Biological and Natural Community Analyses of the Coastal Zone of Kent County, Delaware (Task No. 92-4)

FINAL REPORT

Submitted to:

DELAWARE COASTAL MANAGEMENT PROGRAM

January 1994

by

Delaware Natural Heritage Inventory
Division of Parks and Recreation
Department of Natural Resources and Environmental Control
89 Kings Hy., Dover, DE 19903 (302) 739-5285

Principle Investigators:

Christopher Heckscher.....Zoologist
Keith Clancy.....Community Ecologist
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Comprehensive Biological and Natural Community Analysis of the Coastal Zone of Kent County, Delaware

INTRODUCTION

The objectives of this project were twofold: (i) to undertake a comprehensive biotic inventory of Kent County (this included a special emphasis on rare species), and (ii) to assess and describe the full array of natural communities found within the coastal zone of Kent County, Delaware. Data collected during this study can then be used in conservation and protection efforts taking place in the county.

The land use history of Kent County, has led to a patchwork of severely degraded ecosystems and remnant natural communities. With an ever expanding population base and intensive land use activities, the need to identify those outstanding natural communities and rare species' sites remaining in the county is imperative. The Delaware Natural Heritage Inventory (DNHI) is a statewide program directed at identifying those species and natural communities of concern. DNHI believes that future land use practices should consider the preservation of our most valuable remaining ecosystems. This report summarizes the results of field surveys undertaken in Kent County during 1993 to identify remaining examples of outstanding or intact natural communities and habitats that support rare species. Brief mention will also be made of surveys and significant discoveries prior to 1992.

Initially, this project focused on survey work in one type of ecological habitat: the coastal plain pond community (or Delmarva Bay). Delmarva Bays are a significant ecological and geological entity in Delaware. Their origin is uncertain and many, previously studied Delaware ponds, contain an assemblage of rare species not generally found elsewhere in Delaware. A subset of ponds throughout Kent County were selected for inventory. Field surveys of this subset proved that many were highly degraded. In view of that discovery, the inventory work was expanded to include all intact habitats (including ponds) throughout Kent County.

This report includes information on locations, and discoveries of Federally listed or candidate species, state rare species, and an assessment of natural communities surveyed throughout the county during 1993. Discoveries made prior to 1993 are briefly mentioned.

Methods

Preliminary work involved reviewing the DNHI database for information from previously conducted field work in Kent County; these data were then used as an aid in selecting sites to field survey during the 1993 field season. In addition, potential inventory sites were also identified by reviewing United States Geological Survey (USGS) topographic maps for Kent County and by reviewing recent color infrared (CIR) and true color aerial photography for the county. A subset of these sites were then field-inspected to determine the degree of habitat quality, the presence of rare species and to determine overall biodiversity. Although several sites were visited on more than one occasion by DNHI biologists, additional survey work is needed

(see ADDITIONAL SURVEY NEEDS below) to adequately determine species richness and community structure. Data for each site were recorded onto field forms; these data included habitat descriptions (including notes on relative quality), community assessment, and presence of rare, as well as common, species.

Assessments and descriptions of natural communities were made by recording species compositions at each site, and determining the dominant species present for the tree, shrub, and herb strata. In those habitats that were deemed to be of sufficient quality, one or more plots (of varying sizes) were established and each species' percent cover value was estimated. Names applied to the natural communities described in this report, utilize the scientific names of one or more dominant species; after each "technical" natural community name is a more general name.

RESULTS

Natural Heritage biologists undertook biotic surveys in a variety of habitats throughout Kent County (see Kent County map insert; sites are described below). Surveys were undertaken in Palustrine and Estuarine wetland habitats which included hardwood swamp forests, Coastal Plain ponds, fresh-tidal and non-tidal marshes, brackish and salt marshes and terrestrial hardwood forests. Although attempts were made to concentrate survey efforts on those natural communities that were intact and of high quality, in fact, many sites surveyed were of very poor quality and highly degraded. Natural communities are classified (i.e. named and described) based on their dominant vegetation. Zoological and botanical inventory focused on state rare species (some common species are mentioned where deemed appropriate). Brief descriptions of the habitats that were surveyed (by USGS Quadrangle) and information on any rare zoological/botanical discoveries are presented below. In addition, property ownership and protection status are listed for each site surveyed, as well as additional survey needs. Apparent threats which might degrade the ecological quality of each site are noted where appropriate. State rare species or notable species of concern are listed with respective state ranks and are printed in bold within the site descriptions. Locational maps for all sites surveyed are provided (Appendix I). The Delaware Natural Heritage Inventory's criteria for state ranking of species are also provided (Appendix II). Data collected prior to 1993, are briefly discussed at the end of each quadrangle.

Survey Sites

Bennetts Pier Quadrangle

(1) Bennetts Pier Salt Marshes/Dunes/Beaches (Fig. 1):

SITE DESCRIPTION: The Bennetts Pier area contains relatively pristine saltmarsh habitat bordered by upland forests and agricultural fields to the west and the Delaware Bay to the east. The saltmarsh is dominated by saltmarsh cordgrass (*Spartina alterniflora*). Less common species found in these marshes include the following: saltwort (*Salicornia virginica*), salt hay (*Spartina patens*), spike grass (*Distichlis spicata*) and sea spear (*Atriplex patula*). In addition, high marsh

species such as hightide bush (*Iva frutescens*) and groundsel bush (*Baccharis halamifolia*) are found scattered throughout the marsh.

The Delaware Bayshore is recognized as a globally significant feeding area for migratory shorebirds. These birds congregate along the shorelines to feed on horseshoe crab eggs which have been deposited in the sand. Protection of migratory shorebird feeding areas will lie in protecting existing, pristine, horseshoe crab breeding areas, such as Bennetts Pier beach. Aerial flights conducted annually by the Delaware Division of Fish and Wildlife, have shown consistent shorebird use of this shoreline during the third week in May. In addition, this area is a significant foraging site for **Laughing Gulls, *Larus atricilla* (S3B)** and **Snowy Egrets, *Egretta thula* (S1B)**.

During the course of inventory work, several **Seaside Sparrows, *Ammodramus maritimus* (S3)** were observed within the saltmarsh. It should be noted that a pair of **Black Skimmers, *Rynchops niger* (S1B)** were observed here on one occasion. **Northern Harrier, *Circus cyaneus* (S1B, S3N)** were observed in these marshes in large numbers during the migratory months (September/October and March/April). These marshes likely provide important foraging terrain for harriers as they move seasonally through the Delaware Bay coast. However, there is potential that these marshes may provide future foraging and nesting sites for resident harriers. The large expanse of high quality marsh, seems to be ideal habitat for these open country raptors.

NATURAL COMMUNITIES: This site consists of a mosaic of natural community types, of which the cordgrass saltmarsh is the most abundant. Good to excellent quality.

- ***Spartina alterniflora* Salt Marsh [cordgrass salt marsh]**, forms an extensive, nearly monospecific community of cordgrass. It is found in the low marsh where the vegetation is inundated on a daily basis by tides. Other species present, but generally as scattered individuals include *Salicornia virginica* (glasswort) and *Atriplex patula* (spearscale). This marsh occurs behind the narrow barrier beach that separates it from the Delaware Bay. Daily tidal exchange occurs through the Brockenbridge Gut inlet to the north, via a main channel that bissects the marsh and is parallel to the shoreline. In addition, numerous mosquito ditches are present; these occur at regular intervals and run perpendicular to the main channel. The cordgrass salt marsh is relatively homogeneous on the north side of RD 122, and more heterogeneous on the south side. The cordgrass occurs in two forms: (1) the **tall form** which, typically, is found in lower portions of the marsh (e.g. closer to the water, or along sides of tidal ditches), and (2) the **short form** which dominates the broad marsh between the mosquito ditches.

- ***Spartina patens-Distichlis spicata* High Marsh [salt hay-spike grass salt marsh; salt meadow marsh]**. This community occurs as small inclusions within the cordgrass marsh. In some places, *D. spicata* may be lacking, or conversely, may be found in pure stands. This community is found more landward or in "higher" areas of the marsh with a greater tidal amplitude. *Juncus gerardi* (black grass) and the short form of *S. alterniflora* may occur intermixed in this community.

■ *Baccharis halamifolia-Iva frutescens* **Scrub-Shrub Marsh [groundsel tree-high tide bush marsh; salt bush-salt meadow marsh].** This community occurs near the upland edge of the salt marsh, often forming a distinct narrow or wide zone separating the high marsh from the upland vegetation. It also occurs within the *Spartina* marshes, particularly along the levees of the ditches. It also appears to be more abundant on the south side of RD 122. Other species frequently encountered in this community include: *Distichlis spicata, Hibiscus moscheutos, Panicum virgatum, Phragmites australis*, and *Spartina* spp.

Other Natural Communities at this site include:

(a) **tidal pools/salt pannes** (either are permanent bodies of water or are regularly exposed. Tidal pools typically lack vascular plants but may contain *Ruppia maritima* (ditch grass) and various macro-algal species. Salt pannes are rather harsh habitats that may accumulate salt deposits and are generally devoid of vegetation; occasional individuals of *Salicornia* spp. and *Spartina* spp. may be present.

(b) **pine-red maple scrub thickets** occur as small, scattered "islands" in the marsh and, characteristically, are dense thickets that may contain *Acer rubrum, Pinus taeda, Liquidambar styraciflua, Prunus serotina, Toxicodendron radicans, Myrica cerifera*, and *Rhus copallina*, among others.

■ **Coastal Dunes [sand dunes]** occur as a very narrow strip between the salt marshes and the beaches along the Delaware Bay. Species found in these dunes include the following: *Ammophila breviligulata* (beach grass), *Solidago sempervirens* (seaside goldenrod), *Spartina patens* (salt hay), *Phragmites australis* (common reed), *Cyperus* spp. (galingale), and *Panicum virgatum* (switch-grass). *Cakile edentulata* (sea-rocket), *Euphorbia polygonifolia* (seaside spurge), and *Salsola kali* (saltwort) may be found in the foredunes (or upper beach zone).

■ **Bay Beaches** at this site are comprised of coarse sands and peebles and are generally devoid of vegetation. This beach supports a diversity of invertebrates, is a prime spawning site for the horseshoe crab, and is an important feeding site for a number of migratory shorbirds (e.g. ruddy turnstones, dunlins, sanderlings, and semi-palmated sandpipers).

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

THREATS: Shoreline development.

ADDITIONAL SURVEY NEEDS: A breeding bird inventory should be undertaken, and efforts should be made to determine the presence of any rare *Lepodopteran* species utilizing this system.

(2) <u>Big Stone Beach</u> **(Fig. 2):**

SITE DESCRIPTION: South of the town of Big Stone Beach, occurs a long narrow stretch of

Delaware Bay beachfront. Like Bennetts Pier, this is an important horseshoe crab spawning site, and in turn attracts thousands of shorebirds during the peak period of horseshoe crab spawning. Species observed feeding here include: **Laughing Gull, *Larus atricilla* (S3B); Common Tern, *Sterna hirundo* (S1B, S3N); Dunlin, *Calidris alpina* (S3T); Ruddy Turnstone *Arenaria interpres* (S3N);** and **Red Knot, *Calidris canutus* (S3T).** Annual aerial surveys conducted by the Delaware Division of Fish and Wildlife, consistently show high use by ruddy turnstones and red knots during the third week in May.

The foredunes contain scattered individuals of sea-rocket (*Cakile edentula*), while the narrow dunes immediately adjacent are dominated by beach grass (*Ammophila breviligulata*) and seaside goldenrod (*Solidago sempervirens*). A scrub-shrub thicket is situated between the dunes and an extensive *Spartina alterniflora* dominated saltmarsh.

NATURAL COMMUNITIES: The habitats present at this site are, in essence, an extension of those located at Bennetts Pier (Fig. 1). Moderate quality.

- **Coastal Dunes [sand dunes].** See description for Bennetts Pier (above).

- **Bay Beaches.** See description for Bennetts Pier (above).

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

THREATS: Shoreline development.

ADDITIONAL SURVEY NEEDS: This stretch of beach should be inventoried in June for the presence of breeding birds. Emphasis should be on the beachfront area and adjacent wetlands south of the town of Big Stone Beach. Detailed inventories also need to be conducted for rare plants, particularly in the dune areas.

PREVIOUS SURVEY RESULTS: Only a limited amount of survey work was done previously, and only one state species of special concern had been identified: **Joor's sedge, *Carex joorii* (S2).** Quantified data on natural communities for Bennetts Pier Quadrangle is also lacking. A small forested area was previously surveyed and its natural community characterized: ■ ***Quercus* spp.-*Pinus taeda/Leucothoe racemosa* Floodplain Forest [mixed oak-pine/fetterbush forest].**

<u>Bombay Hook Quadrangle</u>

(1) <u>Bombay Hook National Wildlife Refuge ("Finis Woods")</u> **(Fig. 3):**

SITE DESCRIPTION: In the Piedmont Physiographic province of Delaware, moist, loamy soils high in nutrients and organic matter are typically found. These "rich woods" often support a characteristic flora, typically found only on the Piedmont. Delaware's Coastal Plain soils have a high percentage of sand and are not as rich in organic matter as soils found in the Piedmont. As a result, a flora quite different from the Piedmont is found. However, rich woods areas can

also be infrequently found on the Coastal Plain. These are described here as being Coastal Plain "rich wood pockets." When occurring in dense stands, may-apple (*Podophyllum peltatum*) appears to be a good indicator of this habitat type. Tulip poplar (*Liriodendron tulipifera*), can also be an indicator of Coastal Plain rich woods, but to a lesser extent than may-apple. An excellent example of this community type has been identified in the "Finis Woods" area at Bombay Hook.

Finis Woods is the name given to an area of fragmented woodlands which is dissected by refuge roads, crop lands, impoundments and wetlands. An association of mixed hardwoods defines the community structure of Finis Woods, with seral stages ranging from second growth to old growth.

The rare **yellow passion-flower, *Passiflora lutea* (S1)** was discovered within these woods. Only two other sites for this species are known in Delaware. The following plant species were also recorded in the Finis Woods area of Bombay Hook NWR. State ranks are given if species is of special state concern, and comments are also given from Robert Tatnall's 1946 *Flora of Delaware and the Eastern Shore*:

Scientific Name	State Rank	Comments
Anemonella thalictroides		(infrequent on the Coastal Plain)
Carex retroflexa	**S2**	**(infrequent in woods of the Piedmont)**
Cimicifuga racemosa		(rare on the Coastal Plain)
Circaea quadrisulcata		(common on the Piedmont, less frequent on the Coastal Plain)
Claytonia virginica		(common in the northern portion of the state, rare southward)
Collinsonia canadensis		(common in the Piedmont, local on the Coastal Plain)
Cryptotaenia canadensis		(rare on the Coastal Plain)
Dentaria laciniata		(common in New Castle Co., rare southward)
Galearis spectabilis	**S3**	**(only two collections on the Coastal Plain)**
Geranium maculatum		(common in New Castle Co., rare further south)
Lysimachia ciliata		(frequent in northern New Castle CO, rare southward)
Osmunda claytoniana	**S3**	**(frequent in the Piedmont, rare on the Coastal Plain)**
Oxalis violacea	**S3**	**(infrequent on the Coastal Plain)**
Phegopteris hexagonoptera		(frequent in the Piedmont, less common on the Coastal Plain)
Podophyllum peltatum		(common on the Piedmont, infrequent southward)
Polystichum acrostichoides		(common in the northern portion, rarer southward)
Sanguinaria canadensis		(infrequent to rare on the Coastal Plain)
Scutellaria elliptica	**S3**	**(frequent in New Castle Co., apparently rare farther south)**
Uvularia perfoliata		(common on the Piedmont, becoming rare southward)
Viola brittoniana	**S3**	

The potential remains for additional rare species to be located at Finis Woods.

NATURAL COMMUNITIES: Excellent quality, particularly considering the Piedmont-like characteristics of the poplar-oak/may apple community.

- ***Liriodendron tulipifera-Quercus* spp./*Podophyllum peltatum* Mesic Forest [tulip poplar-**

mixed oak mesic forest]. A "rich woods" characterized by an assemblage of species more commonly found on the Piedmont. Tulip poplar is the dominant canopy species, with lesser amounts of oaks (*Q. alba, Q. falcata, Q. prinus, Q. rubra*). *Fagus grandifolia* (beech), and *Carya* spp. (hickories) are also present. The shrub layer is relatively sparse, while the herbaceous layer is quite diverse and is dominated by *Podophyllum peltatum* (may-apple).

■ ***Quercus phellos/Clethra alnifolia* Swamp Forest [willow oak/sweet pepperbush swamp]** occurs as small inclusions, or at the edge of the tulip poplar-mixed oak mesic forest; it is located in low swamp areas adjacent to or in the Bombay Hook National Wildlife Refuge. In addition to the willow oak and the sweet pepperbush, other common species include *Q. palustris, Q. falcata, Rhododendron viscosum, Viburnum dentatum* var, *lucidum, Acer rubrum, Liquidambar styraciflua, Arisaema triphyllum, Mitchella repens, Carex* spp., and *Thelypteris palustris*.

OWNERSHIP/PROTECTION STATUS: Federal (U.S. Fish and Wildlife Service)/protected.

PREVIOUS SURVEY RESULTS: Very limited, although the Federally Endangered (LE) **Bald Eagle, *Haliaeetus leucocephalus* (S1B)**, and the **green tree frog, *Hyla cinerea* (S3)** were previously discovered in or near Bombay Hook National Wildlife Refuge.

Burrsville Quadrangle

(1) White Marsh Branch Woods (Fig. 4):

SITE DESCRIPTION: A relatively poor quality, and narrow, hardwood swamp forest dominated by red maple (*Acer rubrum*). The understory consists of such widespread species as lizard's tail (*Saururus cernuus*), false nettle (*Boehmeria cylindrica*), jewel weed (*Impatiens capensis*), viburnum (*Viburnum recognitum*), elderberry (*Sambucus canadensis*) and buttonbush (*Cephalanthus occidentalis*). Also, weedy species such as japanese honeysuckle (*Lonicera japonica*), trumpet creeper (*Campsis radicans*), poison ivy (*Toxicodendron radicans*) and pokeweed (*Phytolacca americana*) are abundant. There is very little upland forested buffer adjacent to this habitat. No rare species were observed in this wetland, although several rare sedges; **false hop sedge, *Carex lupuliformis* (S1)**; and **Mitchell's sedge, *Carex mitchelliana*** (S1) were previously discovered in the adjacent roadside ditch.

NATURAL COMMUNITIES: Poor quality.

■ ***Acer rubrum* Swamp Forest [red maple swamp]**. See Site Description (above). Poor quality natural community.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: No zoological inventories were undertaken here. There is some potential for rare amphibians to occur at this site.

