map Preparation for Landscape Units

The decision rules were applied and the landscape units were delineated on a transparent overlay by identifying (1) the areas of most to least or no development, and (2) the landform types. Visual continuity of the landform and land-use combination was determined by driv-

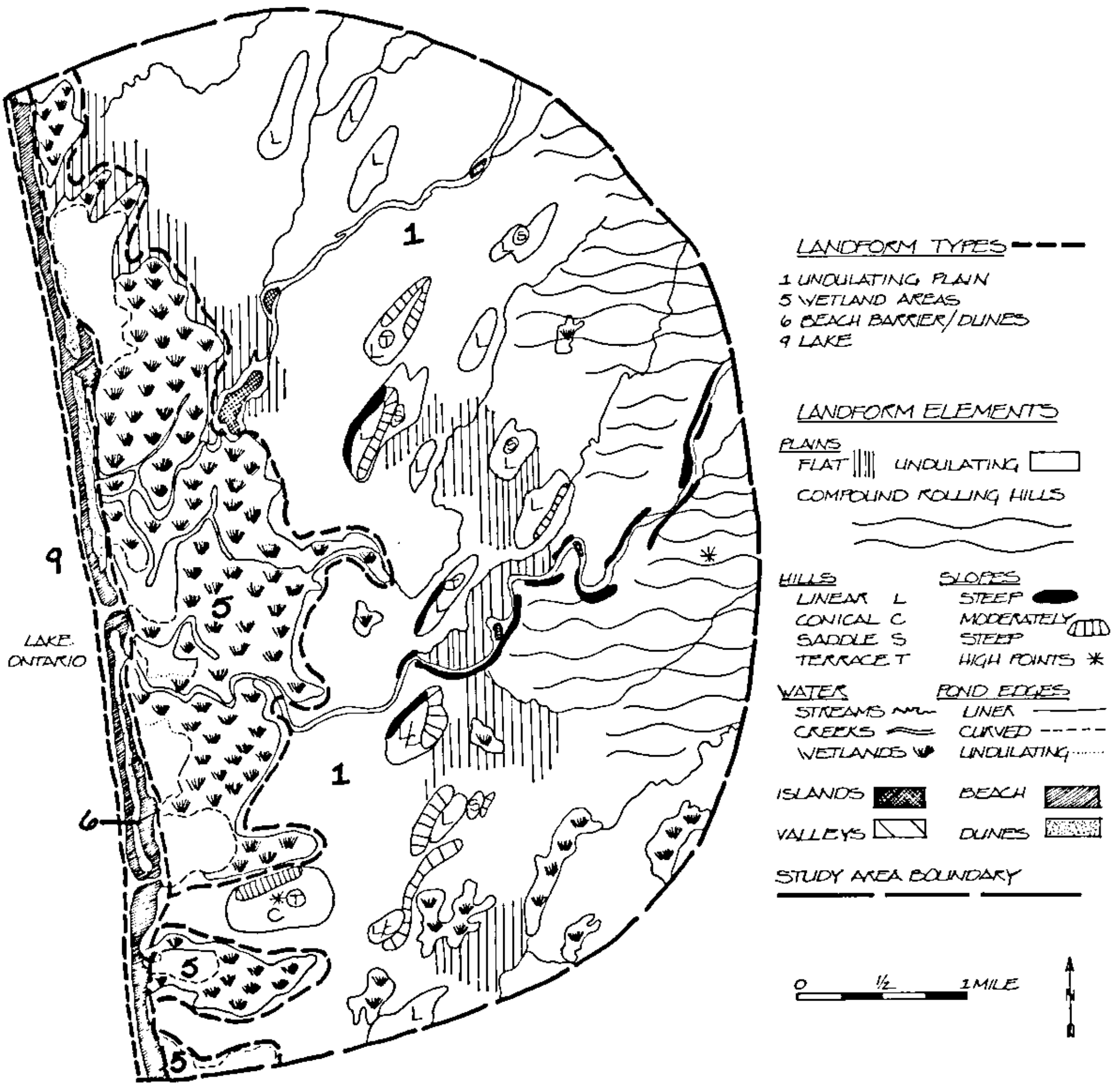

Figure 7.5. Landform types, Sandy Creek study area.

ing the roads in the study areas and noting where patterns changed on the map.

Landscape Units

Ten basic visual units were formed. Each type has its own identifiable visual continuity and density of development. The units are (1) rural town, (2) shoreline resort strip, (3) farm and pasture lands, (4) U-shaped valleys with resort development, (5) U-shaped valleys with forest and water features, (6) islands, (7) forested land, (8) undeveloped lowland, (9) sandy beach and dunes, and (10) flood-pond complex. Landscape units for the Sandy Creek study area are shown in Figure 7.6.

