Manual of

Plant Formation Entitation

Natural Resources Group

New York City

Department of Parks & Recreation

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Foreword

This manual was produced by the Parks Department's Natural Resources Group (NRG), which assesses the natural features of city parks and recommends policies and procedures to preserve the complex array of urban ecosystems in New York City. This manual is a guide to surveying and mapping the types of vegetation found in city parks. The process is called entitation and the procedures described here were specifically designed for New York City's greatly disturbed landscape and the tremendous diversity of natural resources. This is not to suggest that these procedures cannot be applied to parks in other urban areas.

Acknowledgements

We are especially thankful to Dr. Garry Rogers, UCLA, for introducing "The Tentative Physiognomic-Ecological Classification of Plant Formations of the Earth" system (revised from Ellenburg and Muller- Dombois, 1967) which he successfully utilized in a vegetation survey of Floyd BennettField in Gateway National Recreation Area. Brooklyn, NY. Dr. Rogers trained all staff of the Natural Resources Group in proper procedure. We also want to thank the following academics for their comments and review: Dr. William Nierring. Connecticut College, New London, CT; Dr. Rowan Rowntree and his assistant, Charles Nilon, US Forest Service, Syracuse, NY; Dr. Leonard Zoebler, Columbia University, NY, NY; and Dr. Andrew Greller, Queens College, NY. We look forward to continued exchange with them.

Finally, we hope that this manual will prove helpful for the future users, and we welcome suggestions for its improvement or expansion.

1.0 ENTITATION

1.1 Definition

Entitation is a process of identifying and describing discrete vegetation units (entities). Essentially, it is a general inventory of an area's plant communities conducted by means of serial photograph interpretation and field reconnaissance. The survey results in the identification of ecologically distinct plant communities based on species and structure (Some examples: old growth oak/hickory forest, a lense thicket of Rubus, a pioneering stand of sassafras.). The delineation of vegetation units is often a first step in community ecology work even when a gradient analysis is the research goal.

1.2 Objective

Before making any management decisions, it is important to know what there is to work with. Enititation supplies a park manager with a database that is readily discernable. Each entitation unit, or a group of units, is homogenous and small enough that it/they can be dealt with as individual management areas.

The objectives of entitation are to:

1. Delineate discrete vegetation units.
2. Obtain a description and geographic distribution of those units.
3. Acquire detailed representations of the spatial characteristics of the vegetation pattern.
4. Provide a temporal baseline survey used for monitoring changes (e.g., vegetation) over time.
5. Facilitate selecting sites for sampling plots.
6. Assemble information indicative of parkland utilization potential.
7. Generate a resource analysis useful for the support of educational programs (e.g., establishment of a nature center or an interpretive trail).
8. Collect information for each unit that is useful in preparation of a park-wide management plan.

In the summer and fall of 1985, NRG conducted a citywide inventory of natural areas based on covertype. This aerial survey delineated many extensive natural areas throughout the city. These areas were distributed among 25 city parks. Within each park, natural areas will be further classified and studied. The Natural Resources Group field-tested the methods described here during a summer 1985 pilot project in Pelham Bay Park in the Bronx. This park was of chosen because it is the largest New York City park and possesses a wide range of conditions stemming from past disturbance, land use change, and least disturbed areas. The park also has a great diversity of plant community types representative of other natural areas in the city park system.

2.0 METHODOLOGY

2.1 Introduction

Enitation is a type of reconnaissance. Subjective, or visual, data are collected and then analyzed, both cartographically (maps with overlays) and by computer. The entitation map indicates location and size of each unit. The computer records include the unit classifications and descriptions. Vertical aerial photograph enlargements (1"= 200' or 1" = 100 scale) are used to deliniate units in the field. Using aerial photographs with superimposed grids is a guide to preliminary identification of unique vegetation units, teams of two to three technicians trained in natural resource analysis visit each units, on the ground to verify tentative identifications. The vegetation units defined are based on dominant and subdominant species and are described according to their life form (trees, shrubs, herbaceous, etc.). The resulting units are visually distinct and are discernable without quantitative measures.

A data form has been prepared to streamline the ground truth and classification processes (see Section 2.3.2). The form was designed to facilitate the transfer to field data onto a computer-based data system.

Following collection of data in the field, a summary document is prepared. The summary document (entitation report) interprets technical information collection by technicians and presents a synopsis in a form readily usable by resource managers, park administrators, and the public.

The map is a graphic representation of each unit and thus aids in determining the relative importance of vegetation units. The map can also be used for planning management strategies as well as for presentation purposes.

2.2 Materials

Certain materials are needed to carry out entitation (Appendix A). It is advantageous to study all historical records and documents, and to consult knowledgeable people in order to understand past land use patterns that have influenced what is evident in parks today. Maps and aerial photographs are also useful in this respect. Some available photo imagery is listed in Appendix C.

It is imperative to have current aerial photographs to work with in the field. The aerial photographs are enlarged and printed on separate sheets, making up an atlas (Figs. 1 & 2). For the most part, the scale of 1''= 200' with a superimposed grid at 100' intervals is adequate for the task.

From the photo atlas sections, often times formations and borders can be delineated: certain characteristics may be detectable (i.e. single large trees or rock walls) which are useful in orientation during ground checks.