PREVIOUS SURVEY RESULTS: Very limited. Several state rare species were previously identified from the Burrsville Quadrangle: e.g., **Barratt's sedge, *Carex barrattii* (S3); large sedge, *C. gigantea* (S3); false hop sedge, *C. lupuliformis* (S1); Mitchell's sedge, *C. michelliana* (S1); Elliott's gentian, *Gentiana catesbaei* (2); humped bladderwort, *Utricularia gibba* (S2);** and the **mud sunfish, *Acantharchus pomotis* (S2).**

Dover Quadrangle

(1) Mudstone Branch (Fig. 5):

Site A. East of Kenton Rd.:

SITE DESCRIPTION: This branch consists of a relatively pristine stream (including natural beaver ponds) with a sandy bottom, surrounded by hardwood upland forested slopes (the terrestrial forest on the north side consists of old growth hardwoods nearly 150 years old). Several extensive surveys were undertaken at this site in 1991; the following species, including several rare species, were observed at that time:

PARTIAL SPECIES LIST FOR THE MUDSTONE BRANCH OLD GROWTH FOREST AND WETLAND NATURAL COMMUNITIES

RARE PLANT SPECIES PRESENT:
(see attached ranking definitions)

Quercus bicolor	**Swamp white oak**	**S3**
*Ranunculus ambigens**	**Water plantain spearwort (buttercup)**	**S1**
Scutellaria elliptica	**Hairy skullcap**	**S3**

*** was ranked SH previous to discovery at this site; last collected in 1909**

Upland Plant Species:

Acer rubrum	Red maple
Amelanchier arborea	Service berry
Aralia nudicaulis	Wild sarsaparilla
Asplenium platyneuron	Ebony spleenwort
Aureolaria virginica	Downy false foxglove
Botrychium virginiana	Rattlesnake fern
Campsis radicans	Trumpet creeper
Carex laxiculmis	A sedge
Carex sp.	A sedge
Carpinus carolinianus	Hornbeam
Carya glabra	Pignut hickory
Castanea dentata	American chestnut
Chimaphila maculata	Wintergreen
Circaea quadrisulcata	Enchanter's nightshade
Cornus florida	Flowering dogwood
Cypripedium acaule	Pink ladie's slipper

Dioscorea villosa	Wild yam
Epifagus virginiana	Beech drops
Euonymus americanus	Burning/strawberry bush
Fagus grandifolia	American beech
Galium circaezans	Bedstraw
Goodyera pubescens	Rattlesnake plantain
Ilex opaca	American holly
Lindera benzoin	Spicebush
Liquidamber styraciflua	Sweet gum
Liriodendron tulipifera	Tulip poplar
Lonicera japonica	Honeysuckle
Lycopodium digitatum	Running pine
Lycopodium lucidulum	Shinning clubmoss
Lycopodium obscurum	Ground pine
Medeola virginiana	Cucumber root
Mitchella repens	Partridge berry
Parthenocissus quinquefolius	Virginia creeper
Pinus taeda	Loblolly pine
Pinus virginiana	Virginia pine
Podophyllum peltatum	May apple
Polygonatum biflorum	Solomon's seal
Prunus serotina	Wild black cherry
Quercus alba	White oak
Quercus falcata	S. red oak
Quercus michauxii	Swamp chestnut oak
Quercus rubra	Red oak
Quercus stellata	Post oak
Ranunculus sp.	Buttercup
Sassafras albidum	Sassafras
Scutellaria elliptica	Hairy skullcap
Smilacina racemosa	False solomon's seal
Smilax rotundifolia	Greenbrier
Tipularia discolor	Cranefly orchid
Vaccinium corymbosum	Highbush blueberry
Vaccinium spp.	Blueberries
Viburnum acerifolium	Maple-leaf arrow wood
Viburnum recognitum	Arrow wood
Viola sp.	Violet
Woodwardia areolata	Netted chain-fern

WETLAND SPECIES:

Acer rubrum	Red maple
Alisma subcordatum	Water plantain
Apios americana	Wild bean
Arisaema triphyllum	Jack-in-the-pulpit
Athyrium filix-femina	Lady fern
Betula nigra	River birch
Boehmeria cylindrica	False neetle
Callitriche heterophylla	Water starwort
Carex crinita	A sedge
Carex debilis	A sedge
Carex intumescens	A sedge

Carex stricta	A sedge
Clethra alnifolia	Sweet pepperbush
Cornus amomum	Silky dogwood
Cuscuta cf. *gronovii*	Dodder
Dioscorea villosa	Wild yam
Fraxinus pensylvanica	Green ash
Geum sp.	Avens
Glyceria septentrionalis	A manna grass
Gratiola virginiana	Hedge hyssop
Ilex glabra	Inkberry
Ilex laevigata	Smooth winterberry
Impatiens capensis	Jewelweed
Iris sp.	Blue flag
Lemna sp.	Duckweed
Leersia oryzoides	Rice cut-grass
Leucothoe racemosa	Fetter bush
Lindernia dubia	Lindernia
Liquidamber styraciflua	Sweet gum
Ludwigia palustris	Marsh purslane
Lycopus sp.	Water horehound
Mikania scandens	Climbing hempweed
Onoclea sensibilis	Sensitive fern
Osmunda regalis	Royal fern
Osmunda cinnamomea	Cinnamon fern
Peltandra virginica	Arrow arum
Polygonum hydropiperoides	Water smartweed
Polygonum arifolium	Tear thumb
Polystichum acrostichoides	Christmas fern
Pontedaria cordata	Pickerelweed
Potamogeton sp.	Pondweed
Quercus bicolor	Swamp white oak
Quercus phellos	Willow oak
Ranunculus ambigens	Water plantain spearwort
Rubus sp.	Blackberry
Salix nigra	Black willow
Saururus cernuus	Lizard's tail
Sium suave	Water parsnip
Smilax rotundifolia	Greenbrier
Symplocarpus foetidus	Skunk cabbage
Thelypteris palustris	Marsh fern
Urtica sp.	Stinging nettle
Viburnum recognitum	Arrow wood
Woodwardia areolata	Netted chain-fern
Woodwardia virginica	Virginia chain-fern

Amphibians and Reptiles* (with State Ranks)

Eastern Tiger Salamander	S2
Eastern King Snake	S2
Green Treefrog	S3
Spotted Turtle	S3
Wood Frog	S4
Redback Salamander	S5

Northern Cricket Frog	S5
Northern Spring Peeper	S5
Bullfrog	S5
Green Frog	S5
Eastern Box Turtle	S5
Five-lined Skink	S5
Northern Black Racer	S5
Eastern Garter Snake	S5

* Additional surveys may reveal more species; weather conditions, time of day, and seasons of the year affect survey results.

Birds (rare species present)

Great Blue Heron	S2B
Cooper's Hawk	S1B
Broad-winged Hawk	S2B
Barred Owl	S3
Black-billed Cuckoo	S2B
Pileated Woodpecker	S3 (but rare in Kent CO.)
White-breasted Nuthatch	S2B

Birds (other species observed; taxonomic order; most probably breeding)

American Black Duck
Mallard
Wood Duck
Northern Bobwhite
Red-Tailed Hawk
Turkey Vulture
Black Vulture
Great Horned Owl
Screech Owl
Yellow-billed Cuckoo
Whip-poor-will
Belted Kingfisher
Northern Flicker
Hairy Woodpecker
Downy Woodpecker
Eastern Kingbird
Great-crested Flycatcher
Eastern Phoebee
Eastern Pewee
Acadian Flycatcher
Scarlet Tanager
Northern Cardinal
Purple Finch
American Goldfinch
Rose-breasted Grosbeak
Rufous-sided Towhee
White-throated Sparrow
American Crow
Fish Crow
Bluejay
Carolina Chickadee
House Wren
Carolina Wren
Gray Catbird
American Robin
Veery
Wood Thrush
Cedar Waxwing
Red-eyed Vireo
Black and White Warbler
Common Yellowthroat
Louisiana Waterthrush
Red-winged Blackbird
Brown-headed Catbird
Common Grackle
Northern Oriole
Orchard Oriole

n.b. many species of warblers were present, but due to time constraints these were not identified to species; future field

work should be conducted during the summer months, and especially during the fall and spring migrations (these wetlands and upland forest provide one of the best stopover points for migratory birds in central Delaware)

NATURAL COMMUNITIES: Excellent quality old growth forest and wetlands.

■ ***Fagus grandifolia-Liriodendron tulipifera-Liquidambar styraciflua*** **Mesic Forest [beech-poplar-sweet gum Forest].** An excellent 'old growth' forest occurs along the Mudstone Branch. The canopy and sub-canopy trees consist of primarily beech-poplar-sweet gum; the oldest measure more than 100' in height and are nearly 150 years old. This is one of the finest known examples of mature upland forest on Delaware's Coastal Plain.

The surrounding upland communities include several extensive low-lying *Clethra*-dominated thickets. In addition, portions of the site contain younger, recently cut-over woods. The natural communities in the wetlands of Mudstone Branch were not decribed.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection; proposed for development.

THREATS: The majority of the upland portion of this site is being planned for development (though plans appear to be currently on-hold). If development takes place as planned, and most of the upland forest is removed, there could be extreme consequences to the quality of the adjacent wetlands and waters of the Mudstone Branch, not to mention a loss of a significant old growth forest tract.

ADDITIONAL SURVEY NEEDS: Additional biotic surveys are needed at this site, particularly on the south side of the creek and towards its confluence with Fork Branch. A breeding bird survey should be conducted in May and June to determine the presence of any species of special concern in the upland forested area, as well as the wetland portions of this tributary. Potential exists for the occurrence of additional state rarities, due to the unique nature of these mature forests.

Site B. Near confluence with Fork Branch:

The Palustrine floodplain forest on the north side of the Mudstone Branch was surveyed on 2 June 1993 (8 acres of this property has been acquired by the State's Land Protection Office). The swamp forest is a red maple-green ash dominated community with a relatively diverse understory. Species composition of the understory and the presence of weedy species are indicative of historic disturbance. A new subdivision is being constructed presently on the north side; several stormwater drains have been installed on the upper slopes above this wetland (See THREATS below).

Common species of the understory include: poison-ivy (*Toxicodendron radicans*), trumpet-creeper (*Campsis radicans*), virginia creeper (*Parthenocissus quinquefolius*), greenbriar (*Smilax rotundifolia*), lizard's tail (*Saururus cernuus*), false nettle (*Boehmeria cylindrica*), jewel-weed

(*Impatiens capensis*), sedges (*Carex lurida, C. crinita,* and *C. stipata*), waterparsnip (*Sium suave*), whitegrass (*Leersia virginica*), viburnum (*Viburnum dentatum* var. *lucidum*), swamp mallow (*Hibiscus moscheutos* [near stream]), arrowhead (*Sagittaria latifolia*), hempweed (*Mikania scandens*), reed grass (*Calamagrostis* sp.), fetter bush (*Itea virginica*), sweet pepperbush (*Clethra alnifolia*), madder (*Galium triflorum*), and smartweed (*Polygonum arifolium*), to name a few.

A species of dragonfly, ***Hagenius brevistylus*** **(S1)**, was discovered here on 15 May 1993. This represents a new **Kent County record.** This species is dependent on pristine streams with high water quality and a sandy substrate (a recent study of stream quality throughout Delaware, performed by DNREC, showed that the Mudstone has one of the highest water qualities of any stream sampled). **Great Blue Herons,** ***Ardea herodias*** **(S2B)**, were observed using the marshy areas of this tributary for feeding and resting. There is potential that these birds are nesting in the swampy regions of this tributary. In addition, a **Broad-winged Hawk,** ***Buteo Patypterus*** **(S2)** nest was discovered here in 1992, as well as the presence of a **Barred Owl,** ***Strix varia*** **(S3)** in 1993.

NATURAL COMMUNITIES: Moderate quality.

- ***Acer rubrum-Fraxinus pensylvanica*** **Swamp Forest [red maple-ash swamp].** A relatively diverse, but also disturbed, swamp forest along the Fork Branch dominated by maple and ash.

OWNERSHIP/PROTECTION STATUS: Most of this site is privately owned, although the State of Delaware owns an eight acre tract here/partial protection, though adjacent development may have long-term impact to wetlands quality.

THREATS: Stormwater run-off may seriously impact natural communities and water quality as run-off from storms is directed into wetland.

ADDITIONAL SURVEY NEEDS: Additional biotic surveys are needed at this site, on the south side of the creek and towards the Fork Branch confluence. A breeding bird survey should be conducted in May and June to determine the presence of any species of special concern. Potential exists for the occurrence of state rarities.

(2) <u>Forest West of Cheswold</u> **(Fig. 6):**

SITE DESCRIPTION: This palustrine, mixed second growth hardwood forest (nearing maturity) contains a single Coastal Plain pond **(Category I wetland)** of relatively good quality. The Palustrine forest is diverse with the following species common: white oak (*Quercus alba*), spanish oak (*Quercus falcata*), swamp oak (*Quercus michauxii*), american beech (*Fagus grandifolia*), tulip poplar (*Liriodendron tulipifera*), sweet gum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), hickory (*Carya* sp.), sweet bay (*Magnolia virginiana*), american holly (*Ilex opaca*), ironwood (*Carpinus caroliniana*), sweet pepperbush (*Clethra alnifolia*), blueberry (*Vaccinium corymbosum*), spicebush (*Lindera benzoin*), strawberry bush (*Euonymus americanus*),

japanese honeysuckle (*Lonicera japonica*), false solomon's seal (*Smilacina racemosa*), swamp lily (*Lilium superbum*), partridge berry (*Mitchella repens*), skunk cabbage (*Symplocarpus foetidus*), spotted wintergreen (*Chimaphila maculata*), crane-fly orchid (*Tipularia discolor*), may-apple (*Podophylum peltatum*), sedges (*Carex* spp.), blue swamp violet (*Viola cucullata*), New York fern (*Thelypteris noveboracensis*) and club mosses (*Lycopodium lucidulum*, *L. obscurum*, and *L. digitatum*).

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: This entire site needs additional inventory to determine the presence of any rare plants or animals. These elements should be searched for in the forested area, as well as in the Coastal Plain pond. Zoological inventory work should be conducted in April for amphibians and dragonflies, and in June for breeding birds and dragonflies.

NATURAL COMMUNITIES: Fairly good quality.

- ***Quercus phellos-Fagus grandifolia-Liriodendron tulipifera* Mesic-Wet Forest [willow oak-beech-poplar forest].** See Site Description (above) for details.

- ***Cephalanthus occidentalis* Coastal Plain Pond [button bush pond].** See Site Description (above) for details.

(3) <u>Fork Branch West of Kenton Road</u> (Fig. 7):

SITE DESCRIPTION: Towards the upper reaches of the Fork Branch there occurs extensive, relatively high quality palustrine and terrestrial forests. The swamp forest is dominated by red maple (*Acer rubrum*), with lesser numbers of ash (*Fraxinus pensylvanica*). It is disturbed near Kenton Road and on the north side of the creek where houses have been built very near its edge. The understory is diverse with such species as the following: skunk cabbage (*Symplocarpus foetidus*), jack-in-the-pulpit (*Arisaema triphyllum*), *Lindera benzoin*, *Impatiens capensis*, cinnamon fern (*Osmunda cinnamomea*), *Senecio aurea*, *Viola* sp., *Saururus cernuus*, *Viburnum dentatum* var. *lucidum*, *Carex* spp. (*stipata*, *stricta*), royal fern (*Osmunda regalis*), netted chain fern (*Woodwardia areolata*), spotted cowbane (*Cicuta maculata*), *Clethra alnifolia*, arrow-arum (*Peltandra virginica*), *Sambucus canadensis* and *Aronia arbutifolia*.

The terrestrial forest consists of an excellent quality american beech (*Fagus grandifolia*) and tulip poplar (*Liriodendron tulipifera*)-dominated mature forest. The understory is relatively sparse but is dominated by heaths: e.g., huckleberry (*Gaylussacia frondosa*), wild azalea (*Rhododendron periclymenoides*), and low bush blueberry (*Vaccinium* cf. *vacillans*). Several individuals of chinquapin (*Castanea pumila*) were observed in this forest community.

NATURAL COMMUNITIES: Moderately good to high quality forests.

- ***Acer rubrum-Fraxinus pensylvanica* Swamp Forest [red maple-green ash swamp].** See Site

Description (above) for details.

■ ***Fagus grandifolia-Liriodendron tulipifera* Mesic Forest [beech-tulip poplar forest].** See Site Description (above) for details.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

THREATS: Development of uplands.

ADDITIONAL SURVEY NEEDS: This site needs zoological inventory work to determine the presence of species of special concern in the wetlands and adjacent uplands. Emphasis should be given to breeding birds in late May or June, and amphibians in early spring (April).

(4) Cahoon Branch S. of RD 158 (Fig. 8):

SITE DESCRIPTION: This creek, with its associated floodplain forest and nearby upland forest, was only briefly surveyed. The stream has been ditched in the past but is beginning to revert back to a more natural system. The adjacent upland forest on the east side is an important buffer to this stream and ultimately may be significant in maintaining the water quality of Silver Lake downstream. The forest, although not containing rare species, does contain numerous young american chestnuts (*Castanea dentata*; a species on the State's Watch List).

NATURAL COMMUNITIES: More detailed surveys are required to accurately describe and characterize the habitats at this site.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

THREATS: Future development threatens the upland forests. Reditching of the stream would negatively impact this system.

ADDITIONAL SURVEY NEEDS: Further zoological inventory work is needed. Emphasis should be on amphibians and reptiles within the wetland corridor.

(5) Leipsic River Above Garrisons Lake (Fig. 9):

SITE DESCRIPTION: A beaver-impounded stream occurs above Garrisons Lake consisting of extensive colonies of arrow-arum (*Peltandra virginica)*, and water primrose (*Ludwigia peploides)*. Tussock sedge *(Carex stricta)* is frequent in this beaver pond. The upland forests have been cleared virtually to the edge of the wetland (only a narrow strip of forest borders the creek).

NATURAL COMMUNITIES: Not characterized. The palustrine forest upstream from the beaver pond is quite narrow and highly disturbed; there is very little adjacent upland forest buffer to this wetland.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

THREATS: With croplands to the edge of the wetlands, water quality of the stream is in serious jeopardy.

ADDITIONAL SURVEY NEEDS: Additional botanical and zoological inventory work are needed at this site.

PREVIOUS SURVEY RESULTS: Surveys along the Mudsone Branch (see Site 1A above) were undertaken in 1991 and 1992. Otherwise, inventory work on the Dover Quad has been limited. Significant previous discoveries include the **American lotus, *Nelumbo lutea* (S1)** and the **mud sunfish, *Acantharchus pomotis* (S2)**, along the St. Jones River.

Frederica Quadrangle

(1) Milford Neck Ponds East; Pond 2 (Fig. 10, Site A):

SITE DESCRIPTION: This Coastal Plain pond has an open canopy (i.e. it is herbaceous dominated) and is surrounded by mature forest. A road cuts along its eastern side.

On 19 April, high water (up to 3 feet in depth) was present. Several neotropical migrant and resident bird species (e.g. **Yellow-throated Warbler, *Dendroica dominica* (S3B)**; Black and White Warbler, *Mniotilta varia*; Palm Warbler, *Dendroica palmarum*; Wood Thrush, *Hylocichla mustelina*; Hermit Thrush, *Catharus guttatus*; Hairy Woodpecker, *Picoides villosus*; Red-bellied Woodpecker, *Melanerpes carolinus*; Downy Woodpecker, *Picoides pubescens*; Yellow-rumped Warbler, *Dendroica coronata*; and Red-winged Blackbird, *Agelaius phoeniceus*) were observed utilizing the mature forested habitat immediately surrounding this pond. In addition, three common dragonflies were collected at this site (*Pachydiplax longipennis*, *Sympetrum rubicindulm* (or *internum*), and *Lestes rectangularis*).

Two **Little Blue Heron, *Egretta caerulea* (S1B)** individuals, were observed at this site on two different occasions. This indicates the possibility that this pond is either a nesting site (though no nests were observed) for this species, or an important feeding area.

NATURAL COMMUNITIES: Moderate quality, but pond seems to be experiencing a possible overload of nutrients.

- ***Cephalanthus occidentalis*/Mixed Herbaceous Coastal Plain Pond [buttonbush/mixed herbs pond]**. A highly diverse, seasonally flooded pond with a nearly 100% vegetated surface. Species in abundance here include the following: *Cephalanthus*, *Polygonum punctatum*, *Ludwigia sphaerocarpon*, *Bidens laevis*, *B. frondosa*, *Echinochloa walteri*, *Proserpinaca pectinata*, and *Rhynchospora macrostachya*.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

THREATS: Loss of the mature woodlands would not only negatively impact these forests, but may degrade the quality of this pond as a whole.

ADDITIONAL SURVEY NEEDS: Additional botanical and community work needs to be conducted. Little Blue Herons should be looked for in the future, and if found, the importance of this pond for these birds should be determined.

(2) Milford Neck Ponds East; Black's Pond (Fig. 10, Site B):

SITE DESCRIPTION: This Coastal Plain pond contains a large colony of the pest, common reed, *Phragmites australis* around its perimeter. Immediatedly to the interior of the reed, is a large colony of cattail, *Typha angustifolia*, which nearly encircles the pond. At the time of survey, the pond was dry and the large central portion consisted entirely of bare cracked soil. Much of the upland woods surrounding this pond has been recently logged, however, the **large sedge, *Carex gigantea* (S3)**, was discovered here (immediately adjacent to pond opening). Other rare species, previously identified from this pond include: **squarestem spikerush, *Eleocharis quadrangulata* (S3), featherfoil, *Hottonia inflata* (S2), cutleaf water-milfoil, *Myriophyllum pinnatum* (S2)**, and **humped bladderwort, *Utricularia gibba* (S2)**.