Wetland Units

Pertinent wetland classification systems were reviewed for their use in a visual study. Wetland vegetation types and water-body types were

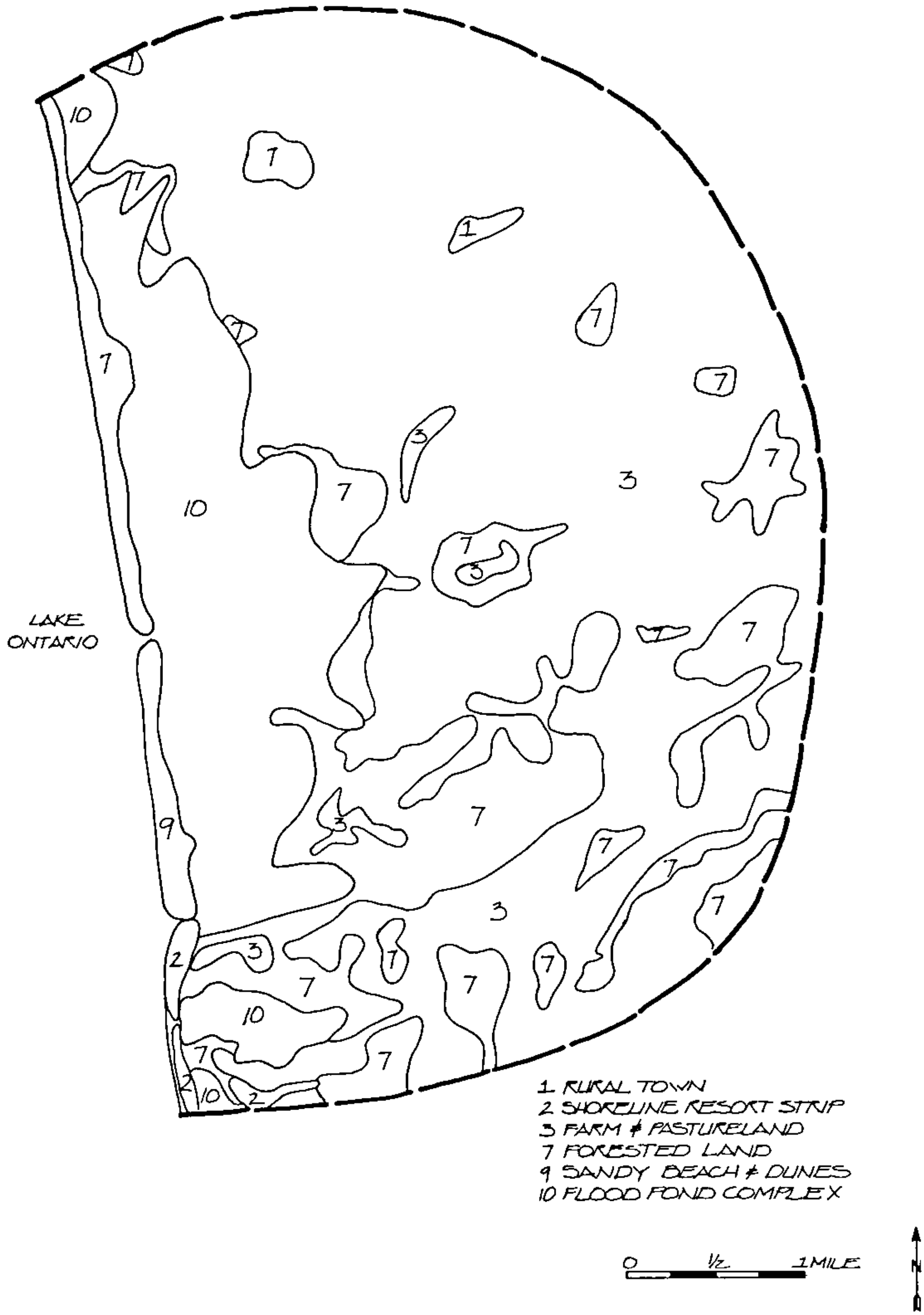

Figure 7.6. Landscape units, Sandy Creek study area.

then delineated. Previous wetland classification systems that were reviewed (Geis and Kee, 1977; Golet and Larson, 1974; New York State Fish and Wildlife Service, 1975; and Shaw and Fredine, 1956) used the criteria of vegetation, soils, and water level to differentiate wetland types. The New York State system was selected because it was similar to other existing systems, readily available to agencies in New York, and adaptable to a regional or local scale.