Figure 1: Pelham Bay Park Aerial Photo Index

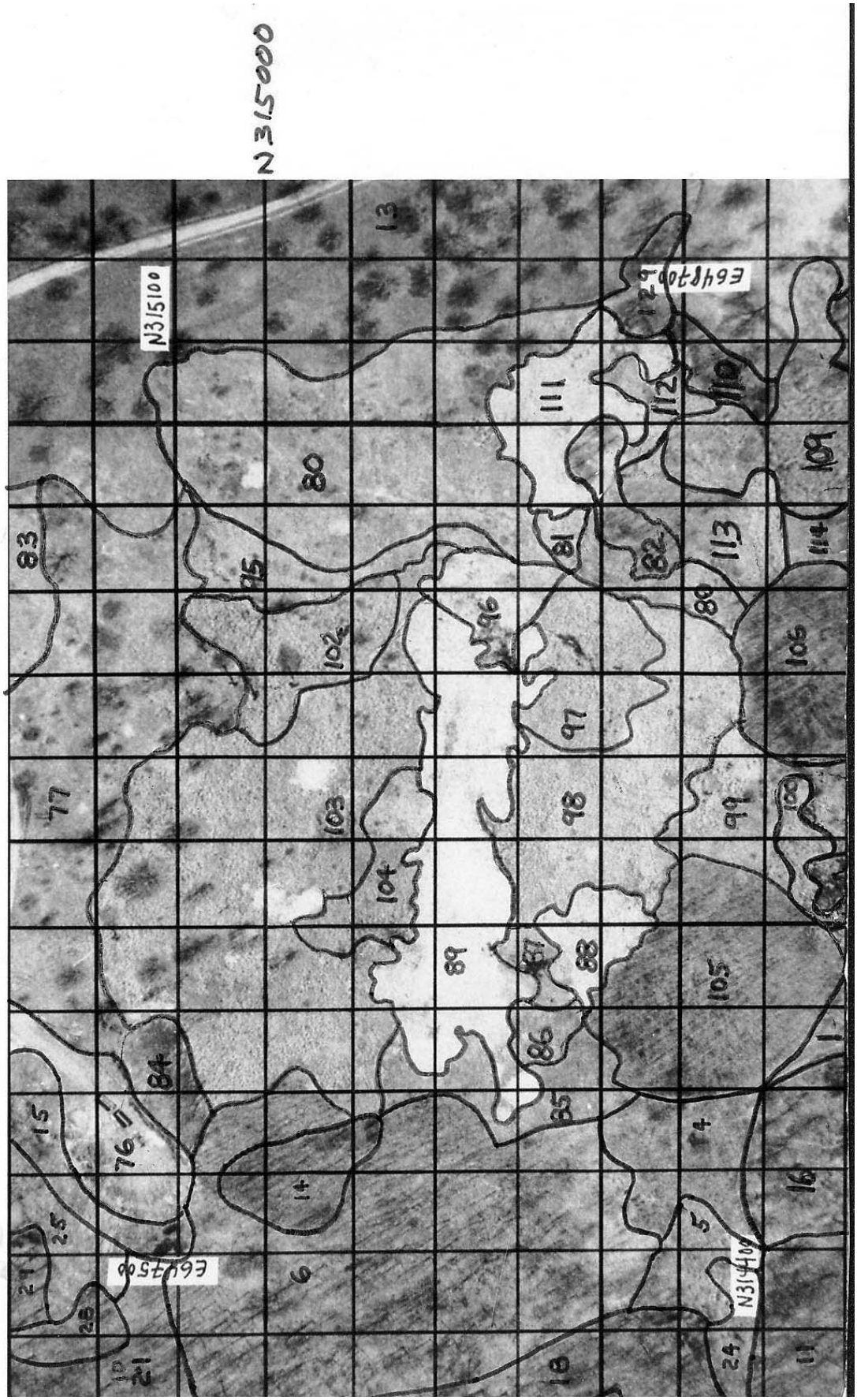


Figure 2: Section 15, Pelham Bay Park Aerial Photo Atlas

2.3 Data collection

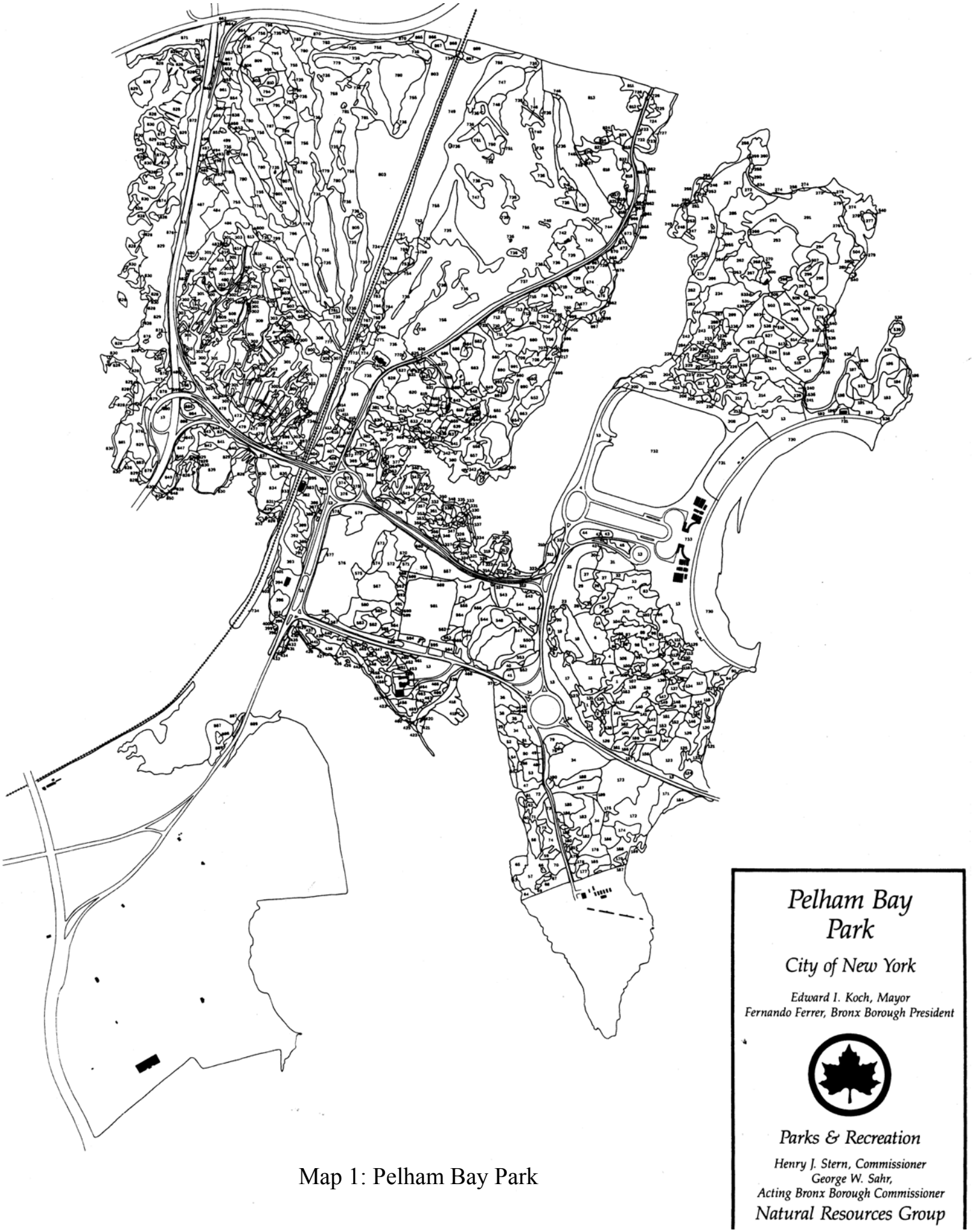
2.3.1 Delineating Entities

Advance knowledge of the classification system and plant identification is essential before unit delineation can be attempted. Entitation is a step-by-step procedure and usually follows as such:

1. Choose an area of the park to work in. For example, the first entitation work at Pelham Bay Park was done on Rodman's Neck (Map 1).
2. Choose appropriate photo atlas section from index. On Rodman's Neck, section 15 (Figs. 1 & 2) seemed to be fairly straight forward for beginners because it is a meadow and tones/patterns on the photograph are easily interpreted.
3. Examine tones and patterns on photo atlas section and tentatively identify unique and homogeneous plant formations.
4. Locate identified area on ground.
5. Check to see if tentative identification is correct or needs to be refined. Technicians will find that the photo is often deceiving due to shadows and distortion. Skill in interpreting ground objects from photo tones and patterns is gained with experience. Ground checks often reveal that additional delineations are required in order to properly describe the complexity of vegetation. This detail is not always recognized on the photo. The field check enabled us to identify the almost circular, gray tone/pattern as clonal stands of white poplar; the white tone as sesame grass; and the mottled, light and dark tone/pattern as a bayberry scrubland with switchgrass interspersed (Fig. 2).

A ground check is made in the following way:

1. Traverse the unit to check species composition, structure, relative abundance, density and site characteristics.
2. Use an obvious point from which to orient, **e.g.** a road, a highly visible tree, a building , etc..
3. Use a compass and pacing (a pace equals two steps) to determine unit orientation and size with respect to the aforementioned point. The ground check makes it possible to sketch boundaries (with a blue, ballpoint pen) on the photo atlas section (Note: Figure 2 section 15 from Pelham Bay Park—sesame grass has been called unit 89: bayberry scrubland is unit 103: and white poplar clones are units 105 and 106). Ink may be erased with a moistened pencil eraser if a revision is required.



Map 1: Pelham Bay Park

2.3.2 How to Complete Data Form and What Codes Mean

After a unit has been delineated, standardized information is collected by means of a data form (Fig. 3, Entitation Data Sheet). Variables were chosen and field tested and results were used in designing a computer program that would allow quick access to any of these variables, either individually or grouped. Modifications were made to better use the limited computer space and certain variables were de-emphasized or combined into one (originally, any detection of birds or mammals was noted; later these were changed to numerical values). Variables were matched with code names and numbers and arranged in a way to facilitate use in the field and data entry into the computer. Formation, dominant woody plants, and vegetation less than 15 feet tall are need to help classify units: historical indicators, current uses, environmental disturbances, and current maintenance are useful in determining management plan objectives (Fig. 4, Completed Entitation Data Sheet).

DESCRIPTION OF CODES ON FIELD DATA FORM:

UNIT: Each unit is assigned a number, which identifies it on the photo atlas, maps, unit descriptions and entitation summary reports. A number may be repeated for similar, but non-continuous plant formations located within the same management zone. When multiple units are delineated, it is indicated with a lower case letter (e.g.. 12a, 12b, 12c).

EAST/NORTH: Coordinates of the unit are noted: these are obtained from the photo atlas and are based on the New York State Department of Transportation's New York Plane Coordinate Grid.

ACRES: Calculated (using dot grid or compensating polar planimeter) and added to data at a later time.

PHOTO: Note the photo/page number of the atlas where this unit has been drawn.

FORMATION: (based on "Tentative Physiognomic – Ecological Classification of Plant Formations of the Earth" (revised from Ellenberg and Mueller-Dombois, 1967). (Appendix F)

> CLOSED FORSET**:** Formed by trees at least 15ft tall with their crowns interlocking. At least 80% canopy closure.
>
> WOODLAND**:** Formed by trees at least 15ft tall, with most of their crowns not touching each other, but at least 30% canopy closure (and no more than 79% - see closed forest).

Figure 3:

ENTITATION DATA SHEET

UNIT #_____ EAST #_____ NORTH #_____ ACRES____ PHOTO_____

CLASSIFICATION: _____ INITIALS_____ DATE____/_____/_____

FORMATION
1. CLOSED FOREST
2. WOODLAND
3. SCRUB
4. HERBACEOUS COMMUNITIES
5. DEPRESSION
6. AQUTIC PLANT (fresh)
7. INTERTIDAL COMMUNITIES
8. VINELAND

DOMINANT WOODY PLANTS
1. EVERGREEN
2. MIXED
3. DECIDUOUS

VEGETATION <15'
1. PHANEROPHYTES
2. CHAMAEPHYTES
3. HEMICRYPTOPHYTES
4. GEOPHYTES
5. THALLOPHYTES
6. LIANAS
7. THALLOPHYTES
8. HYDROPHYTES

TOPOGRAPHY
1. KNOLL
2. UNDULATING
3. SLOPE
4. LEVEL
5 DESERT

SOIL CONDITION
1. DRY
2. DRY / MOIST
3. MOIST
4. WET
5. SURFACE WATER

WILDLIFE INDEX

____ (0 – 5+)

STABILITY INDEX

____ SPECIES COMPOSITION CHANGING? (Y OR N)

____ COMMUNITY STRUCTURE CHANGING ? (Y OR N)

PLANT SPECIES (IN ORDER OF DOMINANCE)

		30'	5-30'	<5'	EXOTICS
1.	_____	___	____	___	_____
2.	_____	___	____	___	_____
3.	_____	___	____	___	_____
4.	_____	___	____	___	_____
5.	_____	___	____	___	_____
6.	_____	___	____	___	_____

REGENERATATING SPECIES (USE SPP. CODE): ___ ____ ___ _____

HISTORICAL INDICATORS
(In order of importance)
__ 1. LANDFILL
__ 2. ROAD
__ 3. FENCE
__ 4. HEDGEROW
__ 5. FOUNDATION
__ 6. FULL-CROWN TREE
__ 7. EXOTIC PLANTING
__ 8. OTHER:

CURRENT USE
__ 1. PICNIC
__ 2. HORSES
__ 3. VECHICLE ACCESS
__ 4. CAMPFIRE
__ 5. SPORTS
__ 6. FOOT TRAFFIC
__ 7. OTHER:

ENVIROMENTAL DISTURBANCE
__ 1. FIRE
__ 2. EROSION
__ 3. SOIL COMPACTION
__ 4. DUMPING
__ 5. AUTO
__ 6. TRASH
__ 7. VANDALISM
__ 8. OTHER

MOWING
1. W / IN LAST YEAR
2. W / IN 1-5 YEARS
3. NOT MOWED

MANAGEMENT CONCERN

___ Y OR N

COMMENTS AND OBSERVATIONS:

Figure 4: Completed Sheet

ENTITATION DATA SHEET

UNIT # 105 EAST #647800 NORTH #314500 ACRES 147 PHOTO 15

CLASSIFICATION: IB3a(1) INITIALS SM DATE 4 / 24 / 88

FORMATION
1. CLOSED FOREST
2. WOODLAND
3. SCRUB
4. HERBACEOUS COMMUNITIES
5. DEPRESSION
6. AQUTIC PLANT (FREE)
7. INTERTIDAL COMMUNITIES
8. VINELAND

DOMINANT WOODY PLANTS
1. EVERGREEN
2. MIXED
3. DECIDUOUS

VEGETATION <15'
1. PHANEROPHYTES
2. CHAMAEPHYTES
3. HEMICRYPTOPHYTES
4. GEOPHYTES
5. THALLOPHYTES
6. LIANAS
7. THALLOPHYTES
8. HYDROPHYTES

TOPOGRAPHY
1. KNOLL
2. UNDULATING
3. SLOPE
4. LEVEL
5 DESERT

SOIL CONDITION
1. DRY
2. DRY / MOIST
3. MOIST
4. WET
5. SURFACE WATER

WILDLIFE INDEX

0 (0 – 5+)

STABILITY INDEX

N SPECIES COMPOSITION CHANGING? (Y OR N)

N COMMUNITY STRUCTURE CHANGING ? (Y OR N)

PLANT SPECIES (IN ORDER OF DOMINANCE)

		30'	5-30'	<5'	EXOTICS
1.	White Poplar	✓	✓	✓	✓
2.					
3.					
4.					
5.					
6.					

REGENERATATING SPECIES (USE SPP. CODE):

HISTORICAL INDICATORS
(In order of importance)
__ 1. LANDFILL
__ 2. ROAD
__ 3. FENCE
__ 4. HEDGEROW
__ 5. FOUNDATION
__ 6. FULL-CROWN TREE
__ 7. EXOTIC PLANTING
__ 8. OTHER:

ENVIROMENTAL DISTURBANCE
__ 1. FIRE
__ 2. EROSION
__ 3. SOIL COMPACTION
__ 4. DUMPING
__ 5. AUTO
__ 6. TRASH
__ 7. VANDALISM
__ 8. OTHER

CURRENT USE
__ 1. PICNIC
__ 2. HORSES
__ 3. VECHICLE ACCESS
1 4 CAMPFIRE
__ 5. SPORTS
__ 6. FOOT TRAFFIC
__ 7. OTHER:

MOWING
1. W / IN LAST YEAR
2. W / IN 1-5 YEARS
3. NOT MOWED

MANAGEMENT CONCERN

Y Y OR N

COMMENTS AND OBSERVATIONS:

mid-aged, clonal white poplar stand at meadow edge. Mortality is beginning to occur, but understory is open due to shading. Ground cover consists of Viburnum, elderberry, goldenrod, chives, wild strawberry, woodland ragweed, honeysuckle, & cool season grasses.

SCRUB; Shrubland or thicket, mainly composed of woody plants 1.5 to 15 ft tall. [Note: Though the lifeform of brambles, marsh elder, and rose may be referred to as chamaephytes (remaining perennially 100 in above ground) in describing the understory in forests and woodlands, their ecology has been classified as scrub when dominating a unit].

HERBACEOUS COMMUNITIES: Grasses, graminoid and other herbaceous plants are predominant in the cover, but woody plants may be sparingly present (though covering not more than 30%).

DESERTS and other scarcely vegetated areas; Lacustrine habitats that are situated in topographic depression of a damned river channel, lacking trees, shrubs, emergents, mosses or lichens with greater than 30% aerial coverage. Composed of rooted and or floating plants that endure or need water covering the soil constantly or at most times of the year.

INTERTIDAL COMMUNITIES: Substrate is exposed and flooded by tides, includes the associated splash zone.

VINELAND: Characterized by at least 30% lianas (e.g. Lonicera japonica. Vitis spp., Toxicodendron radicans). Often on the forest or shrub border. Supported by artificial means or ground surface.

DOMINANT WOODY PLANTS:

EVERGREEN: The canopy is never without foliage.

MIXED: Evergreen and deciduous trees admixed, with evergreens covering at least 20% and up to 80% of the surface.

DECIDUOUS: Majority of trees shed their foliage in the autumn months.

VEGETATION < 15 ft.: (based on " Raunkiaer Life Forms with Revised Subdivisions" [Example are listed in Appendix B]. This lifeform system is based on the position of the overwintering bud with respect to ground surface).

PHANEROPHYTES: Plants that grow taller than 100in or whose shoots do not die back periodically to that height (e.g., trees).

CHAMAEPHYTES: Mature branch or shoot system remaining perenially less than or equal to 100in above ground. Buds are produced on aerial branches close to the soil (e.g., shrubs).

HEMICRYPTOPHTES: Shoots die back to ground level of ground.

GEOPHYTES: Plants with buds or shoots surviving below the ground (rhizomes, bulbs, stem tubers, root tubers).

THEROPHYTES: One year life cycle (annuals). Shoots and root system die after seed production.

LIANAS: Vascular plants needing support, rooting in the ground permanently (vines).

THALLOPHYTES: Non-vascular plants (e.g. mosses and lichens).

HYDROPHYTES: Free moving water plants.

TOPOGRAPHY:

KNOLL: A small, isolated hillock.

UNDULATING: The area has a wavy surface. Its neither a slope, a level area, or a depression, but rather a combination of all three.

SLOPE: Ground that forms a natural or artificial incline.

LEVEL: The ground is smooth and straight; it has no point significantly higher than another.

DEPRESSION: A hollow, or low point, as compared to the surrounding topography. May or may not contain water.

SOIL CONDITIONS (Dependent on the time of year; i.e. summer soil conditions are usually well-drained except after a heavy rain).

DRY: Water is not retained by the soil (e.g. sandy soils or shallow soils on ridges) or is repelled by the surface material (e.g.asphalt or rock).

DRY/MOIST: The soil retains some water, but not enough to be considered moist. A middle point between a dry area and a moist area.

MOIST: Water is retained by the soil.

WET: Soil is saturated.

SURFACE WATER: Water on surface of soil.

WILDLIFE INDEX: Note number of birds, mammals, reptiles; includes sightings, songs or other murmurings, scats, nests, scraping, etc.

STABILITY INDEX: The stability of a site is determined by its species composition and the community structure (closed forest, woodland, etc.). It gives a park manager an idea of the future site conditions. (We have arbitrarily chosen a ten year period as an indicator of stability.)

SPECIES COMPOSITION CHANGING?: Does the entitator think the species composition will be different in ten years? For example, an oak/hickory forest with black cherry regeneration may become a black cherry forest.

COMMUNITY STRUCTURE CHANGING?: Is the site succeeding from an herbaceous community to scrub community, etc.?

PLANT SPECIES: Listing of dominant species according to relative abundance above ground, noting whether it is a native or exotic species, and noting height (above 30 feet, between 5 and 30 feet, or less than 5 feet).

REGENERATING SPECIES: Listing of regenerating tree species: use species code (Table 1), usually initials of the scientific name (e.g. for red oak, write QR).

HISTORICAL INDICATORS (Indicators of past use detectable at time of survey):

LANDFILL: Topography altered by previous filling or dumping: i.e., while building a road or altering a wetland area. Look for rubble on the soil surface or sudden changes in grade.

ROAD: Concrete, asphalt, stone or dirt roadbed used previously and perhaps presently: also, any evidence of a roadbed: clearing or excavation for previous road construction, line of trees/hedgerow.

FENCE: Wooden, chain-link or barbed wire fence, stone wall or other artificial barrier (not currently functional).

HEDGEROW: Evidence of trees or shrubs planted in line: i.e., maple or privet along road or path.

FOUNDATION: Stone, brick, or concrete (evidence of building).

FULL-CROWN TREE: Initially open-grow and free of competition: currently very large with a dominating crown.

EXOTIC PLANTING: Generally not native to the area (e.g. Norway maple, privet, periwinkle).

OTHER: Building, excavation, ditching, etc.

CURRENT USE: (indicators of utilization):

PICNIC: Food consumed (may be designated, scenic or " landscape" area).

HORSES: Bridle path, hoof prints, or any indication of use by horses.

VEHICLE ACCESS: Unit accessible by vehicles, on roads or occasionally along paths.

CAMPFIRE: Evidence of campfire or cookout in unspecified areas.