NATURAL COMMUNITIES: Fair quality pond.

■ ***Nymphaea odorata-Utricularia gibba* Coastal Plain Pond [water lily-bladderwort pond]***. A Coastal Plain Pond that consists of an abundance of water lily and bladderwort as observed during 1991 surveys. Surveys in 1993 were too late in the season, as pond had drawn-down and was nearly devoid of vegetation.

* based on 1991 surveys; pond should be re-visited in 1994.

OWNERSHIP/PROTECTION STATUS: Private/currently no Protection.

THREATS: *Phragmites* expansion, agricultural run-off (eutrophication).

PREVIOUS SURVEY RESULTS: Additional surveys were undertaken along the St. Jones River, at Dover Air Force Base, and in other coastal plain ponds, and the following species of special concern were discovered: several sedges, ***Carex joorii* (S2); *C. typhina* (S1); spikerushes, *Eleocharis melanocarpa* (S2); *E. quadrangulata* (S3); white boneset, *Eupatorium album* (S2); featherfoil, *Hottonia inflata* (S2); bald eagle, *Haliaeetus leucocephalus* (S1B, LE); water-milfoil, *Myriophyllum pinnatum* (S2); yellow passion-flower, *Passiflora lutea* (S1); green frog-fruit, *Phyla lanceolata* (S1); carolina petunia *Ruellia caroliniensis* (S1)**; and several **bladderworts, *Uticularia gibba* (S2)**; and ***U. radiata* (S2)**.

Greenwood Quadrangle

No biotic surveys were undertaken on this quadrangle during 1993. In addition, prior surveys

are also lacking.

ADDITIONAL SURVEY NEEDS: Although nearly all of the streams are ditched, several thousand acres of forested habitat exists in the Kent County portion of the Greenwood Quadrangle. Surveys are badly needed throughout this quadrangle.

Harrington Quadrangle

(1) Bright-Haines Glade Branch Forest (Fig. 11):

SITE DESCRIPTION: Southwest of Harrington occurs one of the largest contiguous forested areas in Kent County. Bright-Haines Glade Branch (BHGB) cuts through the center of this forest. BHGB has been ditched, but appears to be slowly recovering vegetatively. This site maintains a large core area of relatively pristine forest interior (>100 M from an edge). Although greenbriar (*Smilax* spp.) is thick in some areas, this site appears to have been minimally impacted by forest fragmentation effects, providing ideal habitat for many forest interior-dwelling birds.

Sixteen neotropical bird species were found at this site during the nesting season. Of interest was the apparent high numbers of **Worm-eating Warblers, *Helmitheros vermivorus* (S3B)**. Three different territories were located in the southern portion of this site. In addition, a pair of **Pileated Woodpeckers, *Dryocopus pileatus* (S3)**, were observed here. These woodpeckers require large tracts of mature forests, indicating that additional species of concern which require contiguous mature forest, have the potential of being discovered. A **Great Blue Heron, *Ardea herodias* (S2B)**, was also observed foraging in BHGB.

NATURAL COMMUNITIES: Not characterized.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

THREATS: A unique aspect of this forest is the large unbroken area. Any fragmentation will degrade this site as a current potential reservoir for forest interior species.

ADDITIONAL SURVEY NEEDS: Botanical and natural community inventories are needed at this site. Additional inventory for avain species of concern should focus on detection of forest interior species (accipiters, buteos, owls and warblers). This site also warrants amphibian and reptile herpetological inventory work, especially within BHGB. Use of BHGB by herons should also be investigated.

PREVIOUS SURVEY RESULTS: Several surveys prior to 1993 resulted in the discoveries of the following species of special concern: **several sedges, *Carex barratti* (S3); *C. collinsii* (S3); Joor's sedge, *C. joorii* (S2); and *Scleria reticularis* (S2); swamp pink, *Helonias bullata* (S3, LT); sheep-laurel, *Kalmia angustifolia* (S2); blue lupine, *Lupinus perennis* (S1); and coast violet, *Viola brittoniana* (S2)**. The bald eagle was observed along the Murderkill River,

and *Helonias* was discovered at two sites; along the Tantrough Branch and at Killens Pond State Park. The rare lupine also was found at Killens Pond State Park, the only known Kent County site for this legume.

Hickman Quadrangle

No biotic surveys were undertaken on this quadrangle during 1993. In addition, prior surveys are also lacking.

ADDITIONAL SURVEY NEEDS: Like the Greenwood Quadrangle extensive ditching occurs on the Hickman Quadrangle (the Marshyhope has been badly channelized). Similarily, several thousand acres of forested habitat exists on this quadrangle and surveys are badly needed throughout.

Kenton Quadrangle

(1) Penrose Branch E. of RD 163 (Fig. 12):

This floodplain forest and the associated second growth upland forest, were briefly surveyed. Ash (*Fraxinus pensylvanica*) is the dominant overstory tree. Red maple (*Acer rubrum*) is abundant in the understory. Other co-occurring understory species include *Viburnum dentatum* var. *lucidum*, *Symplocarpus foetidus*, *Smilax rotundifolia*, *Impatiens capensis*, *Boehmeria cylindrica*, *Lonicera japonica*, *Carex intumescens*, *Parthenocissus quinquefolius*, *Sambucus canadensis*, *Peltandra virginica*, swamp peanut (*Apios americana*), *Osmunda cinnamomea*, and *Lindera benzoin*.

Disturbances at this site include extensive logging of uplands along the south side of the stream, clearing along the floodplain, and a well worn path on the north side.

No state rare species were observed here, except for two small **bald cypress, *Taxodium distichum*** (S2) individuals; these were observed in a thicket of young vegetation and were likely planted.

NATURAL COMMUNITIES: Poor to good quality.

- ***Fraxinus pensylvanica-Acer rubrum* Floodplain Forest [green ash-red maple swamp forest]**. A somewhat disturbed streamside forest. Stream has been ditched, though not recently.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: A zoological inventory is needed at this site.

(2) Tappahanna Ditch East Forest (Fig. 13):

A large mesic-wet hardwood forest was briefly surveyed on 3 May 1993. Several ditches and old logging roads were observed throughout the area surveyed. Second growth forest consists of mixed hardwoods and a dense understory of an almost inpenetrable greenbrier-blackberry thicket. No rare species were located at this site but only a small fraction of the forest tract was surveyed. It is likely that the physiognomy is little changed throughout.

NATURAL COMMUNITIES: Poor to moderately good quality (more inventory work is needed).

- **Mixed Hardwood Floodplain Forest**. A highly diverse second growth Palustrine forest with no true dominants. This forest is composed of a mixture of oaks (*Q.alba, Q. falcata, Q. rubra, Q. phellos*), *Acer rubrum, Liquidambar,* and *Nyssa sylvatica* in the canopy. Greenbriers (*Smilax* spp.) and brambles (*Rubus*) are quite abundant and thick throughout.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

(3) Stillmar Property at Blackiston (Fig. 14):

This site consists of a second-growth hardwood forest dominated by willow oak (*Quercus phellos*), with a subcanopy consisting of *Acer rubrum*, and *Nyssa sylvatica*, a shrub layer of paw-paw (*Asimina triloba*), winterberry (*Ilex verticillata*), *Viburnum dentatum*, *Vaccinium corymbosum*, and an herbaceous layer consisting of cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda regalis*), several club-mosses (*Lycopodium* spp.) and other common species. Certain areas of these woods contain dense, virtually impenetrable thickets of greenbriers (*Smilax* spp.). Drainage ditches were observed (undoubtedly affecting hydrology), although several low, poorly drained areas were encountered.

Although no rare plants were found, several were discovered growing in low swales along a powerline R-O-W that bisects the lower portion of this site and runs in a southeast to northwest direction. The rare plants observed were: **globe beakrush, *Rhynchopsora globularis* (S1); whip nutrush, *Scleria triglomerata* (S1); swamp sunflower, *Helianthus angustifolius* (S2)**; and **colic root, *Aletris farinosa* (S3).**

The most significant zoological find was the presence of the red-banded hairstreak (*Calycopis cecrops*) utilizing the R-O-W. Although rather common in Delaware, this is **only the second occurrence discovered in Kent County.** Other species utilizing the R-O-W include pearl crescent *(Phycoides tharos)*, tiger swallowtail (*Papilio glaucus*), and other unidentified butterflies and skippers (these species eluded capture and positive identification). The diversity of invertebrates at this site indicates the possibility that rarities may be found with additional inventory effort.

NATURAL COMMUNITIES: Poor to good quality.

- ***Quercus phellos-Acer rubrum* Mesic-Wet Forest [willow oak-red maple forest]**. See Site

Description (above) for details.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection, however, property is being considered for donation to the Delaware Nature Society (private conservation organization).

ADDITIONAL SURVEY NEEDS: The seasonally flooded woods should be inventoried for amphibians in early spring.

(4) Northwest of Davis Corners (Fig. 15):

A rather unremarkable second growth hardwood forest occurs at this site. The only notable species observed here was the **running pine, *Lycopodium clavatum* (S3)**. The forest contained several trash dumps.

NATURAL COMMUNITIES: Not characterized.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: Additional botanical, zoological and natural community survey work is needed, particularly in the eastern and southern portions of this forest tract.

(5) Double Ponds (Fig. 16):

These Coastal Plain ponds consist of rather large open wetlands of emergent vegetation. Vegetation consists of primarily grasses and sedges, but may also contain significant amounts of button-bush (*Cephalanthus occidentalis*). Several rare species have been observed in these ponds from previous site visits, including the Federal Candidate species, **dwarf fimbry, *Fimbristylis perpusilla* (S1, Federal C2); button sedge, *Carex bullata* (S1); twig-rush, *Cladium mariscoides* (S2); maidencane, *Panicum hemitomon* (S2); *Paspalum dissectum* (S2); and an arrowhead, *Sagittaria engelmanniana* (S1). A spotted turtle (*Clemmys guttata*, S3)** was discovered here in March. This was the first known record for this species at this site.

An otherwise unremarkable second growth forest surrrounds these ponds. However, it should be noted, that these surrounding woodlands greatly determine the hydrology and water quality of these ponds, as well as protecting existing rare species.

NATURAL COMMUNITIES: The five herbaceous-dominated coastal plain ponds are of very high quality (some of the best pond habitat in Kent County). The surrounding forest is of average to good quality.

- **Graminoid-Dominated Coastal Plain Ponds [Delmarva Bays].** A series of five, relatively diverse, intermittently flooded ponds situated in a more or less linear fashion. Frequently encountered species in these ponds include the following: *Cephalanthus occidentalis* (generally

with ca. 10% cover), *Carex striata, Panicum spretum, Juncus canadensis, Bidens frondosa, Rhynchospora macrostachya, Dulichium arundinaceum, Hypericum virginicum, Rhexia virginica, Decodon verticillatus*, and *Proserpinaca pectinata.*

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: Additional zoological survey work should be conducted for amphibians and invertebrates.

(6) Jordan Branch (Fig. 17):

A highly disturbed and narrow Palustrine forested habitat occurs along this creek. The Jordan Branch has been ditched previously and plans are underway to rework the ditch this season. Extensive paw paw (*Asimina triloba*) occurs along this branch (especially on the east side of the ditch). The west side of the branch has very little buffer. Property owners have extended their back yards to the edge of the wetland. No rare species were discovered here.

NATURAL COMMUNITIES: Not characterized; habitat extremely degraded with an abundance of weedy species.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: The presence of paw paw indicates a potential breeding site for *Eurytides marcellus* (Zebra swallowtail), currently ranked SA. This area should be inventoried for reproductive evidence of this species.

PREVIOUS SURVEY RESULTS: Only a few surveys, prior to 1993, were undertaken on the Kenton Quadrangle. In addition to several other rare sedges, the most significant discovery was the **dwarf fimbry, *Fimbristylis perpusilla***, a Federal Candidate species for listing (see Double Ponds site above).

Marydel Quadrangle

Several rather poor quality mesic-wet second-growth woods, dominated by red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*) and other hardwoods (e.g. *Quercus* spp., *Liriodendron tulipifera, Nyssa sylvatica, Sassafras albidum*), were inventoried. The understory in this forest consists of nearly impenetrable greenbrier (*Smilax* spp.) thickets. Ditches are also prevalent.

Several Coastal Plain ponds on this quadrangle have been surveyed. With some exceptions, most were discovered to be degraded. The majority of these are degraded due to hydrologic perturbations (e.g. drained due to ditching), logging to the edge, or agricultural run-off problems. In addition, the ponds were either dominated by weedy species, were "filling-in" with woody plants, or were being used as trash dumps (particularly those near dwellings or roads).

(1) Woods and Ponds Northwest of Chapeltown (Fig. 18):

This site consists of a highly disturbed and degraded large second growth mesic hardwood forest of oaks (Q. alba, Q. phellos, Q. falcata, Q. rubra), sweet gum (Liquidambar), and red maple (Acer rubrum), with a dense understory of greenbrier, *Smilax* spp. (the latter species caused walking to be extremely difficult and slow). Several ditches "run" through the forest. The large pond (as indicated on the topographic map) in the western portion of this forest is also rather degraded; the nearby ditches are possibly disturbing its hydrology. At the time of survey (16 June 1993) the pond was dry. It was also "succeeding" into a forested wetland. No significant plant or animal species were observed at this site, although the **large sedge, *Carex gigantea*** (S3) was previously discovered from the pond.

NATURAL COMMUNITIES: Due to disturbed/degraded condidtion of this forest tract the natural communities were not assessed.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

(2) Culbreth Marsh Ditch Pond (Fig. 19):

A small roadside pond was briefly surveyed on 16 June 1993. The pond was dry and contained very little herbaceous cover, only sphagnum moss was observed (although the rare plants, **giant sedge, *Carex gigantea*** (S3) and **beak rush, *Rhynchospora corniculata*** (S1) were reported here from a previous year's survey). The surrounding forest consists of mixed oaks and other hardwoods. No animal species of special concern were observed.

NATURAL COMMUNITIES: The brief visit, and the lack of vegetation at time of sampling, precluded an assessment of the natural community.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: Zoological inventory should take place in April to determine the presence of any amphiban species of concern. Also, the vegetation of the pond should be re-evaluated and the surrounding forest needs to be surveyed.

(3) Sandtown Pond (Fig. 20):

This pond was noted to consist of a relatively high diversity of herbaceous species, including several rare grasses and sedges (discovered in 1992): **maidencane, *Panicum hemitomon*** (S2); **Walter's paspalum, *Paspalum dissectum*** (S2); **and long-beaked baldrush, *Rhynchospora scirpoides*** (S2). No rare animals were located here.

NATURAL COMMUNITIES: Rather good quality pond considering its lack of buffer and nearness to county road.

■ *Cephalanthus occidentalis/Juncus canadensis* **Coastal Plain Pond [button bush/rush coastal plain pond].** Although this pond is immediately adjacent to a road and agricultural land it is of medium quality and deserves some protection/restoration efforts. The buttonbush occurs in small clusters with a cover value of less than 25%, while the rush is quite abundant and has a cover value of nearly 40%.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

(4) Other degraded ponds:

More than ten ponds (some located north of Mud Millpond, others near Sandtown) were surveyed and were discovered to be degraded. These ponds either had succeeded to closed canopy, were drained, had been timbered to their edges or within their borders, or were found to contain many weedy species.

There was a paucity of animals observed in these ponds, an occasional grey treefrog and green frog were observed or heard, while rare salamanders (e.g. tiger, *Ambystoma tigrinum*, and spotted, *A. maculatum*) were not located.

OWNERSHIP/PROTECTION STATUS: All ponds are believed to be privately owned with no current protection.

(5) Forest South of Culbreth Marsh Ditch (Fig. 21):

This site is a dry-wet mixed hardwood, second growth forest dominated by red maple and sweet gums, with a scattering of willow oaks (*Quercus phellos*). Old logging roads and ditches were scattered throughout the area sampled. A very inhospitable place, with impenetrable thickets of greenbriers (*Smilax* spp.). *Clethra alnifolia* is the dominant shrub. Surveys here were incomplete but habitat is believed to be similar throughout. No rare plant species were observed.

NATURAL COMMUNITIES: Poor to fair quality; additional surveys are needed.

■ *Acer rubrum-Liquidambar styraciflua* **Forest [red maple-sweet gum woods].** See Site Description (above) for details.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection

ADDITIONAL SURVEY NEEDS: Although the forest is somewhat degraded, and walking is difficult, this site needs additional zoological and botanical survey.

(6) Choptank River (Fig. 22):

Site A. North Side of RD 211 bridge:

North of RD 211 in the wetlands and forests surrounding the Choptank, many rare species of plants were found: a **nut sedge, *Cyperus refractus* (NEW STATE RECORD, now ranked S1); slender day flower, *Commelina erecta var. angustifolia* (S1); cluster-stemmed chickweed, *Paronychia fastigiata* (S1); hairy bushclover, *Lespedeza hirta* (S2); hairy pinweed, *Lechea villosa* (S2); low frostweed, *Helianthemum propinquum* (S2); toothcup, *Rotala ramosior* (S2); forked chickweed, *Paronychia canadensis* (S2); sharp-winged monkey flower, *Mimulus alatus* (S2); velvety tick treefoil, *Desmodium viridiflorum* (S2); smooth tick-treefoil, *Desmodium laevigatum* (S2); Elliot's Gentain, *Gentiana catesbaei* (S3); hairy skullcap, *Scutellaria elliptica* (S3);** and **white milkweed, *Asclepias variagata* (SU).**

NATURAL COMMUNITIES: Additional surveys are needed before descriptions can be written.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: Much additional survey work is needed within this riverine system. There is potential for the discovery of zoological species of concern. In particular, this area is a historic site for the Cerulean warbler (*Dendroica cerulea*; S1B, Federal C2). This system may also be a critical area for neotropical migrants during the breeding season and during spring and fall migration. Additional botanical and community inventory is warranted.

Site B. Choptank River South of RD 211 bridge:

This area is a Palustrine System thta seems to be of fairly high quality. Several dragonfly species were seen but were unable to be collected with the exception of *Engthemis simplicicollis* (common in Delaware). A number of neotropical migrant birds (8 species total) were identified as well as many year-round resident species.

A significant botanical find included the discovery of the **rough dropseed, *Sporobolus clandestinus* (formerly ranked SH, now S1)** and **tall bush clover, *Lespedeza stuevei* (formerly ranked SH, now S1).** A large population of **wild columbine, *Aquillegia canadensis* (S1)** was found growing along a sandy road bank just west of the river. This population, which is the only known station on Delaware's Coastal Plain, was first reported by Robert Tatnall in 1934. Also found at this site was the rare **blunt-lobed woodsia, *Woodsia obtusa* (S2)**, another plant species typically found on the Piedmont; this is its first known Coastal Plain location in Delaware and a **new KENT COUNTY RECORD**. Lastly, surveys revealed the presence of the state rare **lance-leaved loosestrife, *Lysimachia hybrida* (S2)** found near the wetland.

A young oak-hickory woodland (sparse canopy, ca 20-30 ft.) on mesic sandy soil along the east side of the floodplain, was surveyed. Several rare plant species were discovered at this site: **wintergreen, *Chimaphila umbellata* ssp. *cisatlantica* (S1);** and **crinkled hairgrass, *Deschampsia flexuosa* (S3).** The woodland consists of mature hardwoods (e.g. hickory (*Carya tomentosa), Quercus alba, Quercus falcata*, red oak *(Quercus rubra), Liquidambar styraciflua*, and *Carpinus caroliniana*). Virginia pine (*Pinus virginiana*) is also present. The understory is

sparse with such species as *Gaylussacia frondosa*, *Parthenocissus quinquifolia*, *Carex pennsylvanica*, and *Smilacina racemosa*, present.

NATURAL COMMUNITIES: Needs additional surveys before descriptions can be written.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

THREATS: Development of surrounding uplands could greatly impact the biota and water quality of this unique riverine system. Fragmentation of the surrounding woodlands would also negatively impact the forest-interior neotropical resident bird population which occurs within this river corridor.

ADDITIONAL SURVEY NEEDS: Additional botanical, zoological and community inventory is needed. The Choptank River is a historical location for the Cerulean Warbler (*Dendroica cerulea*; S1B, Federal C2). This species should be looked for in May and June. The number of rare species discovered here this year, suggests the need for further inventory.