Wetland Vegetation Types

Internal wetland contrast is provided by changes in vegetation (Smardon, 1972). Height and texture were the qualities used to delineate wetland vegetation in this study. Height classes for vegetation were provided by the New York State wetlands classification system (Fried and Gardner, 1977). Textural qualities were determined in the field by looking at each cover type and noting its general texture. The height and texture classes form the vegetation types used in this system. *Wetland-type diversity* is dependent upon the number of wetland types found within a wetland. The amount and location of diversity that would occur within the wetlands could be seen by referring to the mapped wetland vegetation types. Wetland vegetation types for the Sandy Creek study area are shown in Figure 7.7.

Map Preparation for Wetland Vegetation Types

The mapping for wetland vegetation types was done by overlaying a transparent sheet on the New York State wetlands classification maps and delineating the dominant vegetative cover types, which were further delineated according to height classes and textural qualities. Cover types consisting of an area of one acre or less were not used because they were not visually significant at the scale of concern.

Wetland Water-body Types

Two characteristics of water influence its distinction in the landscape: size and diversity (Smardon, 1972). *Waterbody-size* classes were not established because there were not enough to provide a range of sizes that would accommodate such a classification. *Water-body diversity* is simply the number of different water-body types that border, go through, or are part of a wetland. Five types were identified in this study: (1) natural ponds, (2) tributary rivers and streams, (3) major river, (4) natural lake, and (5) bays. Water-body types were then described according to their clarity and general textural qualities.

Map Preparation for Water-body Types

The mapping for water-body types was done by overlaying a transparent sheet on USGS topographic maps and delineating the types identified above. Water-body types for the Sandy Creek study area are shown in Figure 7.8.

Wetland Units: Synthesis of Water Bodies and Vegetation

The patterns created by the relationship of wetland vegetation and water bodies were determined to form the wetland units. Two primary decision rules, based on size, were used to formulate units.

Decision Rule 1: The size of a wetland vegetation type in relation to a water-body type determines a particular pattern.

Decision Rule 2: The size of a wetland vegetation type in relation to other wetland vegetation types determines a particular pattern. To apply these decision rules an initial composite map was made by overlaying the wetland vegetation type map and the wetland water-body type map for each study area. The overlay showed each water-body and vegetation type that occurred. The first decision rule was then applied by drawing a line around one vegetation type and its contiguous water-body type. Each time a vegetative type or water-body type changed, a new unit was formed.

In applying Decision Rule 2, a line was drawn around vegetation types. Each time a vegetation type changed, a new unit was formed. At this point, dominant patterns characterizing the wetlands were seen. Because the final units should be realistic and workable sets of combinations, a third decision rule was established.

Decision Rule 3: Only dominant vegetative spatial patterns should be considered in forming units. This was applied by eliminating as separate units those areas where small amounts of vegetative interspersion occurred, except at the periphery of the wetlands. When vegetation