SPORT: Fishing, archery, exercise, jogging/running, golf, etc.

FOOT TRAFFIC: Evidence of pedestrian (e.g. path, trampling, opening in understory).

OTHER: Loitering, para-military exercise, site, vagabond homestead, golf carts, (gathering may be used as a euphemism for teenage parties). etc.

ENVIRONMENTAL DISTURBANCE:

FIRE: Evidence of wildlife, either natural or induced by people. Look for burn scars on tree trunks or charcoal deposits on soil surface.

EROSION: Soil detached and moved by wind, ice, water, or gravity.

SOIL COMPACTION: Increasing soil density and decreasing porosity due to the application of mechanical forces to the soil: i.e. due to vehicle, horse, or foot traffic.

DUMPING: Discarded materials requiring more than one hand for removal: e.g. automobile parts, large pieces of concrete, piles of brush.

AUTO: Automobiles present: in operating condition, or dumped.

TRASH: Discarded material easily removed.

VANDALISM: Painted walls, rocks, plants; felled trees; hacked branches or bark.

OTHER: Dirtbikes, water pollution, or defecation, for example.

MOWING: Note when last mowed.

MANAGEMENT CONCERN: Note Y or N: pertains to vegetation or use of area. Does this area require immediate attention? (e.g. Is a specimen tree being overtopped by vines? Action is noted in comments section)

COMMENTS AND OBSERVATIONS: Synopsis of important features which characterize the unit, an elucidation of above point, including a list of associated vegetation.

PHYSIOGNOMIC-ECOLOGICAL CLASSIFICATION: Note classification derived from the revised Ellenburg and Mueller-Dombois key-(Appendix F, revised Classification System).

INITIALS: Recorder's initials written; in cases where information is unclear or missing, recorder can be questioned.

DATE: Note date of observation.

3.0 CLASSIFICATION

"The Tentative Physiognomic –Ecological Classification of Plant Formations of the Earth" (revised from Ellenburg and Mueller-Dombois. 1967) has been chosen as the basis for vegetation classification (Appendix F). Although this classification was designed for mapping world vegetation covering large areas, it is found to be very flexible and has been successfully applied to much smaller scaled mapping. Specifically, the advantages of this classification system are:

1. It enables an observer to make objective choices in classification of plant formations.
2. It encompasses most of the great diversity of plant formations occurring in city parks – results of natural factors and urban disturbance /influences/ alterations.
3. It is readily adjusted to include special urban plant formations (e.g., vinelands, or urban deserts).
4. Because of the ranking of classification criteria, evaluation may be general or very specific as successive levels are grouped or separated.
5. Classification is used by UNESCO and widely recognized in the fields of plant ecology and biogeography.

4.0 ANALYSIS

Analysis is facilitated by the preparation of first-order products from entitation. These are in both graphic and written form. First-order products include maps, computer printouts, and abridged keys classifying plant formations in the area under consideration.

4.1 Maps

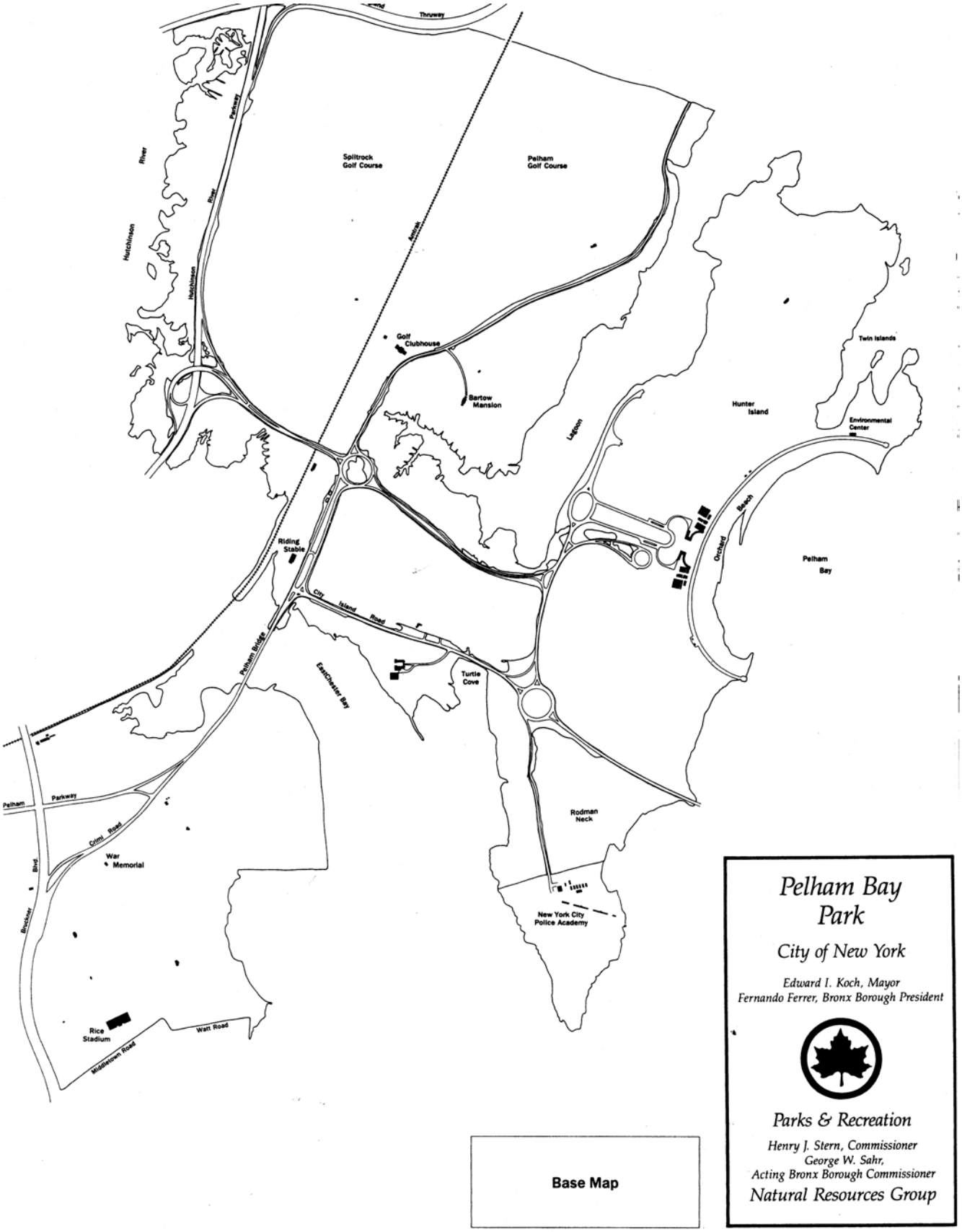
Maps are a powerful tool used to record and convey a variety of pertinent and descriptive characteristics of plant formations delineated during natural resources entitation. Maps with entity boundaries are readily generated by transferring this information from photo atlas sections onto mylar, acetate, or tracing paper. In the simplest form, a base map is produced (Map 2). The addition of unit identification numbers to the base map creates a unit locator map (Map 3). These maps are well suited for illustrating area, extent, and distribution of any of the parameters (e.g. all units that are closed forest, wooland, scrubland etc. See covertype map, Map 4). Computer graphics systems are commended for efficient mapping.

4.2 Computer Printouts

Using a software package designed to file/index allows for easy manipulation of the data collected from the entitation process. The Pelham Bay Park computer documentation on IBM PC-AT was used with a "KEEP-IT" software program. Information can be filed on a unit by unit basis and be called up later in a variety of ways. Some example are: complete unit description, unit with evidence of fire, units with more than three wildlife sightings, a listing of species (in order of dominance) within each cover type, a listing of unit classification, etc. (Tables 2 thru 6).