Site C. Swamp Forest S. of Choptank Mills:

A red maple (*Acer rubrum)*-dominated swamp forest is located west of the Choptank. This site is very open with abundant *Carex stricta* tussocks, resulting in a hummocky topography. Trees are few and scattered. No rare species were observed.

On the east side of the river, groundwater seepage areas found at the base of steep 50 ft. slopes of the Choptank River, were surveyed; specifically for the Federally Threatened swamp pink, *Helonias bullata*, known historically from this area (searches were unsuccessful). The slopes adjacent to the wetlands consisted of well drained sandy soils with various oak species and a sparse heath understory. The wetlands contained the following species: *Acer rubrum*, *Clethra alnifolia*, swamp azalea (*Rhododendron viscosum*), *Osmunda regalis*, *O. cinnamomea*, *Woodwardia areolata*, marsh fern (*Thelypteris palustris*), spike moss (*Selaginella apoda*), *Sphagnum* sp., *Thalictrum pubescens*, *Impatiens capensis*, *Symplocarpus foetidus*, water-mat (*Chrysosplenium americanum*), *Viola cucullata*, wind-flower (*Anemone quinquefolia*), may-flower (*Maianthemum canadensis*), *Lilium superbum*, greenwood orchid (*Platanthera clavellata*), *Galium* sp., and cucumber root (*Medeola virginiana*).

Although not a naturally occurring habitat, a sandy shoulder of County Road 247 supports a large flowering population of the **bird's-foot violet, *Viola pedata*** (S1).

NATURAL COMMUNITIES: Good to high quality swamp forests.

■ ***Acer rubrum* Swamp Forest [red maple swamp].** A mixed hardwood swamp dominated by red maples with lesser amounts of *Liquidambar*, *Nyssa sylvatica*, *Quercus phellos*, and *Fraxinus pensylvanica*.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

THREATS: Further fragmentation of surrounding woodlands.

ADDITIONAL SURVEY NEEDS: This area needs additional botanical, community and zoological inventory. This system should be inventoried for rare birds, reptiles, amphibians and invertebrates. There is potential for further discovery of rare species.

(7) Iron Mine Prong at Norman Wilder Wildlife Area at RD 249 (Fig. 23):

Seven species of neotropical migrant birds were noted at this site on a brief June visit. No other significant animal occurrences were found. However, Iron Mine Prong does have the potential for containing an array of invertebrate species. A newly constructed beaver dam was found on the site.

NATURAL COMMUNITIES: Not assessed at this site.

OWNERSHIP/PROTECTION STATUS: This area is partially owned by the State of Delaware, Division of Fish and Wildlife. The remaining land is private and currently unprotected.

ADDITIONAL SURVEY NEEDS: Botanical, and natural community surveys are needed. In addition, zoological surveys focusing on breeding birds and invertebrates, should be conducted.

PREVIOUS SURVEY RESULTS: Surveys prior to 1993 were few and incomplete, but a number of species of special concern were discovered: e.g., **large sedge, *Carex gigantea* (S3); reticulated nutsedge, *Scleria reticularis* (S2); short-bristled horned-rush, *Rhynchospora corniculata* (S2); maiden-cane, *Panicum hemitomon* (S2); lance-leaved loosestrife, *Lysimachia hybrida* (S2); comely shiner, *Notropis amoenus* (S2); mud sunfish, *Acantharchus pomotis* (S2); margined madtom, *Noturus insignus* (S2); rough green snake, *Opheodrys aestivus* (S2);** and **eastern milk snake, *Lampropeltus getula* (S3)**. No significant natural communities had been previously identified for the Marydel Quadrangle.

Milford Quadrangle

(1) Fishing Branch Marsh (Fig. 24):

This site contains an excellent and highly diverse fresh to oligohaline tidal marsh (scrub-shrub in places). Dominant species include: *Impatiens capensis*, *Leersia oryzoides*, and *Zizania aquatica*. Other co-occurring species are: *Sium suave*, *Toxicodendron radicans*, *Acer rubrum*, *Bidens laevis*, *Thalictrum pubescens*, *Magnolia virginiana*, *Polygonum arifolium*, *Amaranthus cannabinus*, *Hibiscus moscheutos*, *Iris versicolor*, and *Sagittaria latifolia*.

While no rare species were located, the Fishing Branch system was not completely surveyed and

the possibility for rare species still exists.

NATURAL COMMUNITIES: Excellent quality.

- ***Impatiens capensis-Leersia oryzoides-Zizania aquatica* Oligohaline Tidal Marsh [fresh-brackish tidal marsh].** See Site Description (above) for details.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection

ADDITIONAL SURVEY NEEDS: This area needs additional zoological and botanical inventory work.

(2) <u>Swan Creek at New Wharf/Mispillion River</u> (Fig. 25):

Extensive, high quality and diverse oligohaline to mesohaline tidal marshes occur along Swan Creek. These marshes then grade into freshwater marshes, scrub-shrub and then forested wetlands respectively. Much of the marsh is dominated by large expanses of sweet flag, *Acorus calamus*. Large colonies of cattails, *Typha* spp., are also present. Other common co-occurring species include *Polygonum arifolium*, *Peltandra virginica*, *Pontederia cordata*, *Hibiscus mosheutos*, *Amaranthus cannabinus*, *Typha angustifolia*, *T. latifolia*, *Zizania aquatica*, *Leersia oryzoides*, and *Eleocharis parvula*.

In addition to the above species, a relatively large population of **arrowhead, *Sagittaria calycina*** (S1) was discovered in semi-open areas among the *Acorus*, about 200 meters west of Rd. 409. This discovery is significant in that it represents a **new Kent County record.**

Animal use of this wetland seems to be somewhat limited, although additional surveys are recommended. The more notable species observed at this site were the **Great Blue Heron, *Ardea herodias*** (S2B); **Common Snipe, *Gallinago gallinago*** (S3N); and the **Sora, *Porzana carolina*** (S3?). More significantly however, a butterfly, the **bronze copper, *Lycaena hyllus*** (S2) was discovered at this site in September.

NATURAL COMMUNITIES: Good to excellent quality marshes.

- ***Acorus calamus* Oligohaline Tidal Marsh [sweet flag tidal marsh].** A high quality and extensive sweet flag-dominated marsh.

- ***Typha* spp. Oligohaline Tidal Marsh [cattail tidal marsh].** Significant areas of the Swan Creek Marsh system contain cattail-dominated communities included within an otherwise sweet flag-dominated marsh.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: Further inventory should be conducted here, with emphasis

on breeding wetland birds.

(3) Brockenbridge Gut Woods (Fig. 26):

This site contains a mature mixed hardwood forest of relatively high quality. The canopy is dominated by *Quercus phellos* and *Q. alba*. Species found in lesser quantities include *Acer rubrum, Liquidambar styraciflua, Liriodendron tulipifera, Nyssa sylvatica, Pinus taeda,* and *P. virginiana*. Small wetland openings dominated by *Sphagnum* moss are scattered throughout the forest. Walking is relatively easy, although some areas are thick with *Clethra alnifolia* and/or *Kalmia latifolia*. Several old logging roads are present; no rare species were observed here.

NATURAL COMMUNITIES: Moderately good quality forest.

- ***Quercus phellos/Clethra alnifolia* Mesic-Wet Forest [willow oak/sweet pepperbush woods].** See Site Description (above) for details.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: This woodland should be inventoried to determine breeding bird composition, focusing on those species associated with mature forests. Much additional botanical and natural community surveys could be undertaken in this forest tract.

(4) Brockenbridge Gut Powerline R-O-W (Fig. 26):

Though not a natural habitat, an extensive swale occurs along the powerline cut south of Rd. 120 (just east of Rd 419). A large population of the small **swollen bladderwort, *Utricularia radiata*** (S2), and **southern bog clubmoss, *Lycopodium appressum*** (S2) were found here.

NATURAL COMMUNITIES: Not present (anthropogenic).

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: Additional rare species may be discovered if this site is surveyed later in the growing season.

(5) Mispillion River at Beaverdam Branch (Fig. 27):

A rather high quality cord grass, *Spartina alterniflora*, dominated high marsh occurs along this portion of the Mispillion River. This marsh extends for some distance up and down the river. A large population of black grass (*Juncus gerardi*) occurs intermingled with the cord grass. *Baccharis* and *Iva* are common marsh associates and are especially abundant at slightly higher elevations. A pair of **Northern Harriers, *Circus cyeanus* (S1B, S3N)** nested near this site and may well have utilized this area for foraging.

NATURAL COMMUNITIES: Moderately good quality.

- ***Spartina alterniflora* Salt Marsh [corgrass salt marsh].**

- ***Baccharis halamifolia-Iva frutescens* Scrub-Shrub Marsh [groundsel tree-high tide bush marsh; salt bush-salt meadow marsh].**

OWNERSHIP/PROTECTION STATUS: Private/currently no protection

ADDITIONAL SURVEY NEEDS: This site should be inventoried for breeding birds. Importance of this area to nesting Northern harriers should be determined.

PREVIOUS SURVEY RESULTS: Prior surveys were undertaken in excellent riverine habitats along the Browns Branch and portions of the Murderkill River, where the following species of special concern were discovered: **seaside alder, *Alnus maritima* (S3); tickseed sunflower, *Bidens coronata* (S2); blue-joint reedgrass, *Calamagrostis canadensis* (S1); lake sedge, *Carex lacustris* (S1); false hopsedges, *C. lupuliformis* (S1); Walter's St. John-wort, *Triadenum walteri* (S2)**; and **swamp white oak, *Quercus bicolor* (S1)**. Surveys of Tubmill Pond resulted in the discovery of the following species of special concern: **Mitchell's sedge, *Carex mitchelliana* (S1); horsetail spikerush, *Eleocharis equisetiodes* (S2); squarestem spikerush, *E. quadrangulata* (S3); hairy umbrella-sedge, *Fuirena squarrosa* (S3)**; and **brown-fruited rush, *Juncus pelocarpus* (S2)**.

Millington Quadrangle

No biotic surveys were undertaken on this quadrangle during 1993. In addition, prior surveys are also lacking.

ADDITIONAL SURVEY NEEDS: Surveys are needed in all forested habitats in the Kent County portion of this quadrangle.

Mispillion River Quadrangle

(1) The Nature Conservancy Preserve on Milford Neck (Fig. 28):

The Nature Conservancy has acquired a >2000 acre tract of forests and marshes on Milford Neck in southeastern Kent County. The DNHI have undertaken partial surveys of this property and significant discoveries for the 1993 field season are presented below.

Site A. Palustrine Forest:

A seasonally flooded deciduous forest of fairly high quality exists at this site. A mixture of oaks, red maple, sweet gum, tulip poplar, black gum and sassafras predominate. Some areas are dominated by willow oak (*Quercus phellos*) and swamp chestnut oak (*Q. michauxii*), while other

areas are more diverse. Within this Palustrine forest, a population of **spotted salamanders, *Ambystoma maculatum* (S1)**, was discovered; this is the second population known to exist in Kent County.

NATURAL COMMUNITIES: Fair to good quality.

- ***Quercus phellos-Q. michauxii* Palustrine Forest [willow oak-swamp chestnut oak swamp forest].**

- **Mixed Hardwoods Mesic-Wet Forest.** Consists of a diversity of deciduous species (e.g. *Quercus alba, Q. falcata, Q. michauxii, Q. phellos, Acer rubrum, Liquidambar, Nyssa sylvatica, Liriodendron tulipifera, Sassafras albidum*, and *Diospyros virginiana*), with a few scattered pines (*Pinus taeda*).

Site B. Salt marshes:

The saltmarshes at Milford Neck Preserve can be characterized as consisting of four distinctive vegetative zones (or communities); grading from a scrub-shrub community in the high marsh fringe area to pure low saltmarsh. In some areas, two of the zones (middle two below) may be replaced by *Typha angustifolia* when fresh ground water seepage is encountered.

These marshes were surveyed on several occasions. The marshes provide critical foraging habitat for several species of waterfowl and shorebirds during migration. In addition, many species of concern may also use this area for nesting. Species of special concern which were found in 1993, include: **Northern Harrier, *Circus cyaneus* (S1B, S3N); Hooded Merganser, *Lophodytes cucullatus* (S2N); Gadwall, *Anas strepera* (S3N); Great Blue Heron, *Ardea herodias* (S2B); Snowy Egret, *Egretta thula* (S1B); Glossy Ibis, *Plegadis falcinellus* (S2B); Bald Eagle, *Haliaeetus leucocephalis* (S1B, LT); Great Egret, *Casmerodus albus* (S2B); Tricolored Heron, *Egretta tricolor* (S1B); Great Black-backed Gull, *Larus marinus* (S1B, S5N); Common Tern, *Sterna hirundo* (S1B, S3N); Forster's Tern, *Sterna Forsteri* (S1B, S3N); Seaside Sparrow, *Ammodramus maritimus* (S3B); White-rumped Sandpiper. *Calidris fuscicollis* (S3T); Black-necked Stilt, *Himantopus mexicanus* (S2B);** and **Dunlin, *Calidris alpina* (S3T).**

NATURAL COMMUNITIES: Good to excellent quality.

- ***Baccharis halimifolia-Iva frutescens* High Scrub Marsh [groundsel tree-marsh elder scrub marsh]**

- ***Juncus gerardi/Limonium carolinianus-Carex straminea-Solidago sempervirens* [black grass-sea lavender-sedge-seaside goldenrod association]**

- ***Spartina patens-Distichlis spicata-Scirpus robustus-Scirpus americanus-Salicornia europea* [salt hay-spike grass-saltmarsh bulrush-three square-glasswort marsh association]**

- *Spartina alterniflora* **Salt Marsh [cordgrass salt marsh]**

Site C. Peninsular Forest:

In this "peninsular" forested habitat, which is surrounded on three sides by saltmarsh, a high salt marsh "bog-like" wetland exists. This is a herbaceous-dominated habitat surrounded by a forest comprised of *Pinus taeda*. The species found in the herbaceous wetland included the following: *Spartina patens*, bull rush *(Scirpus validus)*, *Hibiscus palustris*, *Atriplex patula* and *Typha angustifolia*.

Several rare plant species were observed along an old dirt road that bissects the "peninsular" forest enroute to the saltmarsh: **white-tubed colic root, *Aletris farinosa* (S3)**; and a **violet, *Viola brittoniana* (S2)**. Additionally, two **spotted turtles, *Clemmys guttata* (S3)**, were found at two different locations at this site.

NATURAL COMMUNITIES: Not assessed at this site.

OWNERSHIP/PROTECTION STATUS: Private (The Nature Conservancy)/protected.

ADDITIONAL SURVEY NEEDS: A significant amount of habitat exists at this site that yet needs to be surveyed.

PREVIOUS SURVEY RESULTS: Surveys prior to 1993 were minimal, and only a few species of special concern were located: **Joor's sedge, *Carex joorii* (S2)**; and **narrow-leaved sunflower, *Helianthus angustifolius* (S2)**.

Sudlersville Quadrangle

No biotic surveys were undertaken on this quadrangle during 1993. In addition, prior surveys are also lacking.

ADDITIONAL SURVEY NEEDS: Surveys are needed in the limited forested habitats present in the Kent County portion of this quadrangle (the majority of Sudlersville occurs in Maryland).

Wyoming Quadrangle

(1) Tidbury Creek Marshes (Fig. 29):

Tidbury creek marsh is bordered by an impressive hardwood forest, with many mature trees (the forest is undoubtedly used by an array of migratory and resident passerine species). The wetlands consist of an exceptionally diverse, impressive brackish to freshwater tidal marsh. This system was briefly inventoried. The marsh species that were dominant in the plots sampled, included the following: *Amaranthus cannabinus*, *Leersia oryzoides*, *Peltandra virginica*, *Typha*

latifolia, whorled-dock *(Rumex verticillatus)*, *Zizania aquatica*, *Hibiscus moscheutos*, and saltmarsh sedge *(Scirpus robustus)*. An unidentified cespitose sedge (*Carex* sp.) was common in the area of the marsh surveyed. Shrubs were also well-represented: *Clethra alnifolia*, *Rosa palustris*, and *Toxicodendron radicans*. Additionally, brief zoological inventories revealed that this marsh is utilized periodically by wading birds, as a foraging area. Species observed include: **Great Blue Heron, *Ardea herodius* (S2B)** and **Great Egret, *Casmerodius albus* (S2B).** Ospreys were also seen using this marsh as a feeding site.

NATURAL COMMUNITIES: Excellent quality marshes.

■ ***Amaranthus cannabinus-Leersia oryzoides-Typha latifolia* Oligohaline Tidal Marsh [water hemp-rice cut-grass-cattail tidal marsh].** A very high quality tidal marsh.

OWNERSHIP AND PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: Much additional biotic surveys are needed throughout this extensive high quality tidal marsh community and adjacent hardwood forests. In particular, inventory work should focus on the importance of this system to wading waterbirds. A breeding bird inventory should also be undertaken.

(2) <u>Isaac Branch at Wyoming/Camden</u> (Fig. 30):

An extremely degraded hardwood swamp forest occurs along the Isaac Branch. This is not surprising considering the narrowness of the habitat and its nearness to the community of Camden/Wyoming.

NATURAL COMMUNITIES: Very degraded.

■ ***Acer rubrum* Swamp Forest [red maple swamp].**

OWNERSHIP/PROTECTION STATUS: Private/currently no protection

ADDITIONAL SURVEY NEEDS: Only limited additional inventories are needed here. One need would be to survey for the Federally Threatened swamp pink *((Helonias bullata)*, that was known, historically, from Isaac Branch. Inventory should focus further downstream.

(3) <u>Hudson/Pratt Branches</u> (Fig. 31):

Only brief surveys were undertaken along these two streams. Along Hudson Branch the habitat consists of moderate to good quality palustrine floodplain forest, with a rather narrow forested buffer on the north side. The wetlands are dominated by red maple (*Acer rubrum*) with lesser amounts of *Liquidambar styraciflua, Fraxinus pensylvanica*, and *Nyssa sylvatica*. The sweet-pepperbush (*Clethra alnifolia*) was the dominant shrub species. The south side of the Branch consisted of relatively steep-sloped upland woods that extend towards the south and towards Pratt

Branch. The south side of Pratt Branch consists of relatively steep-sided hardwood forests consisting of beech (*Fagus grandifolia*), oaks (*Quercus* spp.), poplar (*Liriodendron tulipifera*), and sweet gum (*Liquidambar sytraciflua*), among others. The palustrine wetlands, including the tidal marshes, were only briefly surveyed, but appear to be of high quality.

NATURAL COMMUNITIES: Moderately good quality.

- ***Acer rubrum/Clethra alnifolia* Swamp Forest [red maple/sweet pepperbush swamp].** Along Hudson Branch.

OWNERSHIP/PROTECTION STATUS: Private/currently no protection.

ADDITIONAL SURVEY NEEDS: Although no rare species were observed at this site, additional inventory work is needed.

PREVIOUS SURVEY RESULTS: Surveys prior to 1993 were limited to a small woodlot near Woodside which had several species of special concern (**large whorled pogonia, *Isotria verticillata*, S3; pinesap, *Monotropa hypopithys*, S2**), and roadside occurrences of the rare **crested shield-fern, *Dryopteris cristata* (S2)**, and **Elliott's gentian, *Gentiana catesbaei* (S2)**.

DISCUSSION

Survey work in Kent County revealed a landscape much altered and impacted by human activities, notwithstanding the general ruralness of the county. Habitat degradation in the county, in part, seems to have resulted from extensive ditching operations and deforestation. The ditches have altered the hydrologic regime of individual sites and have apparently sacrificed the biological integrity of these habitats. Many of the sites visited were low in overall biodiversity and often contained an abundance of weedy and/or alien species (thus could be considered poor quality habitats). Throughout much of the eastern portion of the county many of the upland forests have been removed and now only a narrow buffer (if any) separates the wetlands from agricultural or urban landscapes. Large forested tracts that were surveyed (albeit incompletely), primarily, consisted of degraded, second and third-growth woods. These were often thick and nearly impenetrable from an understory of briers and brambles. However, there still remains an enormous amount of forested habitats yet to be surveyed in Kent County.