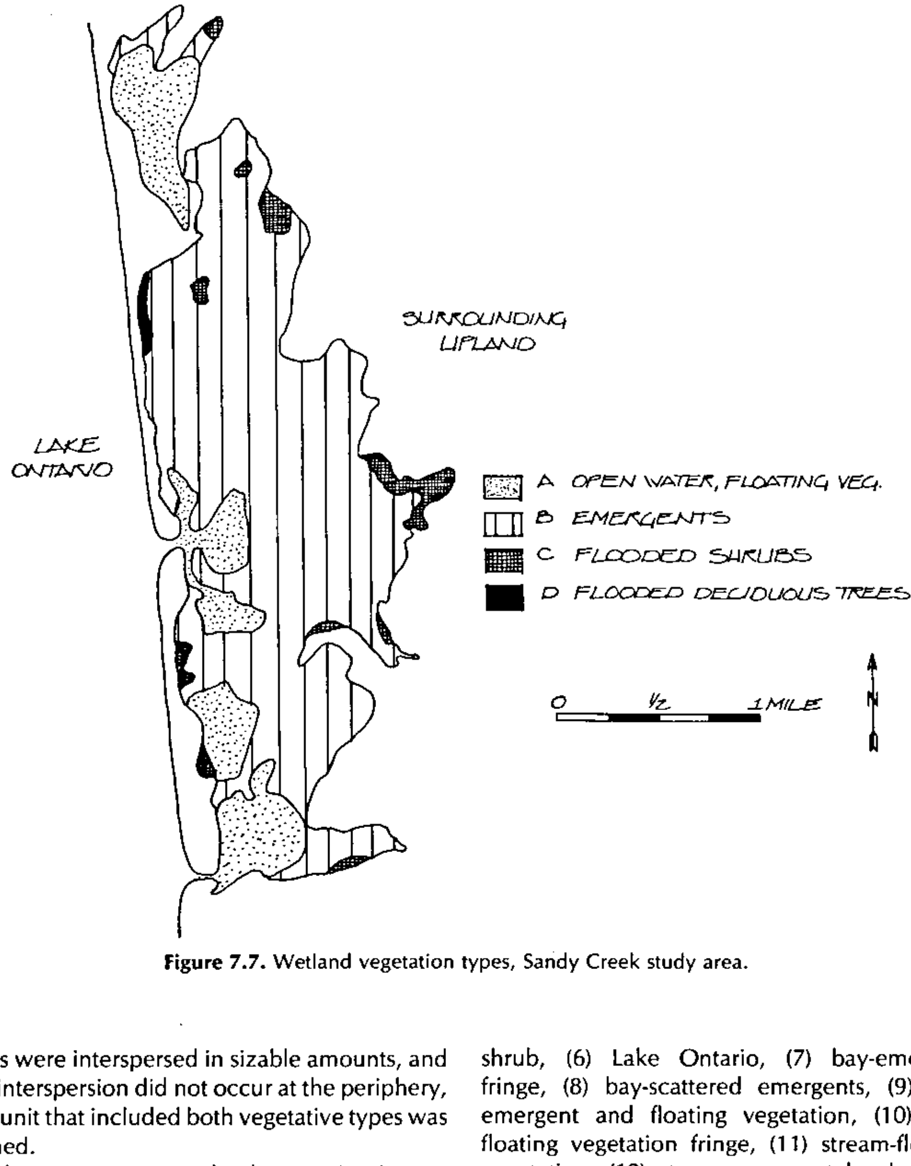

Figure 7.7. Wetland vegetation types, Sandy Creek study area.

types were interspersed in sizable amounts, and this interspersion did not occur at the periphery, one unit that included both vegetative types was formed.

In bay areas some wetland vegetation is connected or contiguous to land, and in some instances it is not. A fourth decision rule was made to delineate this difference.

Decision Rule 4: Wetland vegatation occurring contiguous to land forms a different spatial pattern than vegetation that does not occur contiguous to land. This was applied by delineating between vegetated areas that were or were not contiguous to land. Thirteen wetland units were identified by applying the decision rules: (1) stream-emergent, (2) pond-emergent, (3) shrub patches, (4) deciduous patches, (5) stream-shrub, (6) Lake Ontario, (7) bay-emergent fringe, (8) bay-scattered emergents, (9) bay-emergent and floating vegetation, (10) bay-floating vegetation fringe, (11) stream-floating vegetation, (12) stream-emergent border, and (13) bay/major river/stream-emergent. Wetland units for the Sandy Creek study area are shown in Figure 7.9.

Character Areas: Synthesis of Landscape and Wetland Units

The information produced by the classifications was synthesized and developed into a framework that could be used by planners and designers. The synthesis required aggregation of the landscape and wetland units into character