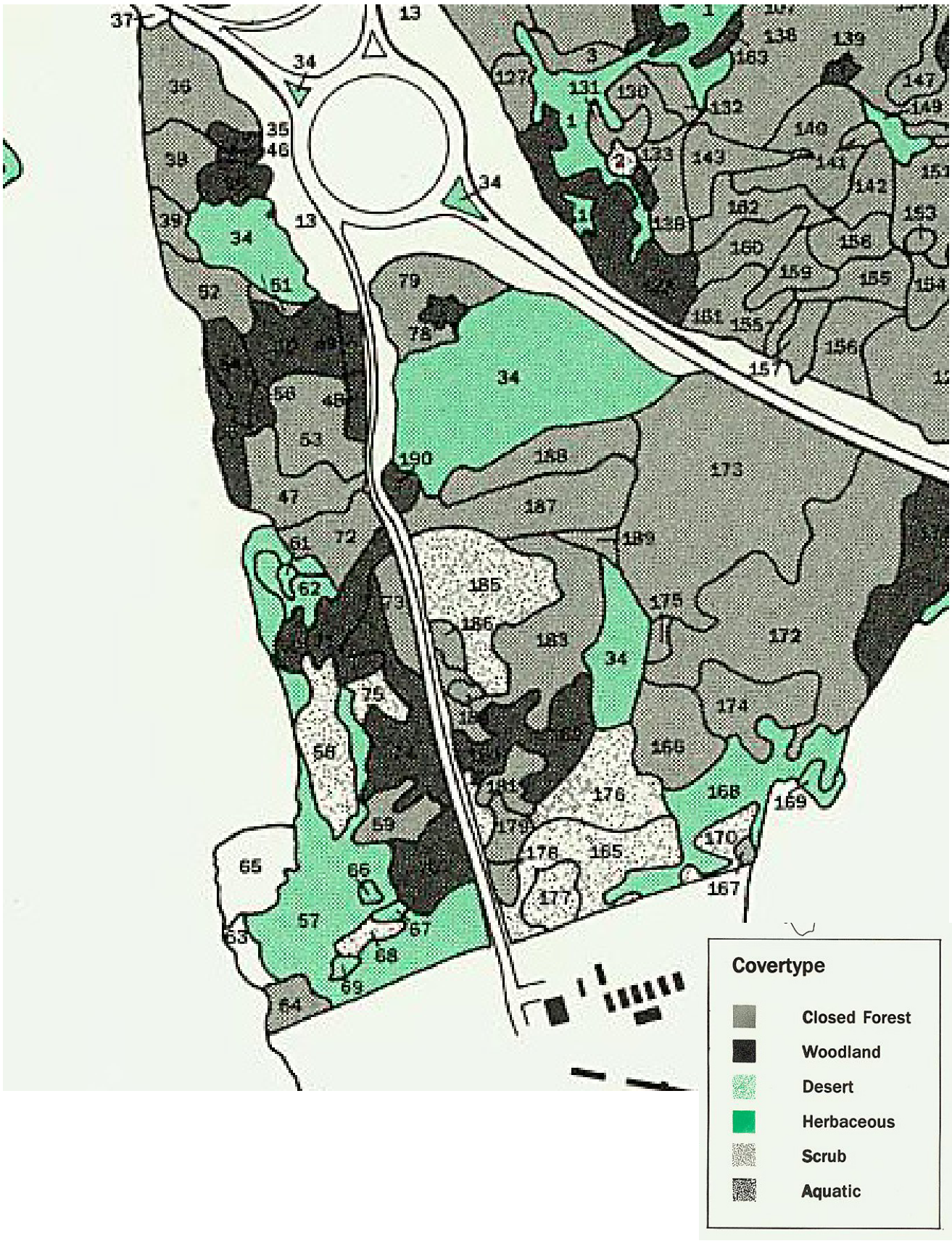
Any or all of the desired information can be printed on hard copy when needed. This is useful for the following reasons:

1. It provides accessible documentation.
2. It facilitates future comparisons of units, larger areas (e.g. Hunter Island), or cover-types in order to discover successional trends and /or drastic changes (possibly due to outside disturbances).
3. It facilitates general analysis of information which would lead to correlations (e.g., less than three wildlife sighting in white poplar stand: areas that are prone to fire, etc.).



Map 2: Pelham Bay Park Base Map

Map 3: Unit Locator Map
Resource Entitation
Rodman's Neck
Pelham Bay Park
Bronx, New York



Map 4: Covertype Map

Table 1: Regenerating Species Code

AA	Ailanthus
AH	horsechestnut
AL	Norway maple
AP	Sycamore maple
AR	red maple
AS	Sugar maple
ASM	Silver maple
BL	Black birch
BP	gray birch
CC	bitternut hickory
CEO	hackberry
CG	pignut hickory
CN	flowering dogwood
CO	shagbark hickory
CR	hawthorn
CT	mockernut hickory
CY	Carya spp.
DV	persimmion
FA	white ash
FF	Fraxinus spp.
FG	American beech
FP	green ash
GD	Kentucky coffee tree
HV	witch hazel
JN	black walnut
JV	Northern red cedar
LS	sweetgum
LT	tulip tree
MA	mulberry
NS	black tupelo
PA	white poplar
PAV	sweet cherry
PB	Norway spruce
PBS	balsam poplar
PD	Eastern cottonwood
PG	white spruce
PGR	bigtooth aspen
PHL	corktree
PN	Austrian pine
PP	Pinus spp.
PO	American sycamore
PR	red pine
PS	black cherry
PST	white pine
PT	quaking aspen
PTH	Japanese black pine
QA	white pine
QB	swamp white oak
QP	pin oak
QQ	Quercus spp.
QR	red oak
QS	post oak
QV	black oak
RH	buckthorn
RP	black locust
SA	Sassafras
SJ	Japanese sophora
SN	black willow
SX	Salix spp.
TL	linden
TO	Atlantic white cedar
TX	Taxus spp.
UA	American elm
UU	Ulmus spp.

Table 2: Complete Unit Descriptions

Unit: 447
Classif: IIB3a (1)
Acreage: 0.09

SITE	SPECIES	HEIGHT	HISTOR.	USES	DISTURB.
Woodland	Bitternut hickory	<5m		Foot Traffic	
Deciduous	Sassafras	<5m			
Phanerophytes	Black cherry	<5m			
Level	Rubus	<5m			
Moist	Goldenrod	<5m			
	Aster	<5m			

COMMENT:

Small clearing in midst of wooded area within sight of asphalt path, possibly an old roadbed which is now a footpath. A few young trees in area. Other species: elderberry, wild grape, bush honeysuckle, dogwood, Virginia creeper, and garlic mustard.

Unit: 448
Classif: IB3a (1)
Acreage: 0.23

SITE	SPECIES	HEIGHT	HISTOR.	USES	DISTURB.
Closed forest	Ailanthus	>5m <5m	Road		
Deciduous	Mulberry	>5m <5m			
Phanerophytes	White ash	>5m <5m			
Slope	Viburnum	<5m			
Well drained	Spicebush	<5m			
	Black cherry	>5m <5m			

COMMENT:

Unit primarily Ailanthus with shrubs and a few a saplings on the lower slope. Other vegetation include: garlic mustard, false Solomon's seal, honeysuckle, jewelweed, roughavens, and elderberry.

Unit: 449
Classif: IIIB4a
Acreage: 0.15

SITE	SPECIES	HEIGHT	HISTOR.	USES	DISTURB.
Scrub	Rubus	<5m			
Deciduous	Elderberry	<5m			
Phanerophytes	Dogwood	<5m			
Level	Ailanthus	<5m			
Moist	Jewelweed	<5m			
	Aster	<5m			

COMMENT:

Clearing in middle of surrounding oak woodland, possibly an old roadbed present. Other vegetation includes phragmites and goldenrod.

Unit: 450
Classif: IIB3a (1)
Acreage: 0.15

SITE	SPECIES	HEIGHT	HISTOR.	USES	DISTURB.
Woodland	White ash	>5m <5m		Auto Access	
Deciduous	Pin oak	>5m			
Phanerophytes	American elm	>5m			
Slope	Mulberry	>5m <5m			
Well drained	Hawthron	<5m			
	Black locust	<5m			

COMMENT:

Unit between road and path. Some lianas, such as wild grape and bittersweet, present along borders. Other species: viburnum, dogwood, Rubus, Ailanthus.

Table 3: Units With Evidence of Fire

UNITS # CLASSIF.	FORMATION	VEG.<5M	SPP. #1-6	HEIGHT
07 B2a(1)	Closed forest	Phanerophytes	Sweet cherry	>5 <5m
			White poplar	>5 <5m
			Mulberry	>5m
			Black walnut	>5m
			Sumac	<5m
			Elderberry	<5m
116 IB2a	Closed forest	Phanerophytes	Black locust	>5m
			Viburnum	<5m
			Elderberry	<5m
			White ash	<5m
			Chives	<5m
179 IB2a(1)	Closed forest	Phanerophytes	Sassafras	>5m
			Sweetgum	>5m
			Sweet cherry	>5 <5m
			Elderberry	<5m
6 IIB2(4)	Woodland	Geophytes	Black locust	>5m
			Goldenrod	<5m
			Rubus	<5m
			Chives	<5m
			Pernnial herbs	<5m
			Black cherry	>5m
26 IB2a(4)	Woodland	Geophytes	Bitternut hickory	>5m
			Rubus	<5m
			Goldenrod	<5m
			Jewelweed	<5m
			Black cherry	<5m
110 IIB2a(4)	Woodland	Geophytes	Black locust	>5m
			Pin oak	>5m
			Sweet cherry	>5m
			J. Knotweed	<5m
			Chives	<5m
			Viburnum	<5m
114 IIB2a(4)	Woodland	Geophytes	Sweet cherry	>5m
			Goldenrod	<5m
			Chives	<5m

Table 4: Units With 3 + Wildlife Sitings

UNIT # CLASSIF WILDLIFE	FORMATION	VEG < 5M	SPP. # 1-6	HEIGHT
59	Closed forest	Hemicryptophytes	Black oak	>5m
IB2a(3)			Bitternut hickory	>5m
2			Sweetgum	>5m
			Pin oak	>5m
			White ash	<5m
			Cool season grass	<5m
64				
IB2b(3)	Closed forest	Hemicryptophytes	Bitternut hickory	>5 <5
3			Black cherry	>5m
			Pin oak	<5m
			Elderberry	<5m
			Goldenrod	<5m
			Cool season grass	<5m
46				
IIB2a(1)	Woodland	Phanerophytes	Sycamore maple	>5 <5
2			Mulberry	>5m
			Vines	<5m
			Japanese knotweed	<5m
71	Woodland	Phanerophytes	Sweetgum	>5 <5
IIB2a(1)			Black cherry	>5 <5
2			Pin oak	>5m
			Vines	<5m
74	Woodland	Phanerophytes	Sweetgum	>5 <5
IIB2a(1)			Bayberry	<5m
2			White ash	<5m
			Pin oak	>5 <5
			Bitternut hickory	>5 <5
			Eastern cottonwood	<5m
118	Woodland	Phanerophytes	Black locust	>5 <5
IIB2a(1)			Black cherry	>5 <5
3			Eastern cottonwood	>5m
			Viburnum	<5m
			Rose	<5m
			Rubus	<5m
126	Woodland	Phanerophytes	Sweetgum	>5m
IIB2a(1)			White ash	>5m
2			Willow	>5m
			White poplar	<5m
			Sweet cherry	>5m
			Rubus	<5m