A preponderance of the Coastal Plain ponds surveyed were quite degraded, possibly due to the effects of ditching (some ponds had ditches leading from them, or near them), agricultural run-off, or otherwise changes in the pond's hydrology. Though not thoroughly surveyed, the tidal salt marshes, are criss-crossed by a network of mosquito ditching (it is unclear to what extent these ditches have impacted the marshes); many of these marshes are of surprising good quality. Dense *Phragmites* stands are not altogether infrequent. Likewise, only a small portion of tidal and non-tidal freshwater emergent marshes were surveyed.

Although much of the landscape surveyed was degraded, to varying degrees, the county is not

entirely an ecological wasteland. Several impressive, mature forest tracts were identified (e.g. along the Mudstone and Fork Branches, along Hudson/Pratt Branches, and near Bombay Hook National Wildlife Refuge). Several ponds in western Kent County (on the Kenton Quadrangle), and on Milford Neck are of very high quality, while the marshes along Mispillion River, at Bennetts Pier, along the St. Jones River (not surveyed to any extent) and its tributaries (e.g. Tidbury Creek), and along Fishing Creek, to name a few, are of high quality.

The total land area of Kent County is ≈ 380,000 acres, and of this total, approximately 28% (≈ 106,540 acres) consists of forested habitats (DNREC, GIS-generated data). In addition, another 12% (≈ 46,000 acres) is comprised of Estuarine and Palustrine tidal non-forested habitats (from Tiner, R.W. 1985. *Wetlands of Delaware*. USFWS, Newton Corner, MA, and DNREC, Dover, DE. 77 p.). In total, nearly 40% (or 146,540 acres) of the Kent County land area was available for surveying.

In conclusion, biotic and natural community surveys in Kent County during the grant period (1992-93; with majority of field work undertaken in 1993) were far from complete. It is estimated that not even 1% of the total available habitats present were surveyed. In addition, many of the habitats surveyed were considered to be of rather poor quality. However, some sites contained good to excellent habitats. Results from surveys in the upper St. Jones River watershed (especially along the Mudstone and Fork Branches), along the Murderkill, Mispillion, and Choptank Rivers, and in marshes on Milford Neck suggest that future Kent County surveys should be concentrated in these areas.

MAP INSERT

KENT COUNTY - SURVEY SITES

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND
ENVIRONMENTAL CONTROL
DIVISION OF PARKS AND RECREATION
89 KINGS HIGHWAY, P.O. BOX 1401
DOVER, DELAWARE 19903

OFFICIAL BUSINESS, PENALTY FOR PRIVATE USE $300

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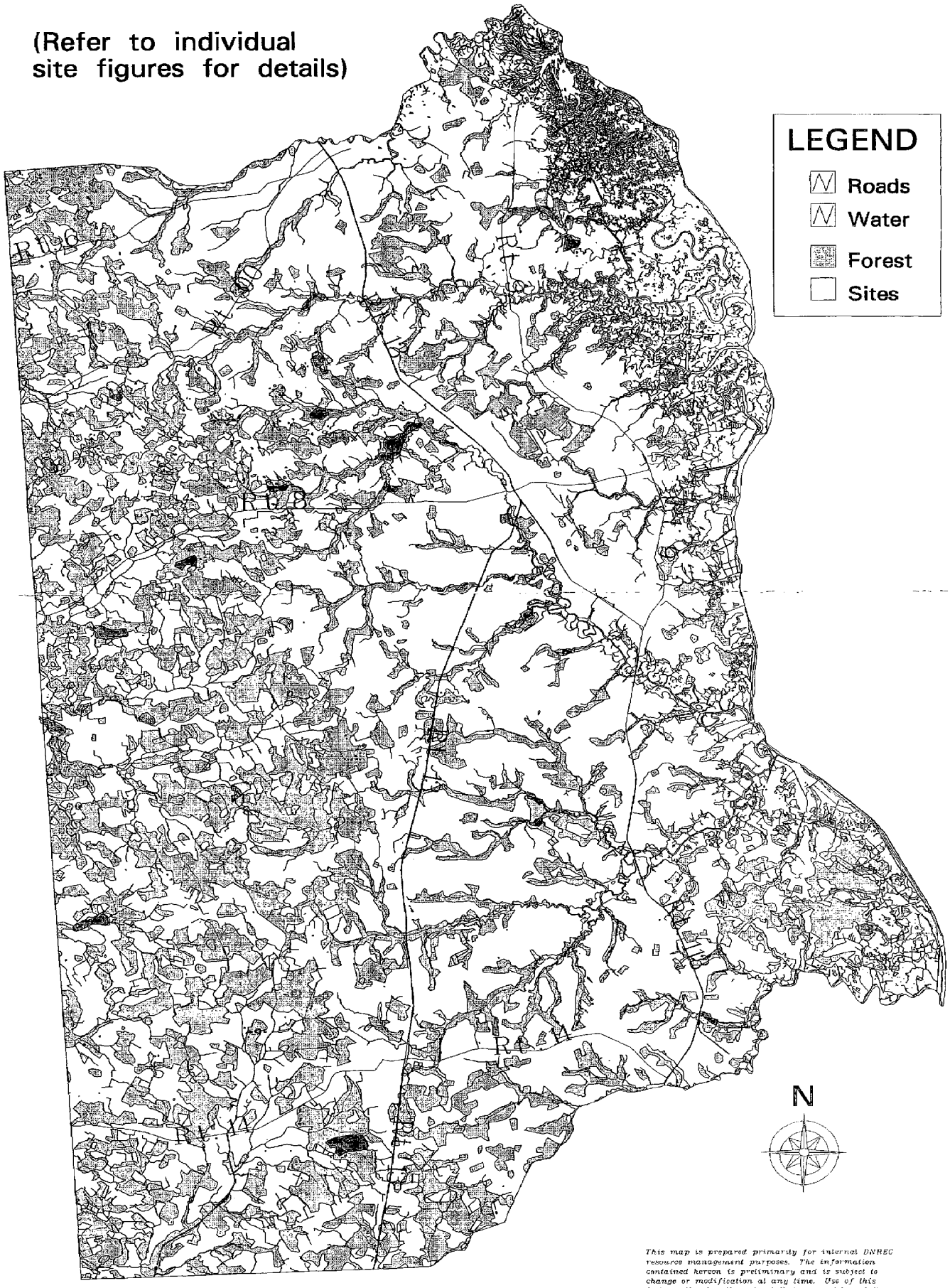
Kent County Survey Sites

(Refer to individual site figures for details)



This map is prepared primarily for internal DNREC resource management purposes. The information contained hereon is preliminary and is subject to change or modification at any time. Use of this information by others is at their own risk and the DNREC in no way guarantees the accuracy of the information.

APPENDIX I. Kent County Survey Sites for 1993 (Figs. 1-31).

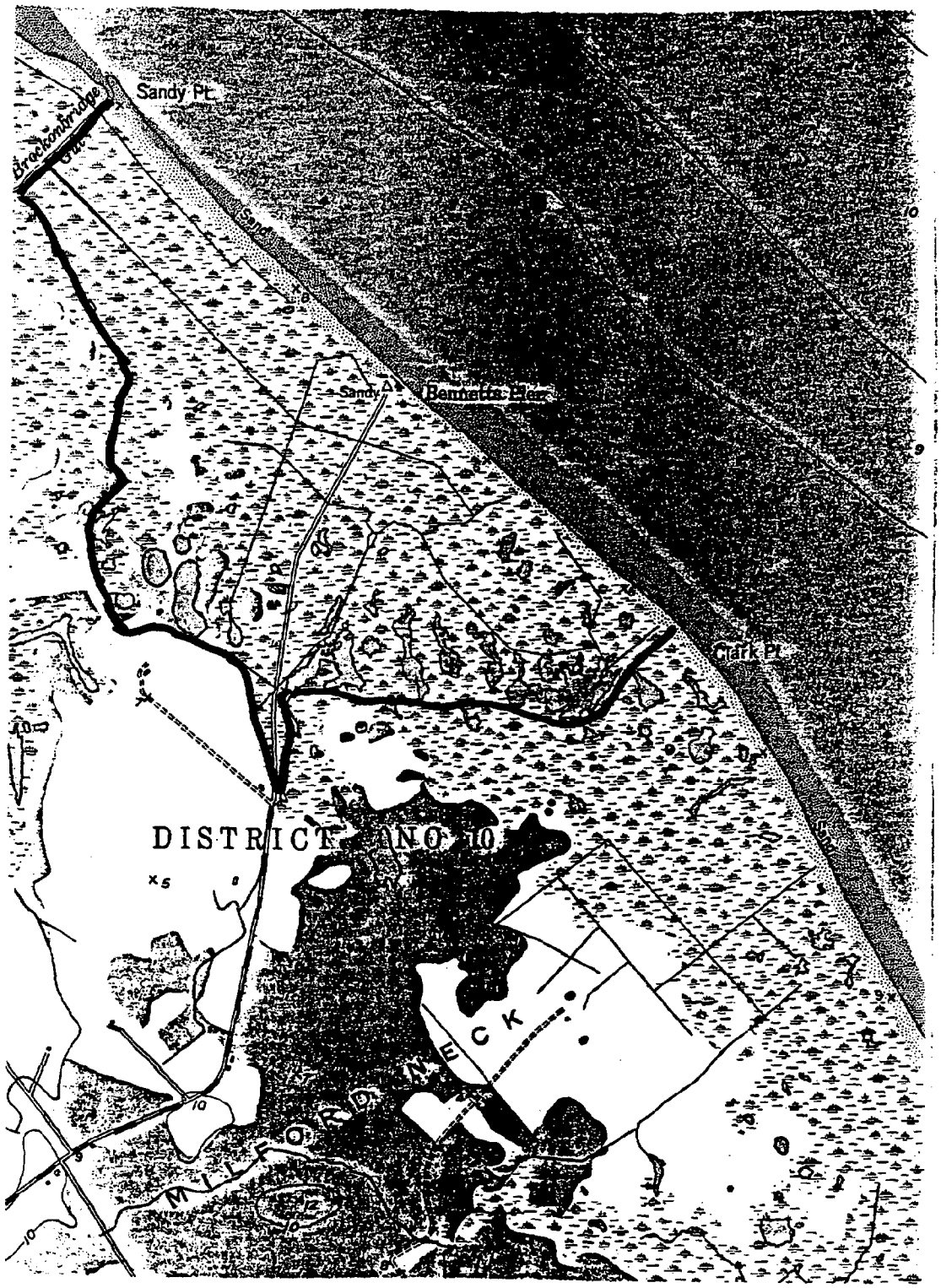


FIGURE 1. Bennetts Pier Saltmarshes; Bennetts Pier Quadrangle.

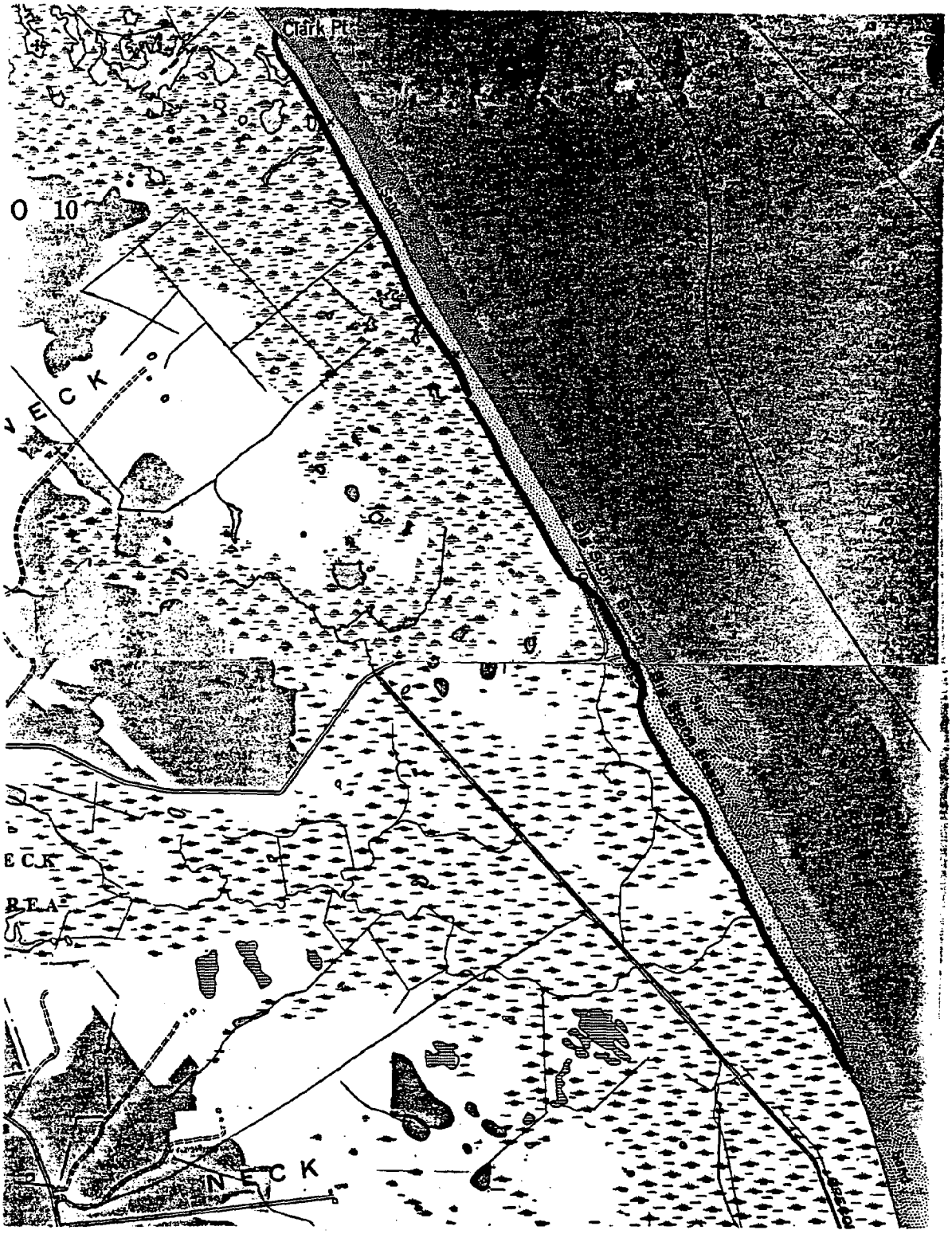


FIGURE 2. Big Stone Beach; Bennetts Pier/Mispillion River Quadrangles.

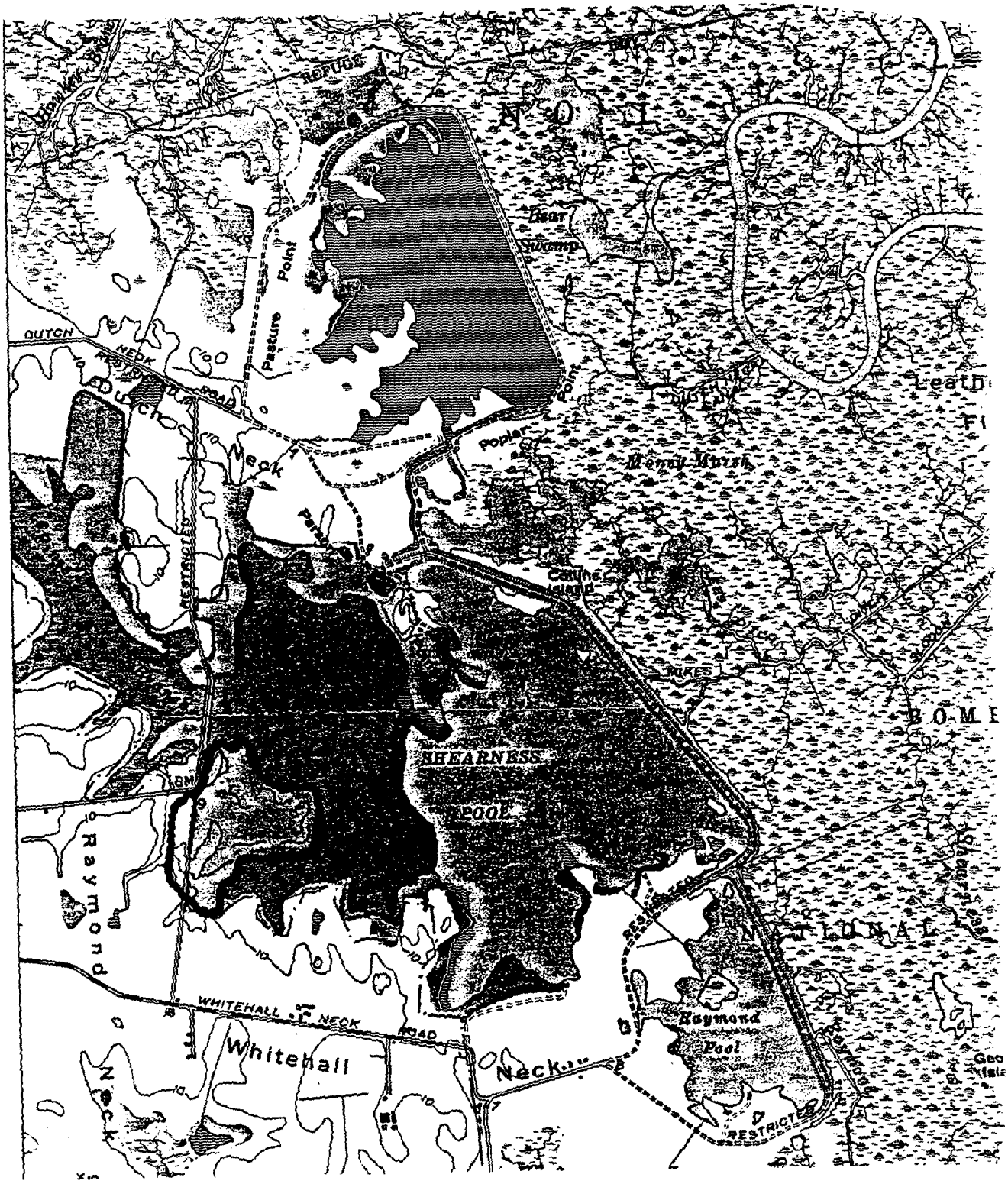


FIGURE 3. Finis Woods; Bombay Hook Quadrangle.

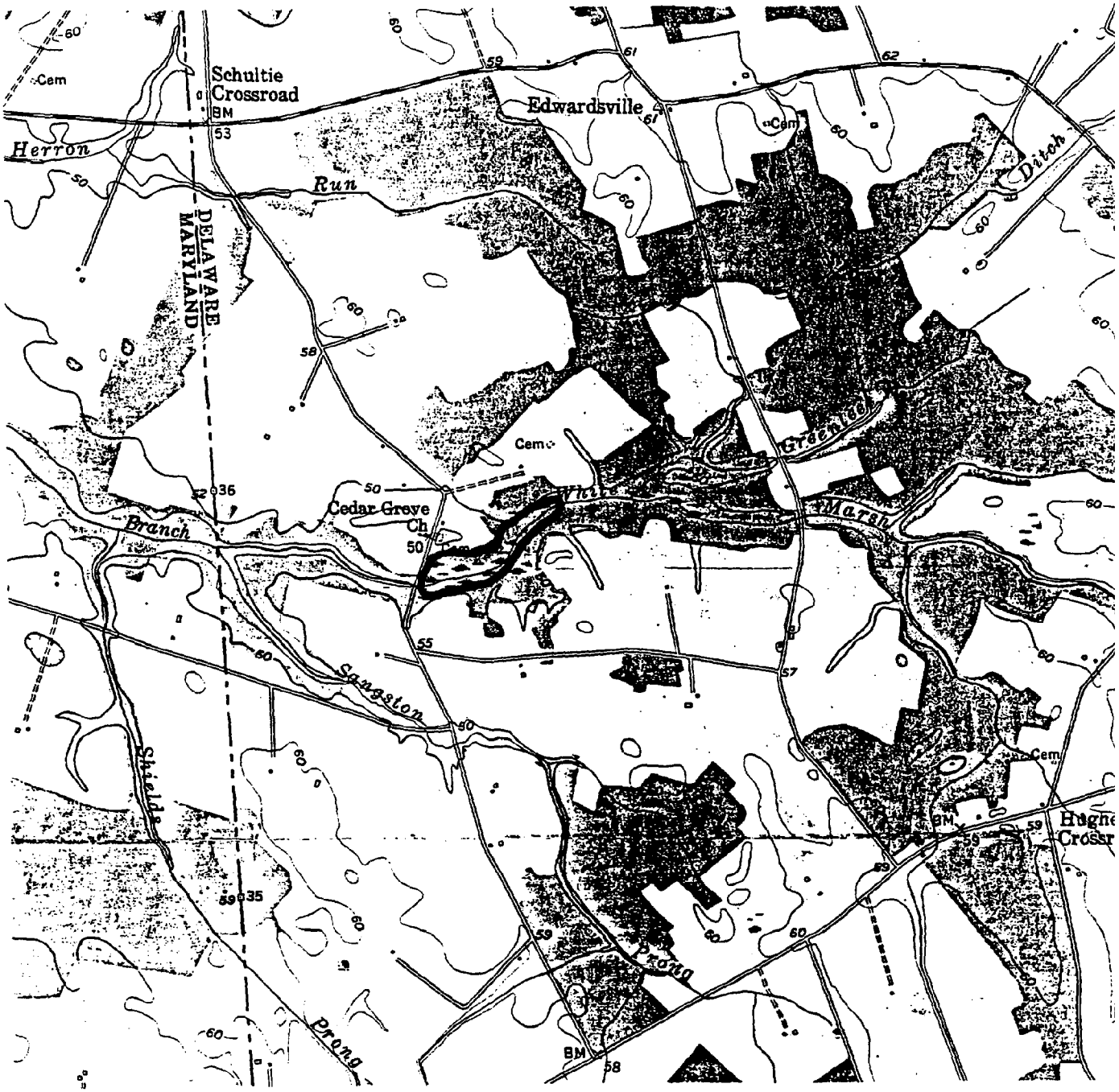


FIGURE 4. White Marsh Branch Woods; Burrsville Quadrangle.