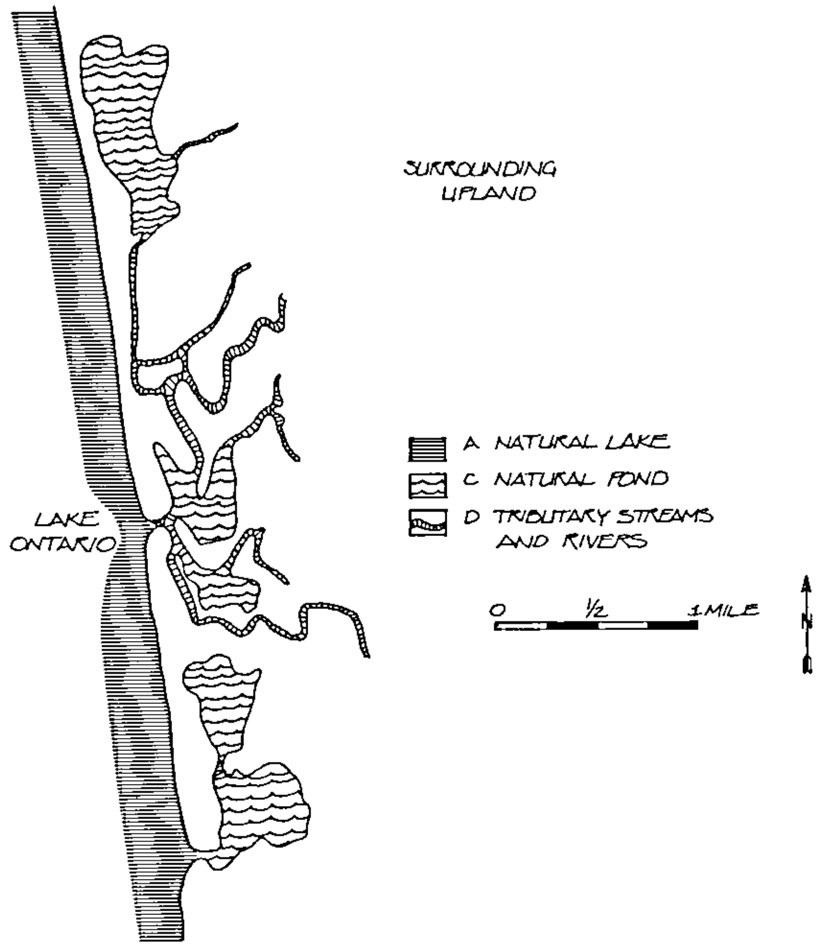

Figure 7.8. Water-body types, Sandy Creek study area.

areas. Spatial concepts were defined and applied to develop the character areas. The following decision rules were used based upon concepts of spatial definition.

Decision Rule 1: The configuration of a wetland's shoreline and the vertical space defining elements determine several identifiable degrees of spatial enclosure.

Decision Rule 2: The scale of enclosure or exposure can be identified on the basis of distance zones.

In applying the decision rules it was necessary to examine the edge configuration for the wetlands and identify areas where enclosure and exposure could occur, as well as areas in between. It was necessary to consider scale when determining if an area would be enclosed.

Distance zones of foreground, middleground, and background were established by estimating the distance and field testing. The distances for the scales of landscape zones were foreground (0–¼ mile), middleground (¼ to ½ mile), and background (more than 1 mile). Distance was used to establish enclosed and exposed areas.

Enclosed Areas

If a recessed area was ¼ mile or less across at its mouth, it would be dominated by foreground distance and could be considered enclosed.

Exposed Areas

Exposed areas are those that project outward from the shoreline (see Figure 7.10). Totally ex-