Table 5: Dominant Species—Closed Forest

SPECIES#1	FREQUENCY	PERCENT
Ailanthus	3	3.49
European alder	2	2.33
Norway maple	5	5.81
Bitternut hickory	2	2.33
Black cherry	8	9.30
Black locust	15	17.44
Black oak	1	1.16
Black walnut	1	1.16
Eastern cottonwood	1	1.16
Hickory	1	1.16
Linden	1	1.16
Oak sp.	1	1.16
Pin oak	6	6.90
Quaking aspen	1	1.16
Red oak	6	6.90
Sassafras	3	3.49
Sugar maple	1	1.16
Sweet cherry	5	5.81
Sweetgum	3	3.49
Sycamore maple	2	2.33
White ash	2	2.33
White pine	2	2.33
White poplar	13	15.12
Willow	1	1.16
TOTAL	86	100.00

Table 5 (cont.): Dominant Species—Woodland

SPECIES	FREQUENCY	PERCENT
Ailanthus	1	2.94
European alder	1	2.94
Norway maple	3	8.82
Bitternut hickory	1	2.94
Black cherry	7	20.59
Black locust	4	11.76
Gray birch	1	2.94
Pin oak	3	8.82
Quaking aspen	1	2.94
Sweet cherry	3	8.82
Sweetgum	4	11.76
Sycamore maple	1	2.94
Vines	1	2.94
White poplar	2	5.88
Willow	1	2.94
TOTAL	34	100.00

Dominant Species—Scrub

SPECIES	FREQUENCY	PERCENT
Rubus	2	12.50
Viburnum	1	6.25
Bayberry	6	37.50
Goldenrod	2	6.25
Graystem dogwood	1	6.25
Sumac	4	25 .00
TOTAL	16	100.00

Table 5 (cont.): Dominant species- -Terrestrial Herbaceous

SPECIES #1	FREQUENCY	PERCENT
Japanese knotweed	3	5.66
Phragmites	10	18.87
cool season grass	6	11.32
day lily	1	1.89
fern	2	3.77
goldenrod	9	16.98
jewelweed	1	1.89
mugwort	1	1.89
seasame grass	5	9.43
spikegrass	2	3.77
switchgrass	12	22.64
wild strawberry	1	1.89
TOTAL	53	100.00

SPECIES #1	FREQUENCY	PERCENT
mugwort	1	100.00
TOTAL	1	100.00

Table 6: Units By Classification

CLASSIF.	UNIT #	FORMATION	DOG WOOD	VEG. <5m
	8	Closed forest	Everg. W/decid	Hemicryptophytes
	43	Closed forest	Everg. W/decid	Hemicryptophytes
	10	Closed forest	Decid. W/everg	Phanerophytes
	42	Closed forest	Decid. W/everg	Phanerophytes
	45	Closed forest	Decid. W/everg	Phanerophytes
	127	Closed forest	Decid. W/everg	Phanerophytes
	132	Closed forest	Decid. W/everg	Geophytes
	3	Closed forest	Deciduous	Phanerophytes
	7	Closed forest	Deciduous	Phanerophytes
	9	Closed forest	Deciduous	Phanerophytes
	11	Closed forest	Deciduous	Phanerophytes
	14	Closed forest	Deciduous	Phanerophytes
	17	Closed forest	Deciduous	Phanerophytes
	18	Closed forest	Deciduous	Phanerophytes
	19	Closed forest	Deciduous	Phanerophytes
	21	Closed forest	Decid. W/everg	Phanerophytes
	25	Closed forest	Deciduous	Phanerophytes
	27	Closed forest	Deciduous	Phanerophytes
	28	Closed forest	Deciduous	Phanerophytes
	29	Closed forest	Deciduous	Phanerophytes
	30	Closed forest	Deciduous	Phanerophytes
	31	Closed forest	Deciduous	Phanerophytes
	32	Closed forest	Decid. W/everg	Phanerophytes
	36	Closed forest	Deciduous	Phanerophytes
	37	Closed forest	Deciduous	Phanerophytes
	38	Closed forest	Deciduous	Phanerophytes
	39	Closed forest	Deciduous	Phanerophytes
	40	Closed forest	Deciduous	Phanerophytes
	41	Closed forest	Deciduous	Phanerophytes
	44	Closed forest	Deciduous	Phanerophytes
	51	Closed forest	Deciduous	Phanerophytes
	52	Closed forest	Deciduous	Phanerophytes
	53	Closed forest	Deciduous	Phanerophytes
	72	Closed forest	Deciduous	Phanerophytes
	73	Closed forest	Deciduous	Phanerophytes
	79	Closed forest	Deciduous	Phanerophytes
	105	Closed forest	Deciduous	Phanerophytes
	106	Closed forest	Deciduous	Phanerophytes
	107	Closed forest	Deciduous	Phanerophytes

Table 6 (cont.): Units By Classification

CLASSIF.	UNIT	FORMATION	DOM WOOD	VEG. <5M
	116	Closed forest	Deciduous	Phanerophytes
	117	Closed forest	Deciduous	Phanerophytes
	123	Closed forest	Deciduous	Phanerophytes
	129	Closed forest	Deciduous	Phanerophytes
	130	Closed forest	Deciduous	Phanerophytes
	138	Closed forest	Deciduous	Pnanerophytes
	140	Closed forest	Deciduous	Phanerophytes
	141	Closed forest	Deciduous	Phanerophytes

Appendix A: Checklist of Materials Required for Field Work:

- Photo Atlas and Index
- Data Forms
- Clipboards and Notepads
- Ballpoint Pens (i.e. blue Papermate)
- Compass
- Vegetation Classification Key
- Field Guides (See Appendix D for a recommended bibliography)

Appendix B:

Life Forms of Common Plant Species

(Based on Manual of Vascular Plants, Gleason and Cronquist)

SPECIES	LIFE FORM	REPRODUCTION
All trees	Phanerophyte	Perennial
Groundsel tree	Chamaephyte	Perennial
Bayberry	Chamaephyte	Perennial
Viburnum	Chamaephyte	Perennial
Sumac	Chamaephyte	Perennial
Bush honeysuckle	Chamaephyte	Perennial
Marsh elder	Chamaephyte	Perennial
Rubus	Chamaephyte	Perennial
Catbrier	Liana	Perennial
Japanese honeysuckle	Liana	Perennial
Poison ivy	Liana	Perennial
Virginia creeper	Liana	Perennial
Wild grape	Liana	Perennial
Black swallowwort	Liana	Perennial
Jewelweed	Therophyte	Annual
Glasswort	Therophyte	Annual
Gerardia	Therophyte	Annual
Salt meadow fleabane	Therophyte	Annual
Garlic mustard	Geophyte	Perennial
Japanese knotweed	Geophyte	Perennial
Chives	Geophyte	Perennial
Day lily	Geophyte	Perennial
Phargmites	Geophyte	Perennial
Black grass	Geophyte	Perennial
Switchgrass	Geophyte	Perennial
Mugwort	Hemicryptophyte	Perennial
Spartina	Hemicryptophyte	Perennial
Sea lavender	Hemicryptophyte	Perennial
Sesame grass	Hemicryptophyte	Perennial
Goldenrod	Hemicryptophyte	Perennial
White snakeroot	Hemicryptophyte	Perennial
Aster	Hemicryptophyte	Perennial
Curly dock	Hemicryptophyte	Perennial
Plantain	Hemicryptophyte	Perennial
English plantain	Hemicryptophyte	Perennial
Little bluestem	Hemicryptophyte	Perennial
Dandelion	Hemicryptophyte	Perennial
Cool season grasses	Hemicryptophyte	Perennial
Virginia knotweed	Geophyte	Perennial

Appendix C: Photo Imagery

1. Current Vertical Photography	Type	Scale	Year
Lockwood, Kessler and Barlett, Inc.	Black & White	1:19,000	(1984 1978)
1 Aerial Way	Black & White	1" = 5000'	(1974)
Syossel, NY 11791			
(516) 938-0600 (Attn: Bill Brunn)			
Dept. of Environmental Conservation	Black & White	1" = 200'	(1974)
SUNY Building 40	Color/Infrared	1" = 1000'	(1974)
Stony Brook, NY 11794			
Sanborn Map Company	Black & White	1" = 1167'	(1982)
629 Fifth Avenue	Black & White	1" = 1000'	(1975)
Pelham, NY 10803			
Keystone Aerial Survey, Inc.	Black & White	1" = 800'	(1980)
North Philadelphia Airport	Black & White	1" = 2000'	(1980)
Philadelphia, PA 19114			
(215) 938- 3119			
U.S. Dept. of Commerce	Color (NYC Shoreline)	1" = 2500'	
Nat'l Oceanic & Atomospheric Admin.			
National Oceanic Service			
Charting & Geodetic Services			
Rockville, MD 20852			
EROS	Color/Infrared	1" = 4834'	(1984)
Data Center	Black & White	1" = 6667'	(1984)
Sioux Falls, SD 57198			
(605) 594- 6151			
Aerial Cartographics of America			
100 W. Main Street			
Babylon, NY 11702			
(516) 587- 5060	Color/Infrared		

2. Aerial Photo Atlas with superimposed 100' coordinate grid system (1' = 200'). Atlas sections are 8 ½" x 11". Grid system same as New York Plane Coordinate Grid, East and Long Island Zones, NYS department of Transportation. Arrange contract with private photographer. Atlas section should overlap 100'. Label grid at 1000' intervals; grid lines should be very thin and orientated correctly.