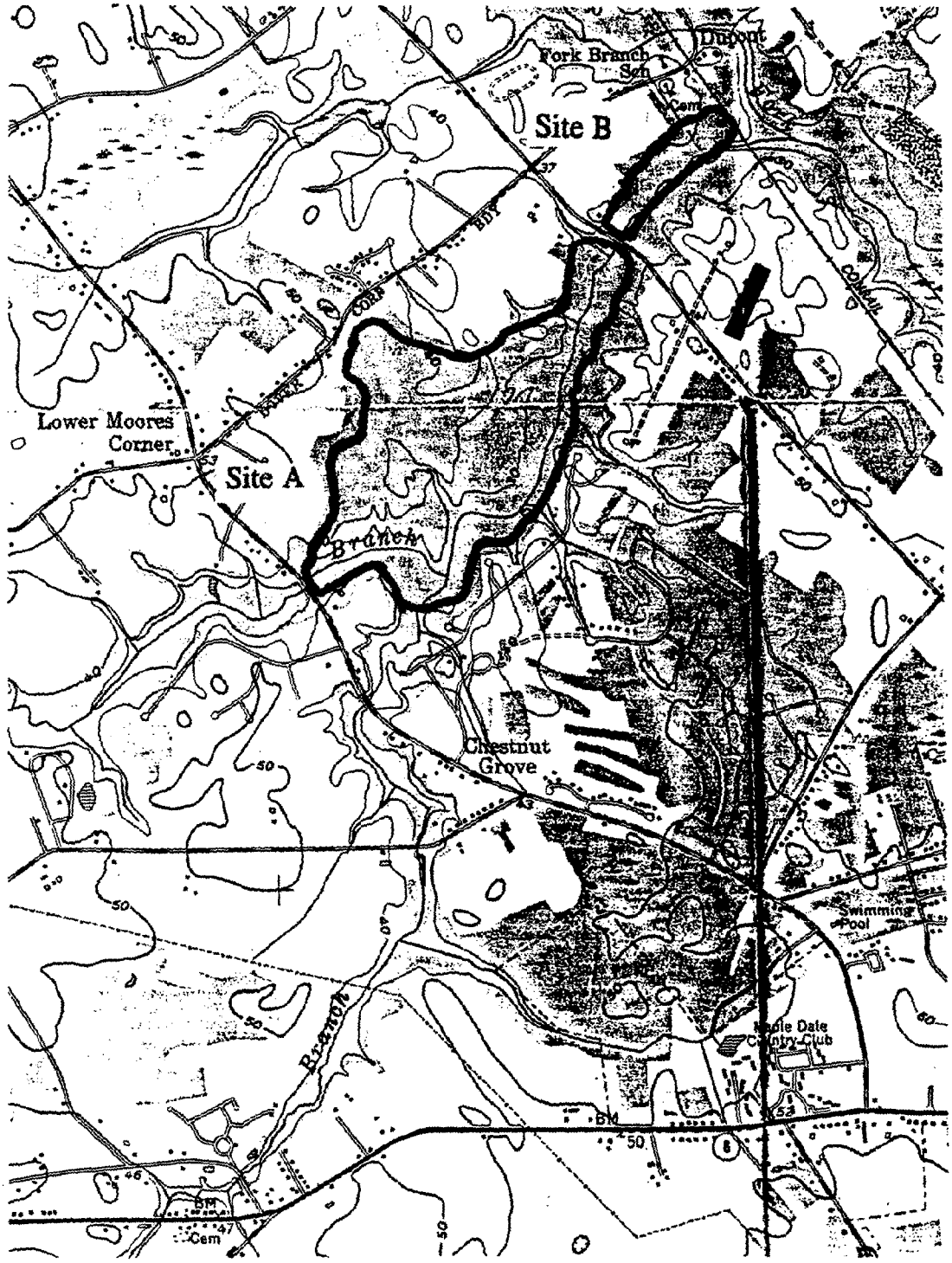


FIGURE 5. Mudstone Branch, showing Site A (east of Kenton Road) and Site B (near confluence with Fork Branch); Dover Quadrangle.

FIGURE 6. Mesic-wet Forest West of Cheswold; Dover Quadrangle.

FIGURE 7. Fork Branch West of Kenton Road; Dover Quadrangle.

FIGURE 8. Cahoon Branch South of Road 158; Dover Quadrangle

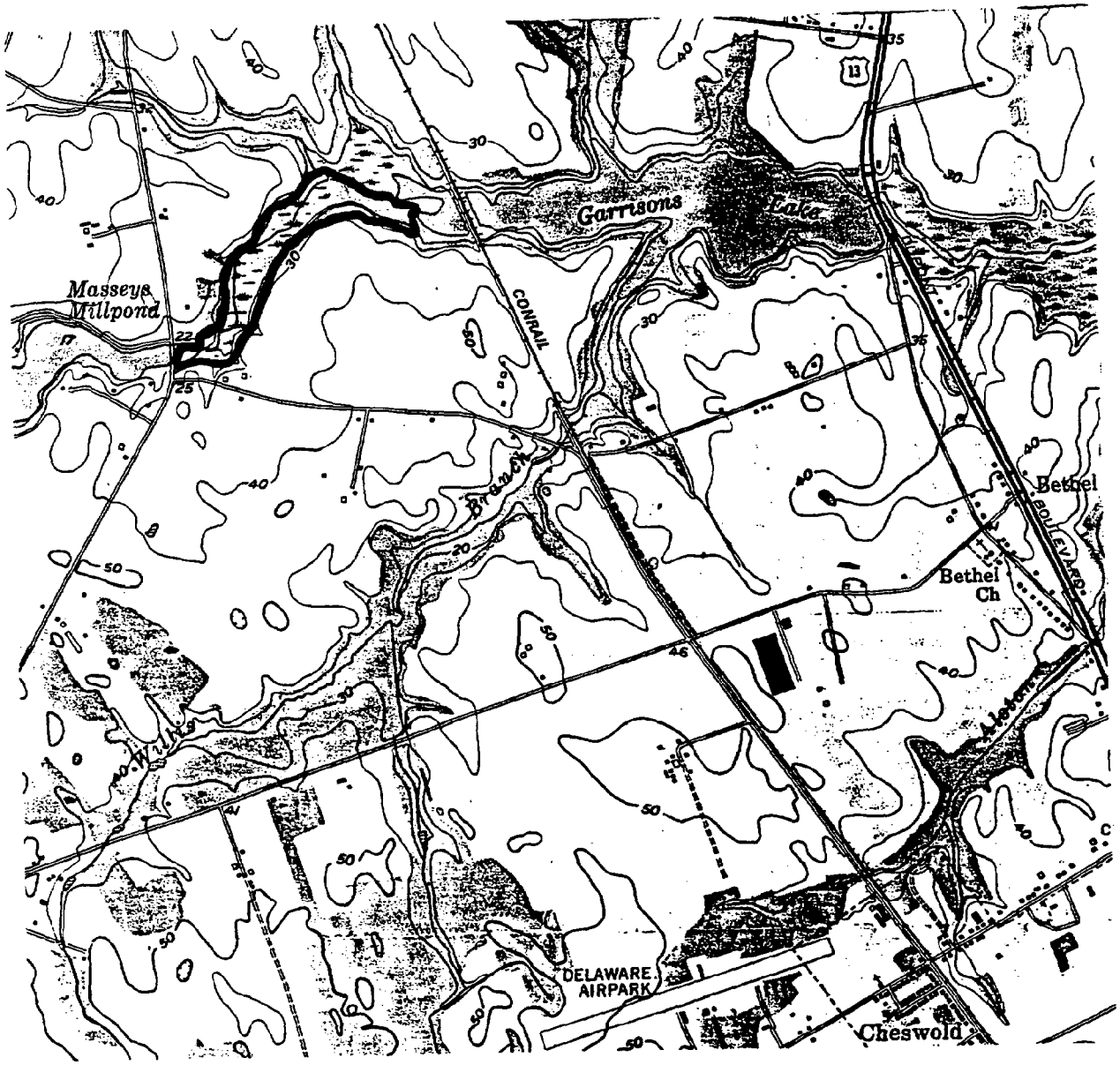


FIGURE 9. Leipsic River Above Garrisons Lake; Dover Quadrangle.

FIGURE 10. Milford Neck Ponds East showing Site A (Pond 2) and Site B (Black's Pond); Frederica Quadrangle.

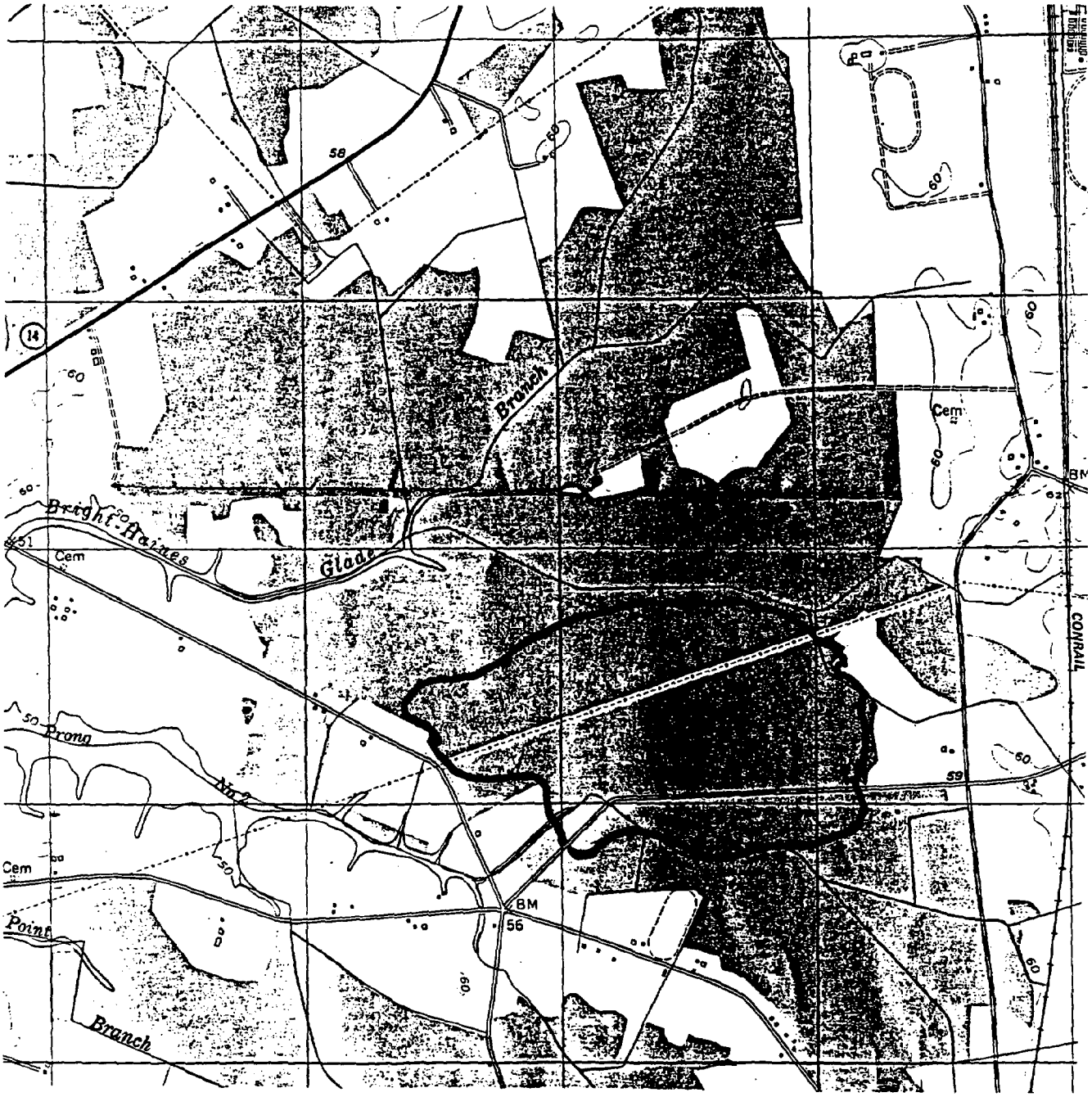


FIGURE 11. Bright-Haines Glade Branch Forest; Harrington Quadrangle.

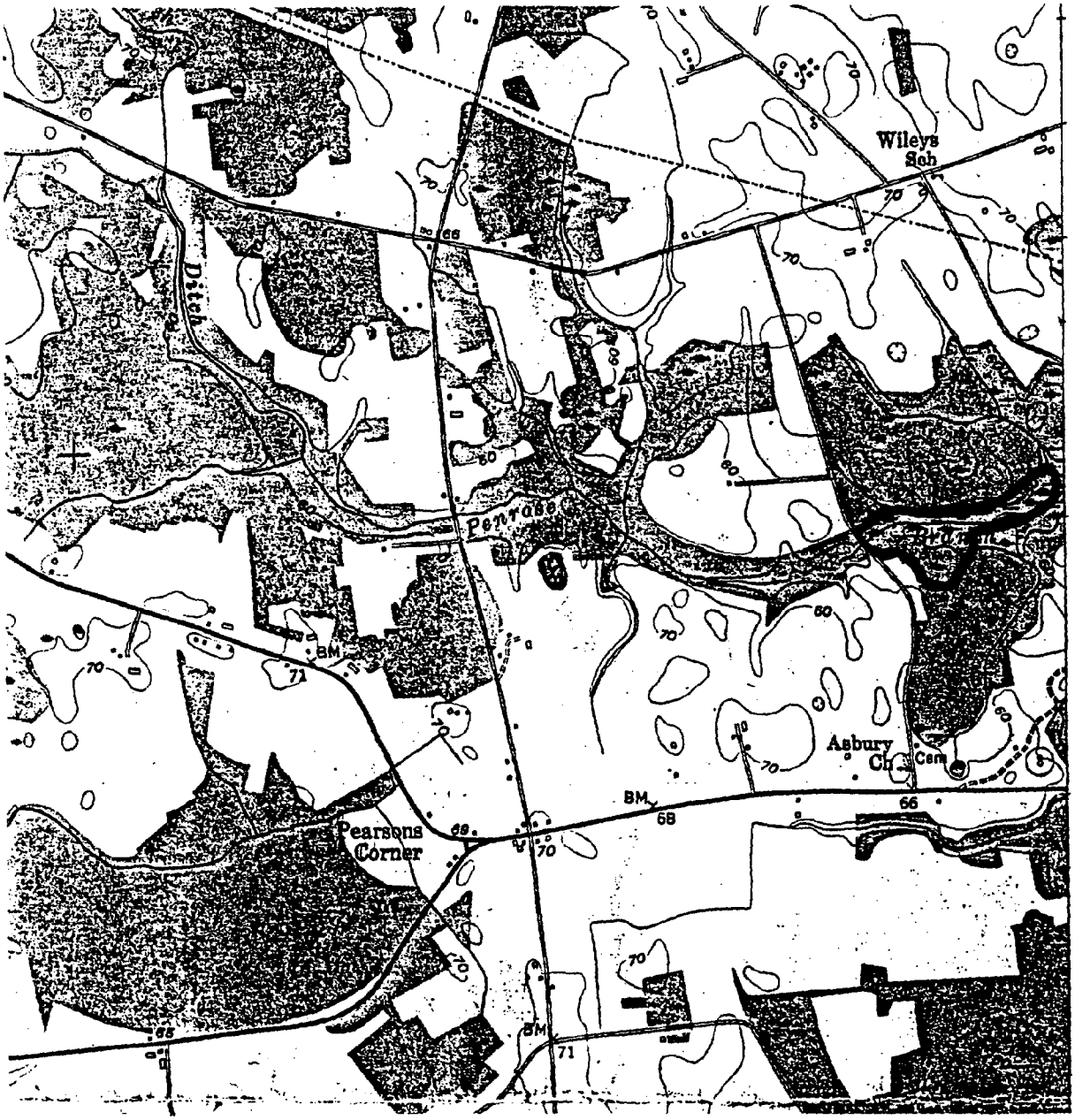


FIGURE 12. Penrose Branch East of Road 163; Kenton Quadrangle.

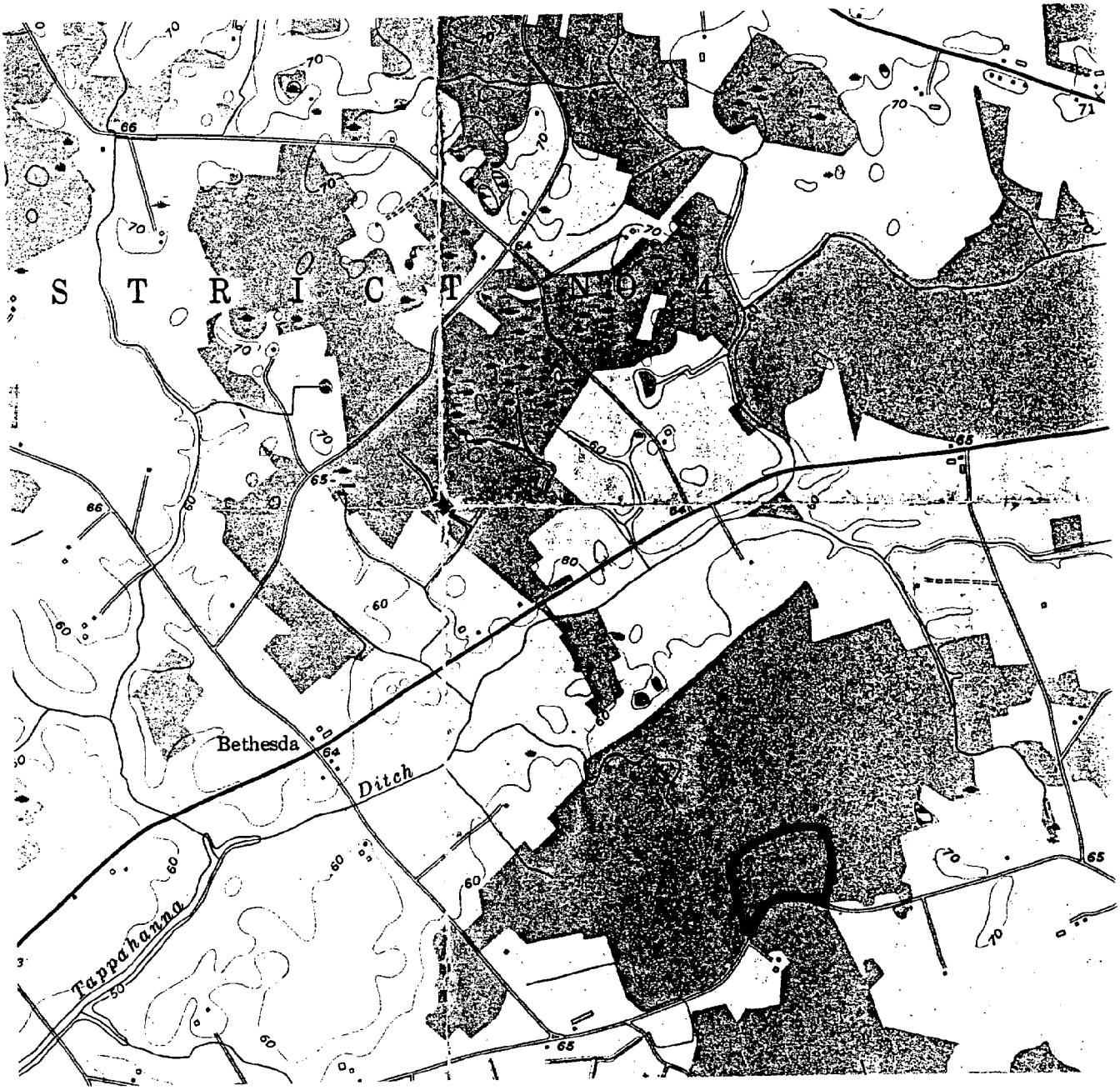


FIGURE 13. Tappahanna Ditch East Forest; Kenton Quadrangle.