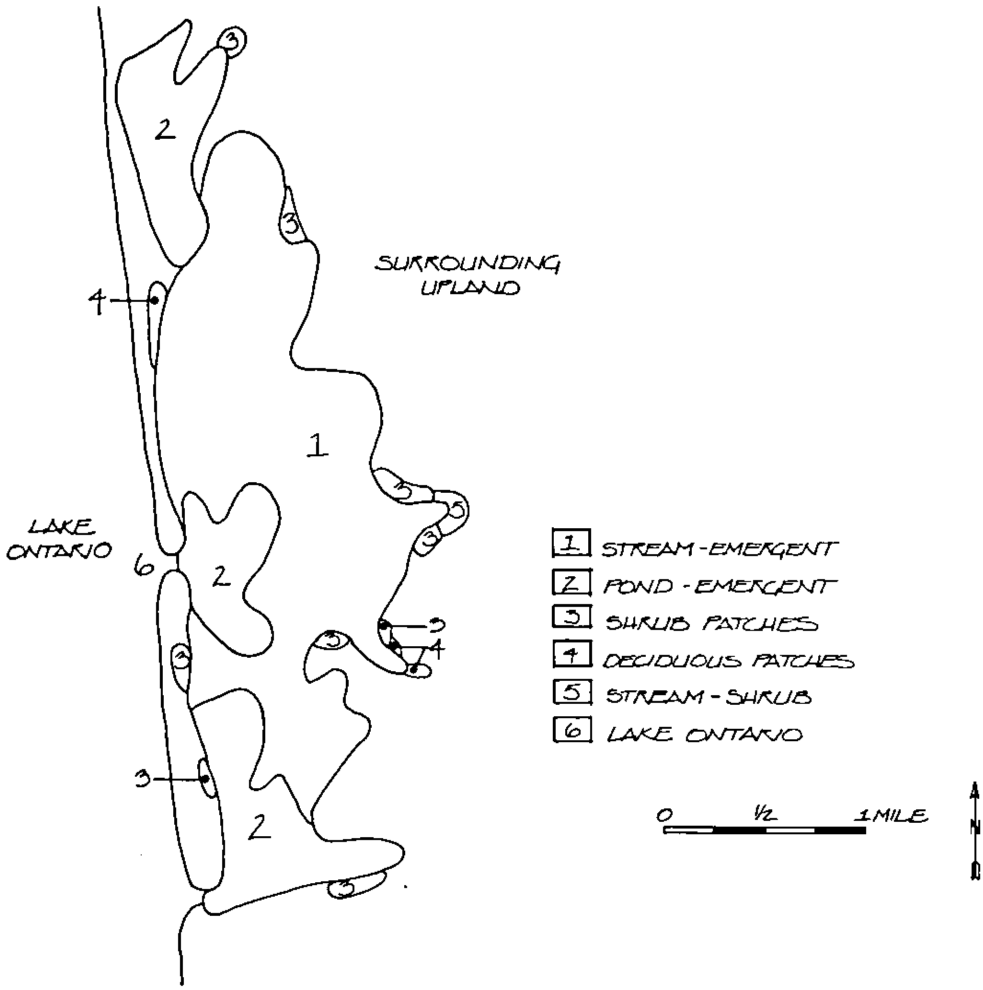

Figure 7.9. Wetland units, Sandy Creek study area.

posed areas were identified as those in which space-defining elements were absent within the foreground distance.

It was necessary to note the type of vertical space-defining elements of landform and vegetation within each designated area. An area was considered open if the bordering upland unit consisted of grassland vegetation and closed if woodland vegetation occurred. Litton's (1974) vegetative-edge types (butt, transitional, digitate, and diffuse) were used to determine the presence or absence of enclosure and contrast produced by vegetation.

A third decision rule was developed to identify areas dominated by focal points.

Decision Rule 3: A strong focal point can dominate an area. In this study the focal points used in the formation of character areas were natural focal points. They occur where tributary streams and rivers enter bays or where natural ponds connect to natural lakes. Visual movement is directed toward these areas where attention becomes concentrated.

Micro and Macro Areas

Character areas were developed at two scales. Areas showing the general character of large segments of the wetland and surrounding upland were delineated and called macro areas.

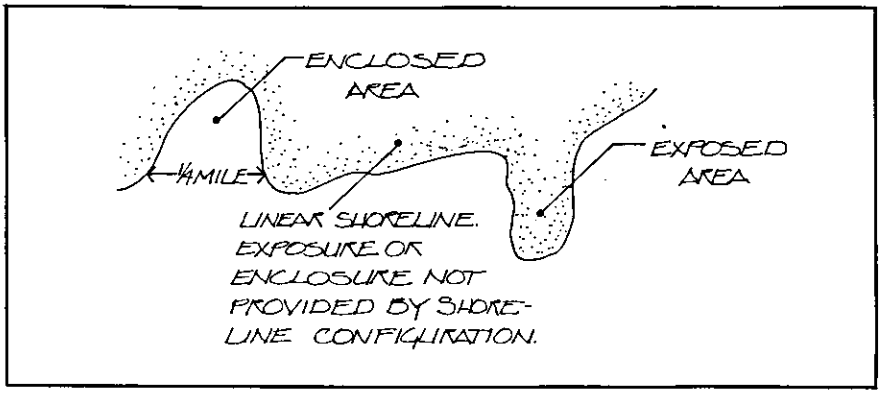

Figure 7.10. Spatial enclosure based on shoreline configuration.

Smaller segments within the macro areas showing individual characteristics were delineated and called micro areas.

Micro Areas

The micro areas were delineated by analyzing the map overlays to determine the type of spatial definition present. The analysis required the identification of the presence and relative prominence of space-defining elements and the type of shoreline configuration. The application of these observations developed for spatial definition is shown in Table 7.1.

Macro Areas

The macro areas were delineated by identifying major changes in (1) landform patterns and (2) scale. Areas where symmetrical and asymmetrical enclosure occurred adjacent to the wetlands were delineated and then used as a basis for delineating macro areas. Large areas where the middleground dominated were distinguished from those where the foreground dominated. The macro areas further serve to distinguish among the three broad categories in which wetlands are found: in the region-bays, flood-pond areas, and along tributaries.

Map Preparation for Character Areas

The decision rules for the character areas were applied by the following mapping process.

Micro Areas

1. The landscape and wetland units maps were overlayed with a transparent sheet. Exposed and enclosed areas were identified by measuring the recessed areas to determine if the foreground was dominant (¼ mile or less at the mouth of the area) and located by drawing lines around each of the recessive, linear, and exposed areas of the shoreline configuration.

2. The different types of vegetative edges (butt, transitional, digitate, diffuse) were then delineated on the transparent sheet by using Litton's (1974) description of each edge. This identified the space-defining types of vegetation at the wetlands' edges (spatial definition from landform was minimal and was used to define macro areas).

3. Focal areas were identified by noting where streams and ponds entered larger bodies of water and then were labeled on the overlay.