Appendix C (cont.): Photo Imagery

3. Air Photo interpretation (without field or entitation):

CLEARS – Cornell Laboratory for Environmental Applications of Remote Sensing:

Cornell University
Hollister Hall
Ithaca, NY 14853
(607) 256- 6520

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Appendix D: Recommended Field Guides

Brockman, C. Frank. Trees of North America. Racine. Wisconsin: Western Publishing Company , Inc., 1979

Brown, Lauren. Grasses: An Identification Guide. Boston , Massachusetts: Houghton Mifflin Co., 1979.

Niering, William A. and R. Scott Warren. Salt Marsh Plants of Connecticut. New London. Connecticut: Connecticut Arbortum Association.

Peterson, Roger Tory and Margaret Mckenny. A field Guide to Wildflowers of Northeastern and North Central North America. Boston. Massachusetts: Houghton Millin Co., 1968.

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Appendix E: Literature Cited

1. Gleason, Henry A. and Arthur Cronquist. 1963. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. Willard Grants Press. Massachusetts. 810pp.

2. Mueller- Dombois, D. and H. Ellenburg. 1974. Aims and Methods of Vegetation Ecology. John Wiley and Sons, New York. 574pp.

3. UNESCO. 1973. International Classification and Mapping of Vegetation. Ecology and Conservation Series, No.6, 93pp.

Appendix F: Classification System

I. **CLOSED FOREST.** formed by trees at least 5m tall with their crowns interlocking.

II. **WOODLANDS.** (Open stands of trees.) Formed by trees at least 5m tall, with most of their crowns not touching each other , but covering at least 30% of the surface;grass cover sometimes present.

III. **SCRUB.** Shrub lands or thickets. Mainly composed of woodychamaephytes and phanerophytes (e.g., Rubus spp., Rosa spp., Myrica spp., etc.), 0.5-5.0m, all.

IV. **HERBACEOUS COMMUNITIES.** Grasses, graminoid and other herbaceous plant are predominant in the cover, but woody plants may be sparingly present (i.e. covering not more than 30%).

V. **DESERT** and other scarcely vegetated areas. Plants are scattered or may be absent.

VI. **FRESHWATER AQUATIC PLANT FORMATIONS.** Lacustrine habitats that are situated in a topographic depression or a dammed river channel, lacking trees, shrubs, emergents, mosses or lichens with greater than 30% areal coverage. Composed of rooted and or floating plants that endure or need water covering the soil constantly or at most times of the year.

VII. **INTERTIDAL COMMUNITIES.** Substrate is exposed and flooded by tides. Includes the associated splash zones.

VIII. **VINELAND.** Characterized by >30% lianas (e.g., Lonicera japonica. Vitis sp ., Toxicodendron radicans). Often on forest or shrub border. Supported by artificial means or ground surface.

I. **CLOSED FORESTS.** Formed by trees at least 5m tall with their crowns interlocking.

A. Temperate evergreen forests. The canopy is never without foliage: however, individual trees may shed their' leaves (e.g. Pinus spp., Abies spp., Tsuga spp., Picea spp., erc.)

1. Evergreen conifer forest with rounded crowns (e.g. Pinus spp.).

a) understory (<5m) dominated by phanerophytes
b) understory (<5m) dominated by chamaephytes
c) understory (<5m) dominated by hemicrytophytes
d) understory (<5m) dominated by geophytes
e) understory (<5m) dominated by therophytes
f) understory (<5m) dominated by lianas

2. Conical crowns (e.g. Picea spp. and Abies spp.)(subdivisions as above*).

B. Mainly deciduous forests. Majority of trees shed their foliage simultaneously in connection with the unfavorable season (Quercus spp., Carya spp., Prunus spp., etc.).

1. Cold deciduous forests with evergreen trees (or shrubs) admixed. Unfavorable season mainly Characterized by winter frost. Deciduous trees dominant. but evergreen species present as part of the main canopy or as understory.

a. Cold deciduous forest with evergreen broad leaved trees (e.g., Ilex spp.).

1) understory (<5m) dominated by phanerophytes
2) understory (<5m) dominated by chamaephytes
3) understory (<5m) dominated by hemicrytophytes
4) understory (<5m) dominated by geophytes
5) understory (<5m) dominated by therophytes
6) understory (<5m) dominated by lianas

b. Cold deciduous forest with evergreen needle leaved trees (subdivisions as above*).

2. Cold deciduous forest without evergreen trees. Deciduous trees absolutely dominant. Evergreen chamaephytes and some small, evergreen trees may be present.

a. Temperate lowland and submontane cold deciduous forest. trees up to 50m tall (subdivisions same as above*).

b. Cold deciduous riverine forest. (Flooded by channels, therefore more moist and richer in nutrients than a.). Trees and shrubs with high growth rates and vigorous herbaceous undergrowth (e.g., Salix nigra, Populus deltoides, Fraxinus pennsylvania, etc.).

1) Temporarily flooded. Between high water and average water.

a) understory (<5m) dominated by phanerophytes
b) understory (<5m) dominated by chamaephytes
c) understory (<5m) dominated by hemicrytophytes
d) understory (<5m) dominated by geophytes
e) understory (<5m) dominated by therophtes
f) understory (<5m) dominated by lianas

2) Seasonally flooded. Between average water and low water. (subdivision as above*).

C. Cold deciduous palustrine swamp or peat forest. (Flooded until late spring or early summer, Surface soil organic.). Relatively poor in tree species. Ground cover mostly continuous.

1) Mainly broad leaved.

A) understory (<5m) dominated by chamaephytes
B) understory (<5m) dominated by phanerophtes
C) understory (<5m) dominated by hemicrytopytes
D) understory (<5m) dominated by geophytes
E) understory (<5m) dominated by therophytes
F) understory (<5m) dominated by lianas

2) Mainly deciduous coniferous e.g., Taxodium distichum (subdivisions as above*).

3) Mixed broad leaved and diciduous coniferous, e.g., Larix laricinia (subdivision as above*).

II. **WOODLANDS.** (Open stands of trees.) Formed by trees at least 15 feet tall. With most of their crowns not touching each other, but covering at least 30% of the surface. Grass cover sometimes present.

A. Mainly evergreen woodlands. Evergreen as defined in IA.

1. Evergreen broad leaved woodlands (e.g., Ilex spp.).

A) understory (<5m) dominated by phanerophytes
B) understory (<5m) dominated by chamaephytes
C) understory (<5m) dominated by hemicryptophytes
D) understory (<5m) dominated by geophytes
E) understory (<5m) dominated by therophytes
F) understory (<5m) dominated by lianas

2. Evergreen needle leaved woodlands. Mainly needle or scale leaved. Crowns of many trees extending to the base of the stem or at least very branchy.

a. Evergreen coniferous woodland with rounded crowns (e.g., Pinus spp.).

1) understory (<5m) dominated by phanerophytes
2) understory (<5m) dominated by chamaephytes
3) understory (<5m) dominated by hemicryptophytes
4) understory (<5m) dominated by geophytes
5) understory (<5m) dominated by therophytes
6) understory (<5m) dominated by lianas

b. Evergreen coniferous woodland with conical crown prevailing mostly sublpine (e.g., picea spp. and Abies spp.) (subdivisions as above*).

B. Mainly deciduous woodland. (see IB).

1. Cold deciduous woodlands with evergreen trees (see IB2).

a) understory (<5m) dominated by phanerophytes
b) understory (<5m) dominated by chamaephytes
c) understory (<5m) dominated by hemicrytophytes
d) understory (<5m) dominated by geophytes

e) understory (<5m) dominated by therophytes
f) understory (<5m) dominated by lianas

2. Cold deciduous woodlands without evergreen trees (seeIB2).

a. Broad leaved deciduous woodland (e.g., Quercus spp., Carya spp., Prunus Spp., etc.).

1) understory (<5m) dominated by phanerophytes
2) understory (<5m) dominated by chamaephytes
3) understory (<5m) dominated by hemicrytophytes
4) understory (<5m) dominated by geophytes
5) understory (<5m) dominated by therophytes
6) understory (<5m) dominated by lianas

b. Needle leaved deciduous woodland (e.g., Larix spp., Taxodium spp., etc.) (subdivisions as in 2a*).
c. Mixed deciduous woodland broad leaved and needle leaved (subdivisions as in 2a*).
d. Cold deciduous riverine woodland see IB2b (subdivisions as in 2a*).
e. Cold deciduous palustrine swamp or peat woodland see Ib2c (subdivisions as in 2a*).

III. **SCRUB**. Shrublands or thickets. Mainly composed of woody chamaephytes and phanerophytes (e.g., Rubus spp., Rosa spp., Myrica spp., etc) 0.5-5.0m tall.