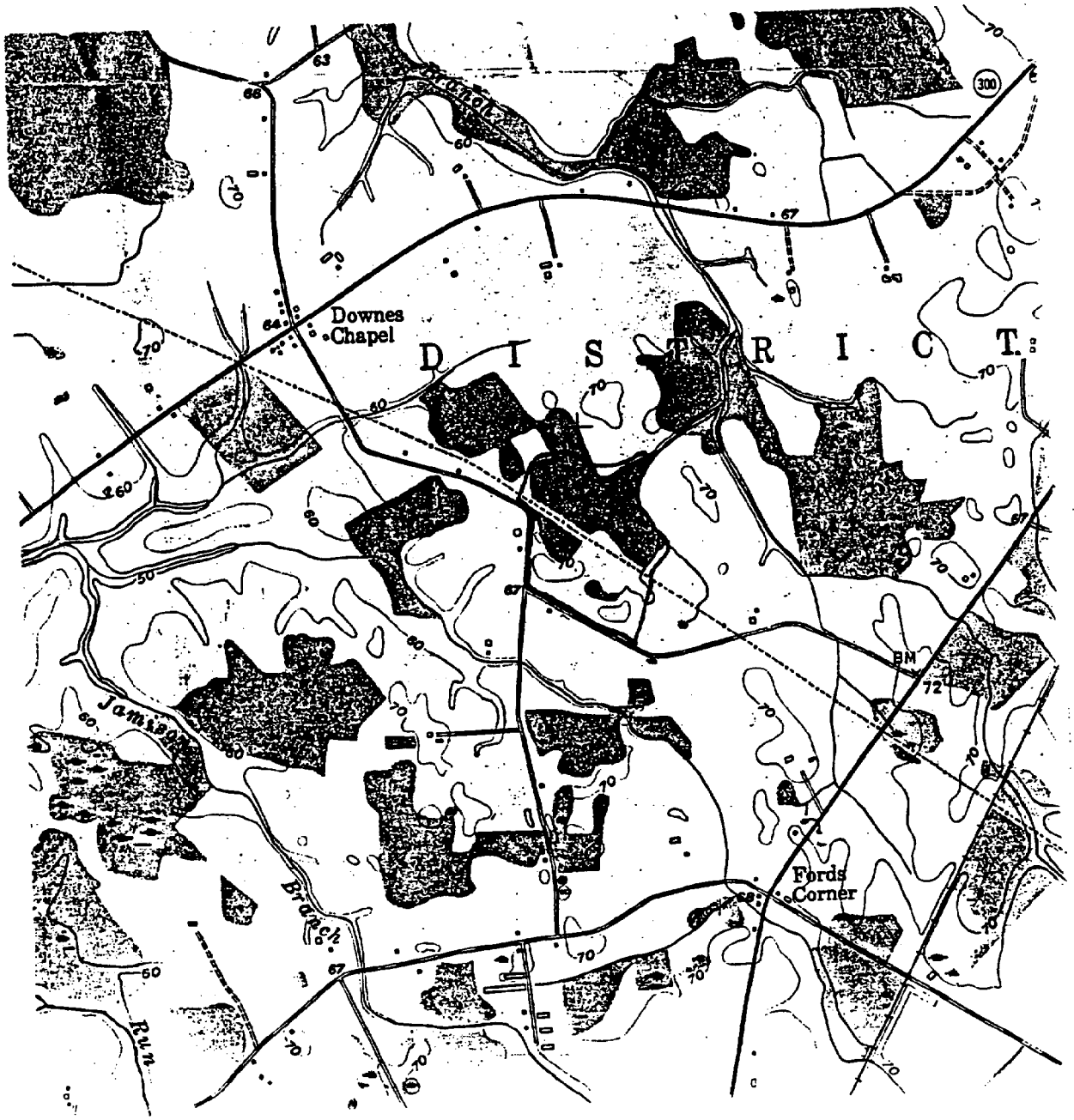


FIGURE 14. Stillmar Property at Blackiston; Kenton Quadrangle.

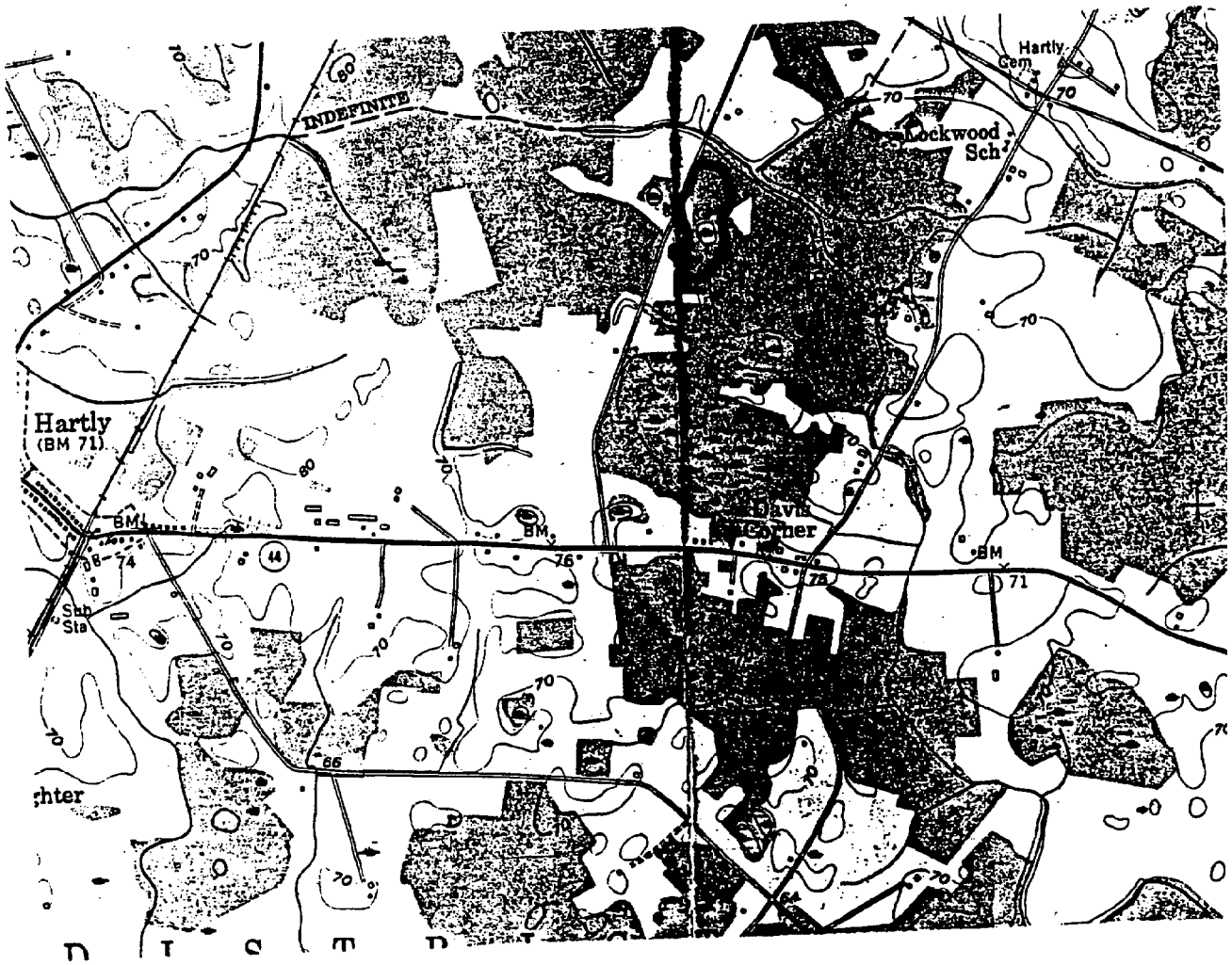


FIGURE 15. Woods Northwest of Davis Corners; Kenton Quadrangle.

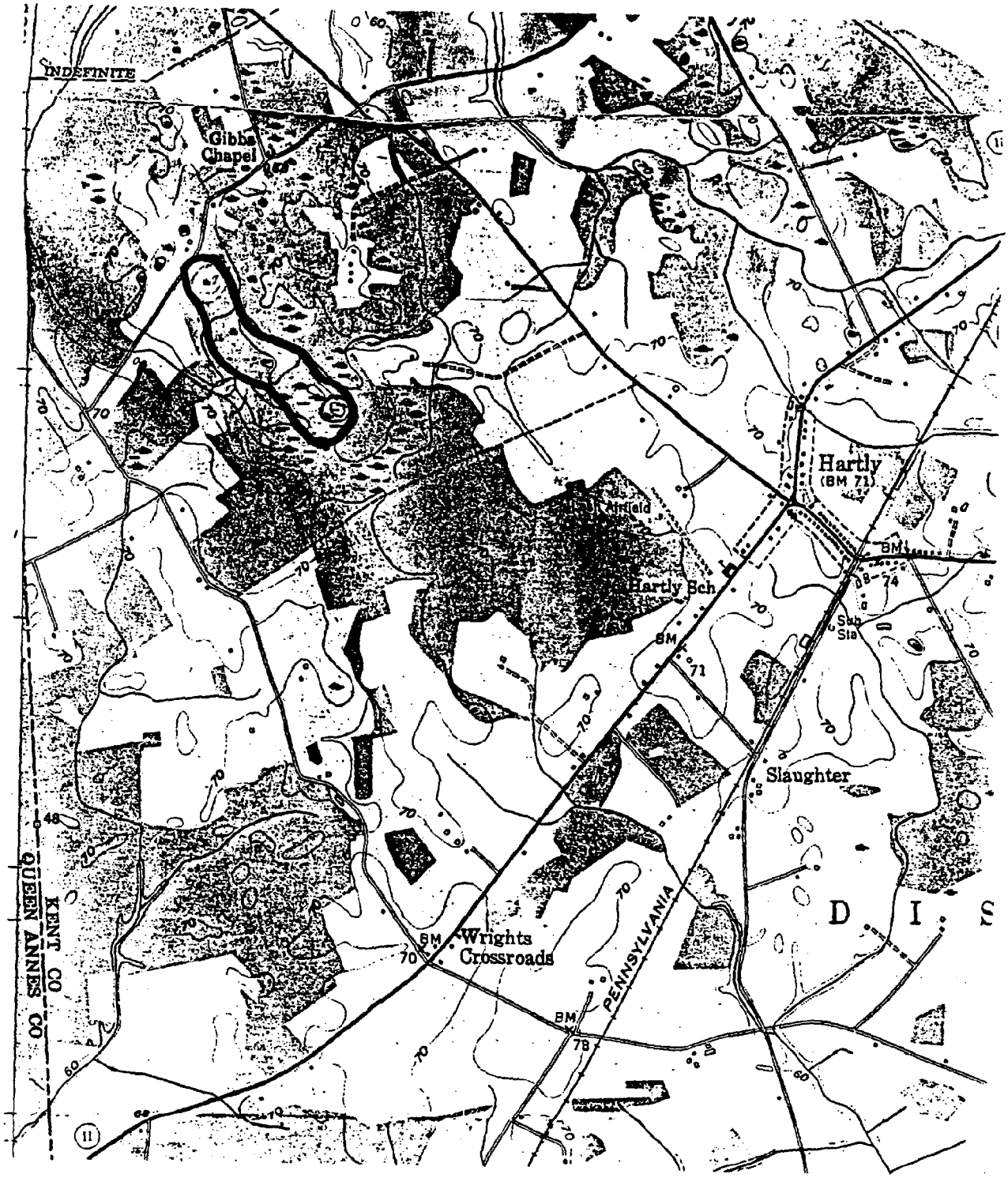


FIGURE 16. Double Ponds; Kenton Quadrangle.

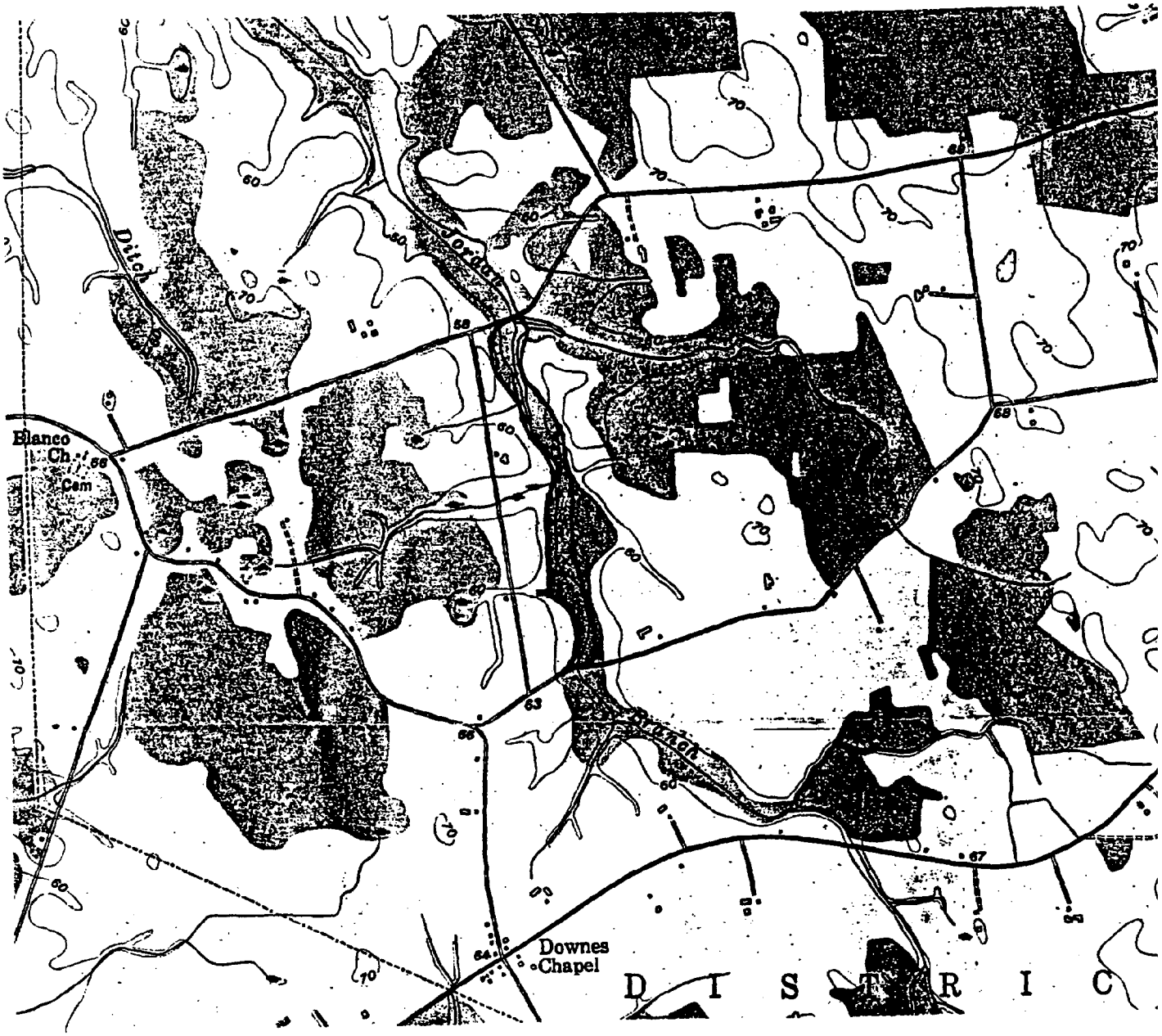


FIGURE 17. Jordan Branch; Kenton Quadrangle.

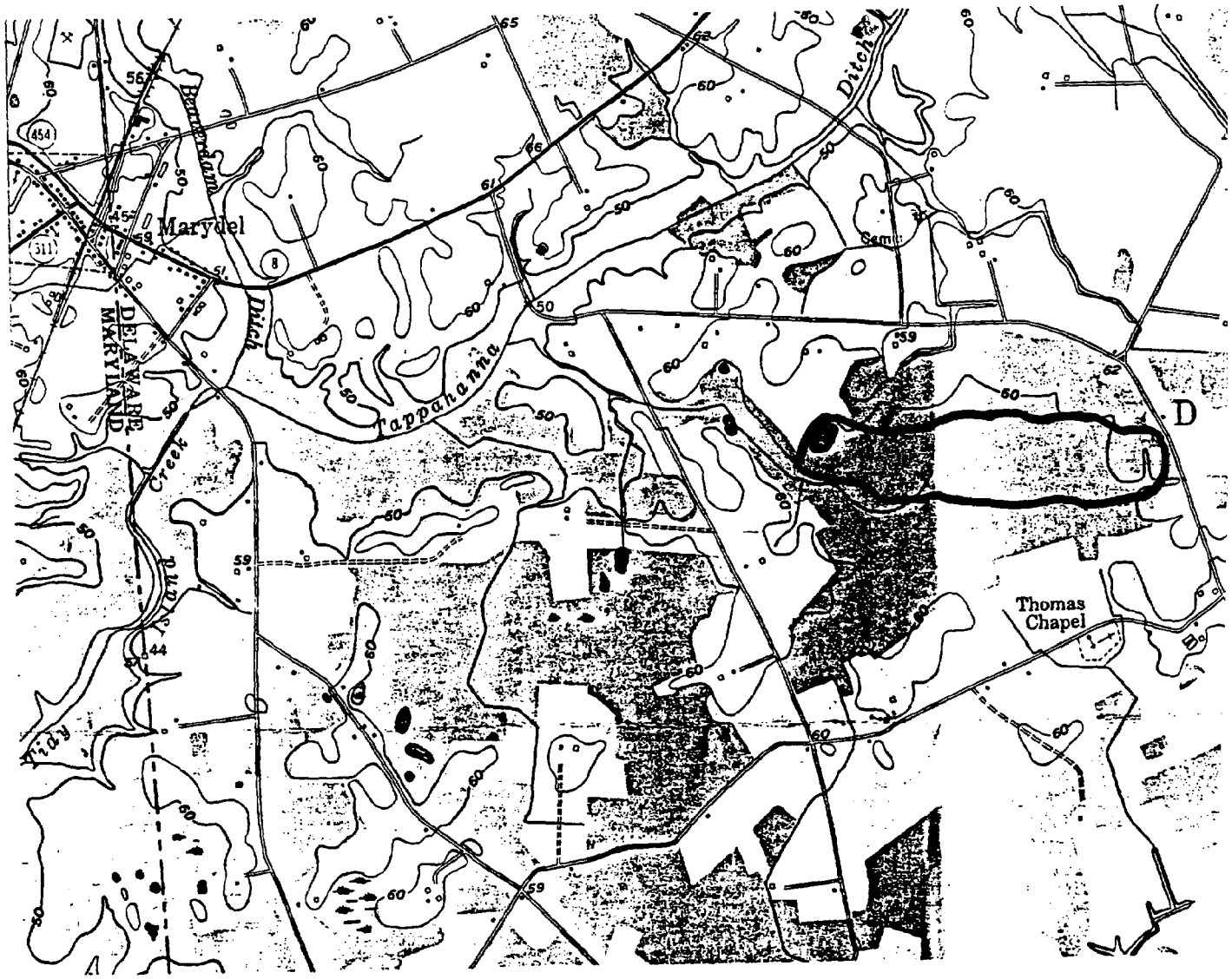


FIGURE 18. Woods and Ponds Northwest of Chapeltown; Marydel Quadrangle.