4. Each area was observed to determine which description in Table 7.1 was appropriate and then was labeled accordingly.

Macro Areas

Macro areas were identified by separating micro areas dominated by foreground from those dominated by middleground and drawing lines on the overlay around each group of micro areas formed by the separation. In addition, elongated corridors of symmetrical and asymmetrical landforms were identified from the landscape units map, and lines were drawn around all the adjoining micro areas encompassed by the corridors, forming macro areas

Table 7.1 Spatial-Definition Descriptions: Micro Areas

Areas	Descriptions
1. Extremely enclosed	Space-defining elements of vegetation and/or landform produce dominant enclosure approaching a canopy. Immediate foreground dominates. Shoreline configuration is recessed.
2. Moderately enclosed	Space-defining elements of vegetation and/or landform, produce enclosure, no canopy present. Shoreline configuration recessed. Foreground dominates.
3. Average enclosure	Space-defining elements are present and provide identifiable scale. Shoreline configuration is linear or undulating with occasional small inlets, but no strong recessed or projecting areas. Foreground and middleground awareness.
4. Moderately open	Space-defining elements are present, but shoreline configuration projects outward and is exposed. Foreground and middle-ground awareness with emphasis on middleground.
5. Extremely open	Space-defining elements are minimal. Middle ground dominates. Shoreline configuration may be linear, exposed, or recessed.

based on landform definition. The character areas for the Sandy Creek study area are shown in Figure 7.11.

Utilization of the Study

The following products were generated by this study: (1) descriptions and maps of landscape units of three study areas in the St. Lawrence–Eastern Ontario region, (2) descriptions and maps of wetland units found within the three study areas, (3) descriptions and maps of the character areas of the wetlands and surrounding uplands. It is important to understand the utility and limitations of this information. Uses of the study are outlined in this section.

The visual management of resources usually begins with a descriptive analysis of the resource. Laurie (1970) emphasized the distinction between character and descriptive studies (classificatory) and quality studies, which are essentially analytical (evaluative).The classification often precedes the evaluation, or rather it provides the information base for the evaluation in visual management systems. The descriptive classification can be generated for utility by itself in the planning and design process, or it can be generated for use as a data base for evaluation.

To determine visual quality using the character areas as a data base, it would be necessary to apply a procedure for rating and ranking the areas. A number of procedures could be used. It should be pointed out that the descriptive classification is one part of the visual management system, with evaluation another important part. If a ranking procedure were applied to the character areas, the comparison of areas could contribute more information for use in a visual management system. Specifically, ranking the wetlands regionwide would show which wetlands have a higher or lower visual value. This helps determine priority of wetland protection and suggests priority of purchase for open-space uses.

The information from visual assessment could be used by private firms and governmental agencies for environmental-impact statements that involve visual values of wetlands. The SLEO region is economically dependent upon tourist trade and is trying to increase that trade. Thus it is important that the region's attractions be preserved. An identification and description of the visual character of resources is one of the first steps in understanding how proposed programs may affect that character.

A 1972 shoreline study done for the SLEO Commission by the College of Environmental Science and Forestry introduced the idea of a "natural-history interpretation system," which would focus on the unique and important natural areas, mainly the wetlands (Webb et al., 1972). The system would afford an opportunity for people to learn about the natural history and ecology of the region and provide additional justification for protection, preservation, and management of the wetlands.