A. Thickets. Poor in herbaceous undergrowth. Individual shrubs interlocked.

1. Mainly deciduous. (Deciduous in the sense of 1B)
2. Mainly evergreen thicket. (Evergreen in the sense of 1A.)

a. Evergreen broad leaved thicket.
b. Evergreen needle leaved thicket.

B. Shrubland. Rich in herbaceous undergrowth. Most of the individual shrubs not touching each other.

1. Mainly deciduous. (Deciduous in the sense IB).

a. Temperate upland deciduous shrubland.
b. Deciduous riverine shrubland. Fast growing shrubs, occurring as pioneer on banks of channels or islands that are often vigorously flooded, therefore mostly with very sparse undergrowth.
c. Deciduous peat shrubland with Sphagnum and or other peat mosses.
d. Palustrine deciduous shrubland. At least periodically flooded with water, or having ground water saturated soils (e.g. Cephalanthus occidentalis).
e. Lacustrine deciduous shrubland. Fast growing shrubs, occurring as pioneers on edges of permanent open water.

2. Mainly evergreen shrubland (e.g., Taxus spp.).

IV. **HERBACEOUS COMMUNITIES**. Grasses, graminoid and other herbaceous plants are Plants are predominant in the cover, but woody plants may be sparingly present (i.e., covering not more than 30%).

A. Terrestrial herbaceous communities

1. Steppers and related grasslands. (e.g., North American "prairies" etc.: temperate, with late summer drought and winter frost season.). More resistant to woody invasion than meadows. Therefore, trees or shrubs absent as a rule, except on wetter sites, e.g., along rivers, in ravines and in the forest border ecotone. Warm season grasses dominate.

   a. Tall grass steppes. Grasses taller than 1m dominate, e.g., Phragmites.

      1) Tall grass steppe with trees.
      2) Tall grass steppe with shrubs.
      3) Tall grass steppe with trees and shrubs.
      4) Tall grass steppe with without woody plants.

   b. Mid grass steppes. Medium sized grasses locally frequent , e.g. Panicum virgatum (subdivisions as in 1 above).

   c. Short grass steppes. Mostly composed of mat forming. More or less low grasses, e.g. Andropogen scoparius (subdivision as in 1 above).

   d. Forb rich steppers. Broad leaved forbs. Mostly hemicryptophtyes. Are frequent (subdivisions as in 1 above).

2. Meadows, pastures, or related grasslands. Hemicrytophytes dominating as a rule. More forbs than steppes. Cool season grasses dominate.

   a. Tree meadow. Grassland with isolated trees.
   b. Scrub meadow. Shrub groups in grassland.
   c. Grassy meadow with trees and shrubs.
   d. Grassy meadow without trees or shrubs.
   e. Sedge rush meadow. More or less graminoid herbs dominate. indicating periodically water logged soil.
   f. Lawn (where lawn is defined as maintained turf grasses) with trees.
   g. Lawn with trees and shrubs.
   h. Lawn with shrubs.
   i. Lawn without trees or shrubs.

3. Forb vegetation and similar communities. More or less broad leaved herbs dominating. Woody life forms only exceptionally present.

   a. Mainly perennial forb communities dominated by nongraminoid hemicrytophytes and geophytes. Annuals sometimes present, but of little importance.

      1) Forest border herb formation. Occuring as a narrow transitional band, consisting of hemicrytophytes, geophytes, and therophytes. Growing more vigorously than the adjacent pasture meadow.
      2) Tall forb formation. Dense stands of broad leaved herbs. Mostly dicotyledonous herbs taller than 50cm.
      3) Fern thicket.
      4) Perennial forb formation on organic deposits at the flood lines. Consisting of broad leaved herbs, growing abundantly on more or less decomposed organic deposits, which are often renewed by floods.

5) Perennial ruderal (i.e. growing on debris, ruins, and other places strongly influenced by man) and clearing herb formation. More or less broad leaved herbs.
6) Mainly perennial weed formation on cultivated land. Mostly hemicryptophytic Or geophytic weeds, growing more or less abundantly in the shade of cultivated Perennial plant stands (e.g., nurseries and gardens).

b. Mainly ephemeral (i.e. shortlived) forb communities. Therophytes more frequent than perennial herbs.

1) Ephemeral halophytic (i.e. plants that grow in salty soil) formation.
2) Ephemeral ruderal and clearing forb formation. Like 3a5 above, but dominated by annuals.
3) Mainly ephemeral weed formation on cultivated land.

B. Fresh aquatic or semi aquatic herbaceous communities. Includes lacustrine. riverine, and palustrine wetlands.

1. Emergent Wetlands. Open formations on constantly or mostly waterlogged ground, without or with very few woody plants.

a. Riverine. Emergent marsh associated with channel edeges.
b. Lacustrine. Associated with permenant open water.
c. Palustrine. Associated with semi permanent water, or groundwater saturated soils.

2. Sedge peat marshes and similar marshes. Dominated by sedges, seasonally flooded.

a. Tall sedge marsh. (frequently flooded and commonly for long periods: as a rule natural.) Foliage taller than 30-40 cm. Sedges dominating throughout; very few other life forms.
b. Low sedge marsh. (Flooded little or only for short periods.). Dominated by small sedges (Carex spp., Juncus spp., Scirpus spp., many other herbaceous life forms.

3. Flushes. Herbaceous vegetation growing on habitats where seepage water crops up at the surface. (Constantly wet, but rarely flooded).

a. Forb flush. Mostly dominated by small forbs.
b. Moss flush. Dominated by mosses.

V. **DESERTS** and other scarcely vegetated areas. Plants are scattered or may be absent. Chasmophytic vegetation: Permanent plants rooting in fissures of rocks or wall.

A. Crytogamic mat on rocks:

1. Foliose (i.e. leaflike) lichens and mosses dominant.
2. Crustose (i.e. crusty) lichens dominant.
3. Blue green algae dominant; dark strips on rocks caused by Cyanophyceae that grow actively when the water is trickling down.

B. Scarcely vegetated screes. (More or less unstable, steep slopes of stones beneath weathering rocks). Mostly permanent herbs or half woody plants adapted to survive the movement of stones at the scree surface, sometimes even stopping them.

C. Scarcely vegetated sand accumulations.

1. Scarcely vegetated sand dunes.

   a. Tall - grass dune. Built up and partially covered by geophytic grasses (e.g., Panicum virgatum or grass like plants which are able to adapt their root and shoot system to new accumulations of sand that bury them in stormy periods.
   b. Short grass dune (mostly continental). Low hemicryptophytic or geophytic grasses and sedges (e.g., Limonium carolinianum. Solidago sempevirens, etc.).
   c. Forb dune.

2. Bare sand dunes. Only exceptional with some isolated plants.

a. Shifting dunes in forest environment.
b. Shifting sunes in beach environment.

3. Artificial beach. Outside of tidal range.

D. Scarcely vegetated artifical surface (i.e., roads, parking lot, airstrips, buildings, courtyards, recreational facilities, etc.). Vegetation in cracks and small patches covering >30% of the area.

E. Scarcely vegetated compacted surfaces (i.e., dump, heavy equipment yard. etc.). vegetation restricted by soil compaction and periodic surface disturbance.

VI. **FRESHWATER AQUATIC PLANT FORMATIONS.** Lacustrine habitats that include those situated in a topographic depression or dammed river channel lacking trees, shrubs, emergents, mosses, or lichens with greater than 30%areal coverage. Composed of rooted and/or floating plants that endure or need water covering the soil constanly or at most times of the year.

A. Rooted floating leaf communities. Includes submergents e.g. Nuphar spp., Nymphaea spp., Brasenia schreberi.

B. Free floating (nonrooted) fresh water communities.

1. Broad leaved, free floating communities (temperate). Disappearing in the cold season.
2. Lemna type free floating communities.
3. Free floating macroscopic algae communities e.g. Spirogyra spp., Lyngbya contorta, Agmenellum. quadruplicatum.

C. Rooted Submergent. (e.g. Elodea spp., Potamogeton spp., Ceratophyllum spp., etc.).

VII. **INTERTIDAL COMMUNITIES.** Substrate is exposed and flooded by tides, includes the associated splash zones.

A. Marine. Salinities exceed 30 parts per thousand with little or no dilution except at the mouths ot estuaries.

1. Herbaceous. Includes emergent wetlands (intertidal salt marches).

   a. Flooded daily (e.g., Spartina alterniflora).
   b. Not flooded daily (e.g., high marsh, Spartina patens).

      1) Rich in succulents (e.g., Salicornia spp.).
      2) Poor in succulents.

2. Algal. Algae are the dominant plant species.

   a. Rock substrate.

      1) Blue green algae dominant.
      2) Green algae dominant (e.g. Fucus spp., etc.).

   b. Unconsolidated substrate, including mud flats.

B. Esturine. Usually semi enclosed by land but have open. Partially obstructed, or sporadic access to open ocean, and in freshwater runoff from the land.

1. Same subclasses as in A. above.

VIII. **VINELAND.** Characterized by >30% lianas (e.g., Lonicera japonica, Viti spp., Toxicodendron radicans). Often on forest or shrub border. Supported by artificial means or ground surface.

A. Lianas with trees.
B. Lianas with shrubs.
C. Lianas with trees and shrubs.
D. Lianas with forbs.