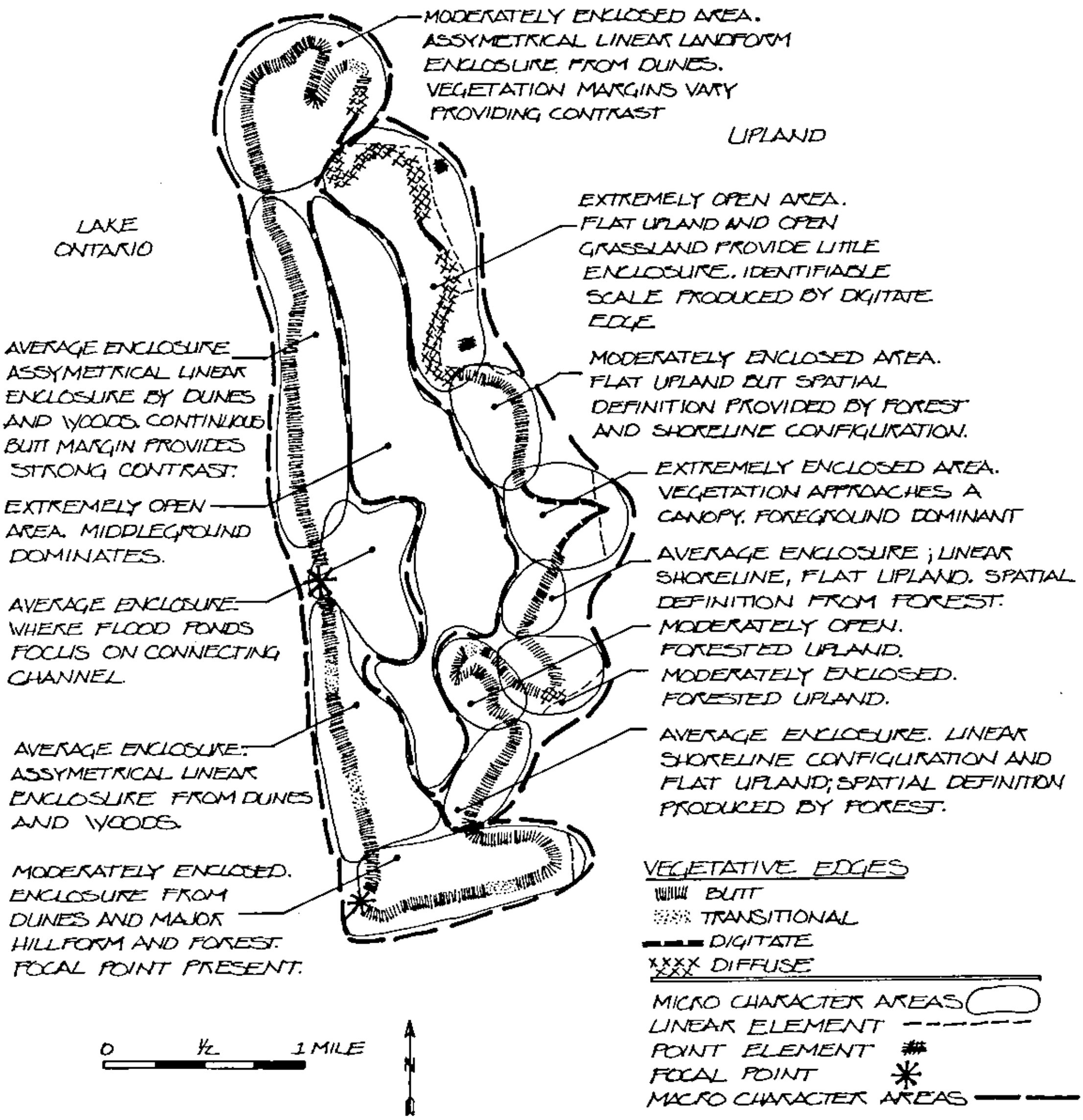

Figure 7.11. Character areas, Sandy Creek study area.

The descriptive analysis of the wetlands could be used in planning interpretive facilities at different scales. The character areas provide a framework that could be used for planning various sequential experiences along a trail or canoe route. A planner or designer could provide a diversity of educational, recreational, and visual experiences and reduce visual fatigue by planning a route through several different types of character areas. It could also be used by the SLEO Commission as a basis for the establishment of a visual inventory system for the analysis of wetlands in the region.

Coupled with an evaluation, the system could be used to identify key areas and visually distinctive sections. Zones could be located relating to a variety of land uses based upon visual quality. For instance, observation or viewing points could be established in key visual zones reserved for protection, while areas of lower quality could be designated for recreational activity.

The descriptive analysis might also serve as an information base to proposed alteration of shoreline character. It may be beneficial to plant trees to produce enclosure in certain areas, direct or modify views, or open up areas of vegetation. In this study the analysis has the advantage of generating a mapped product that could be used directly by designers and planners in decisions involving the visual management of wetlands.

The analysis relies heavily upon the decision rules for its outcome or final product—the character areas. The decision rules themselves, although based on design theories considered important in visual assessment, cannot be considered the only important rules that could be used in such a process. The use of other concepts should be explored.

One advantage of the descriptive analysis is that it generates the landscape and wetland units as separate products and later synthesizes them, which means that either process could be applied and used alone for assessment purposes. For instance, the landscape units could be generated for assessment of areas where the intent is not necessarily to focus on wetlands, but on the landscape in general.

Probably more subjectivity is involved in the application of the variables in this study than in Smardon's 1972 study. The decision rules are largely abstract concepts or dimensions that in some cases can lend themselves to different interpretations by various assessors. Smardon's use of the variables involves more clearly defined measurement techniques, which would leave less room for variation in interpretation. Subjectivity may be reduced by involving others in the decision-making process in the selection and application of decision rules and variables.

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