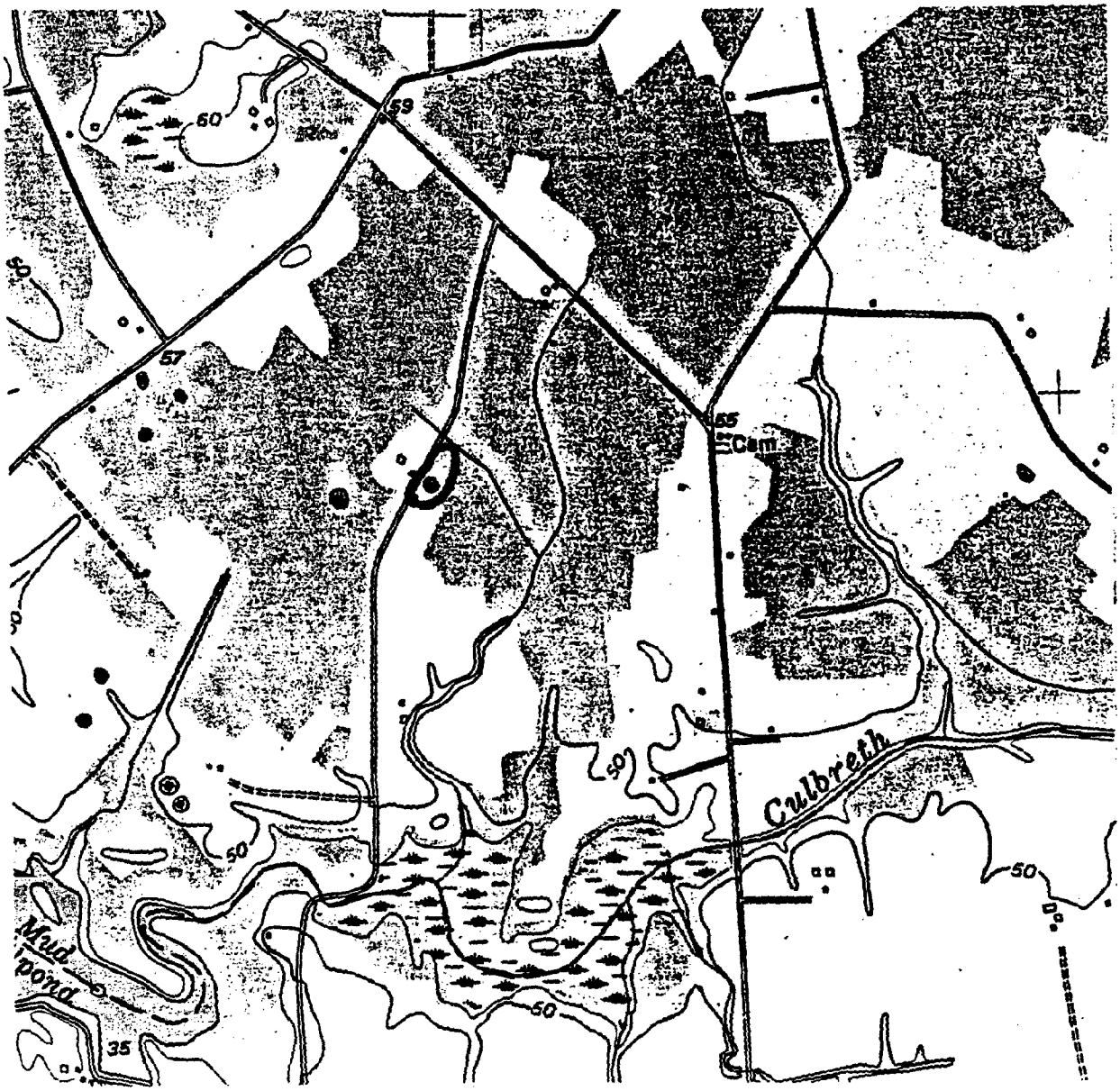


FIGURE 19. Culbreth Marsh Ditch Pond; Marydel Quadrangle.

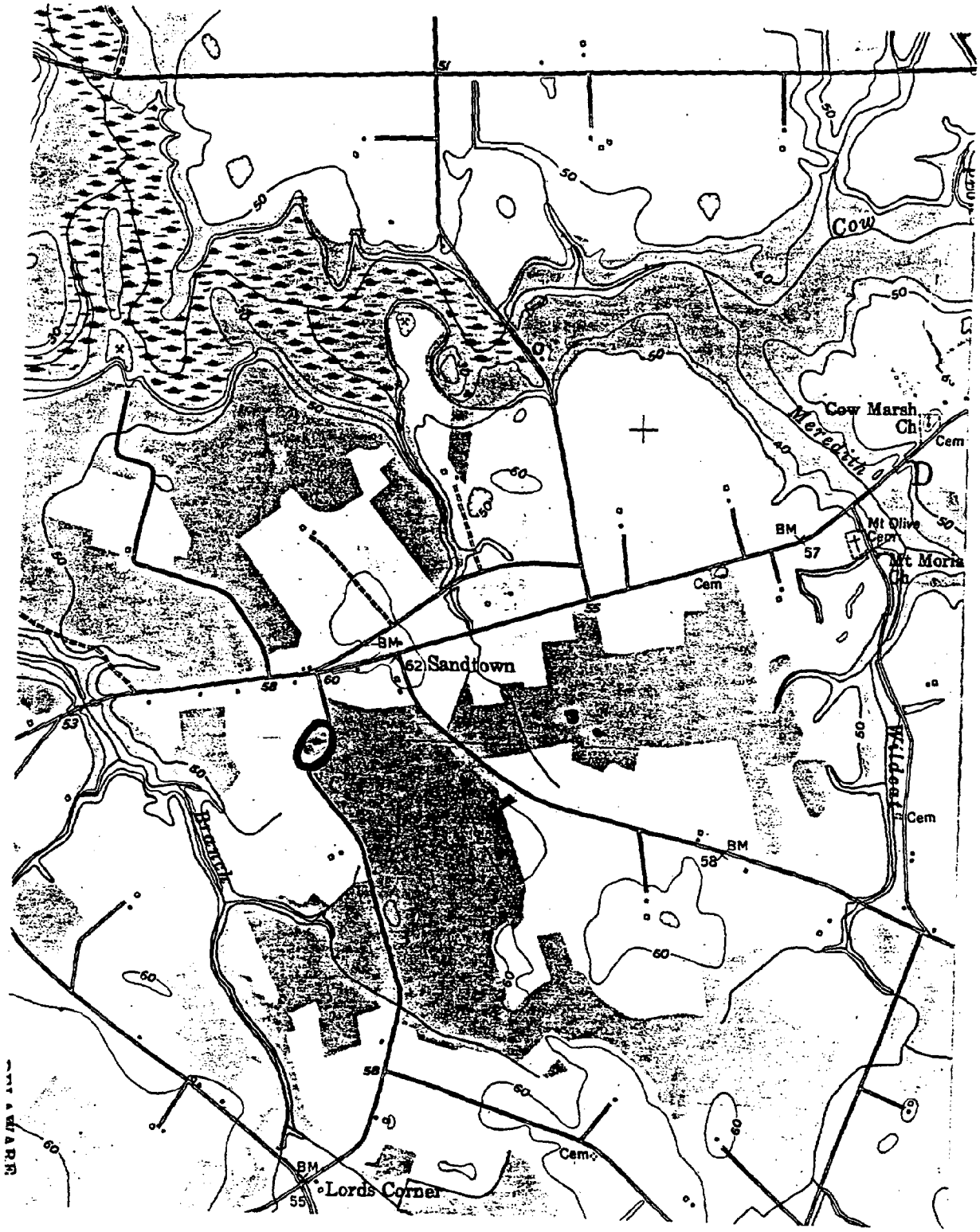


FIGURE 20. Sandtown Pond; Marydel Quadrangle.

FIGURE 21. Forest South of Culberth Marsh Ditch; Marydel Quadrangle.

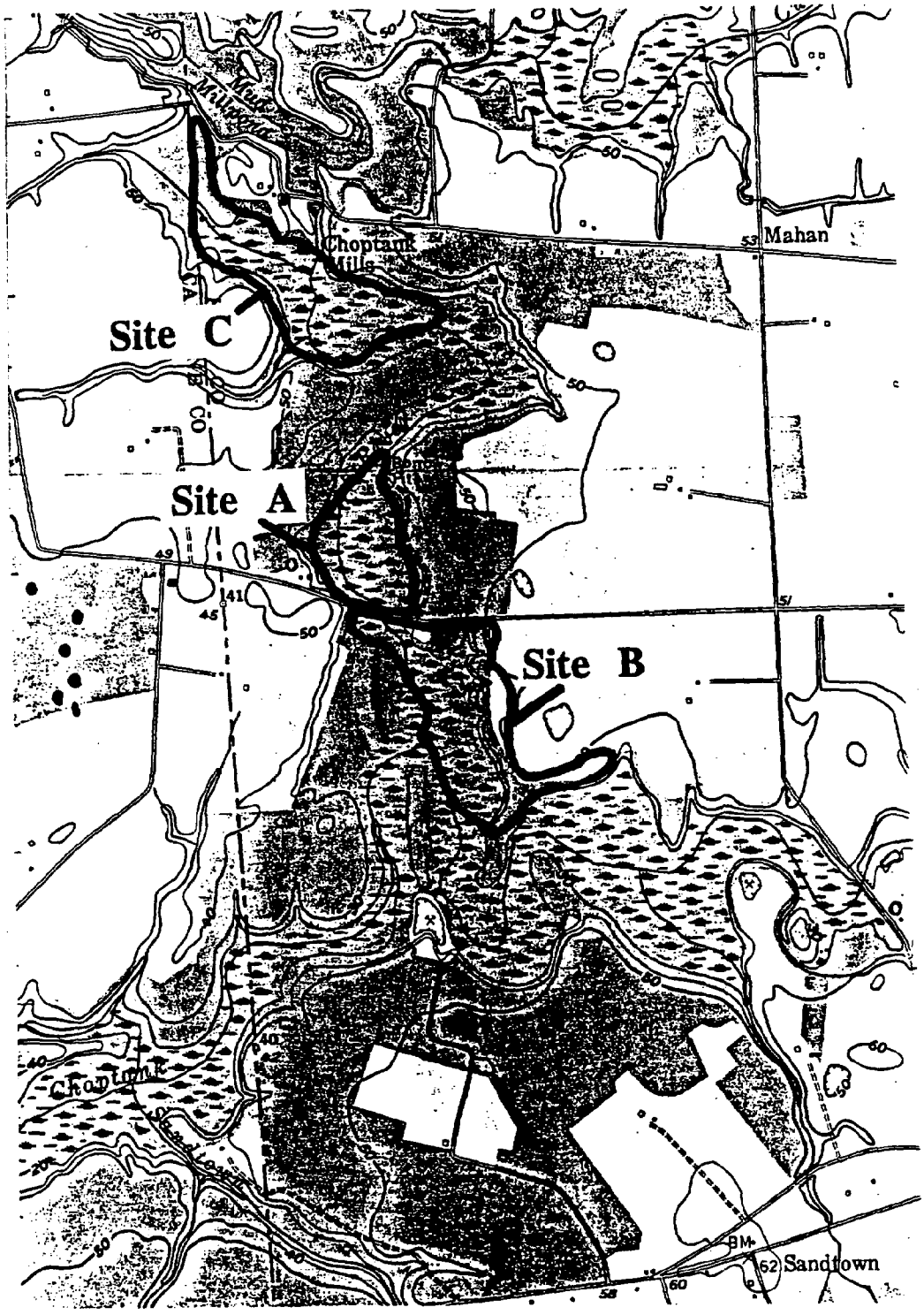


FIGURE 22. Choptank River, showing Site A (Above Road 211 Bridge), Site B (Choptank River at and below Road 211 Bridge) and Site C (Swamp Forest South of Choptank Mills); Marydel Quadrangle.

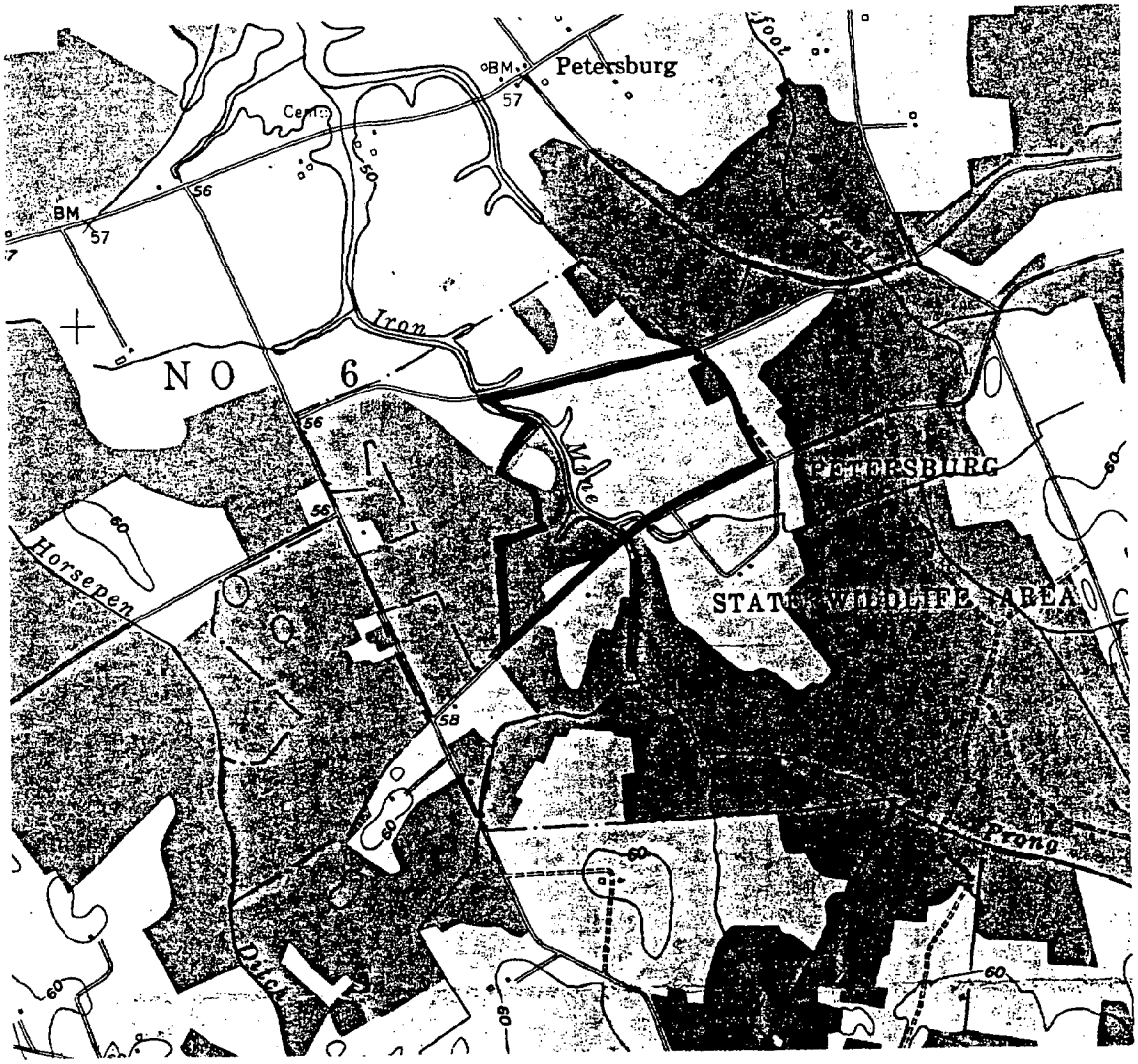


FIGURE 23. Iron Mine Prong at Norman Wilder Wildlife Area at Road 249; Marydel Quadrangle.

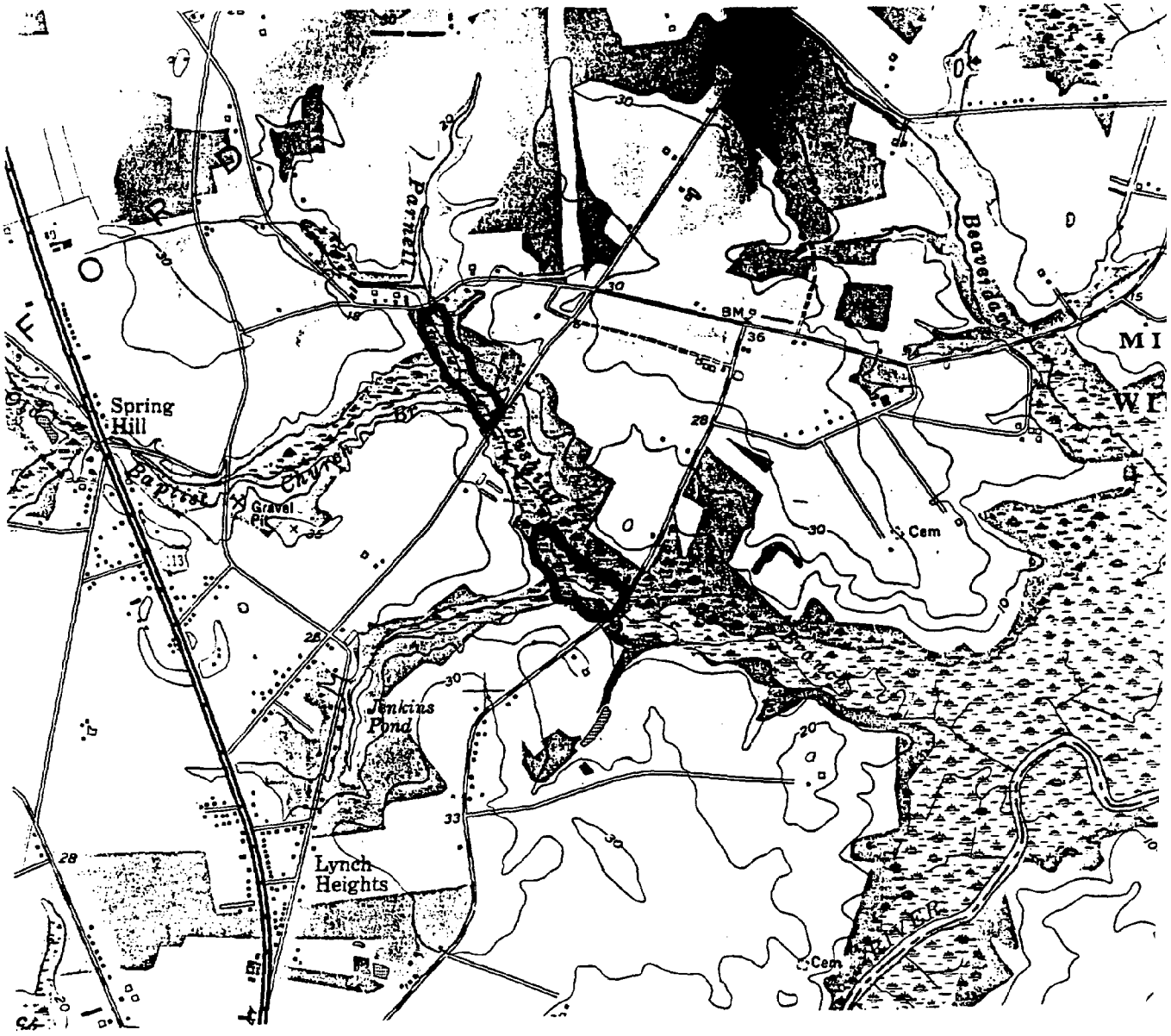


FIGURE 24. Fishing Branch Marsh; Milford Quadrangle.

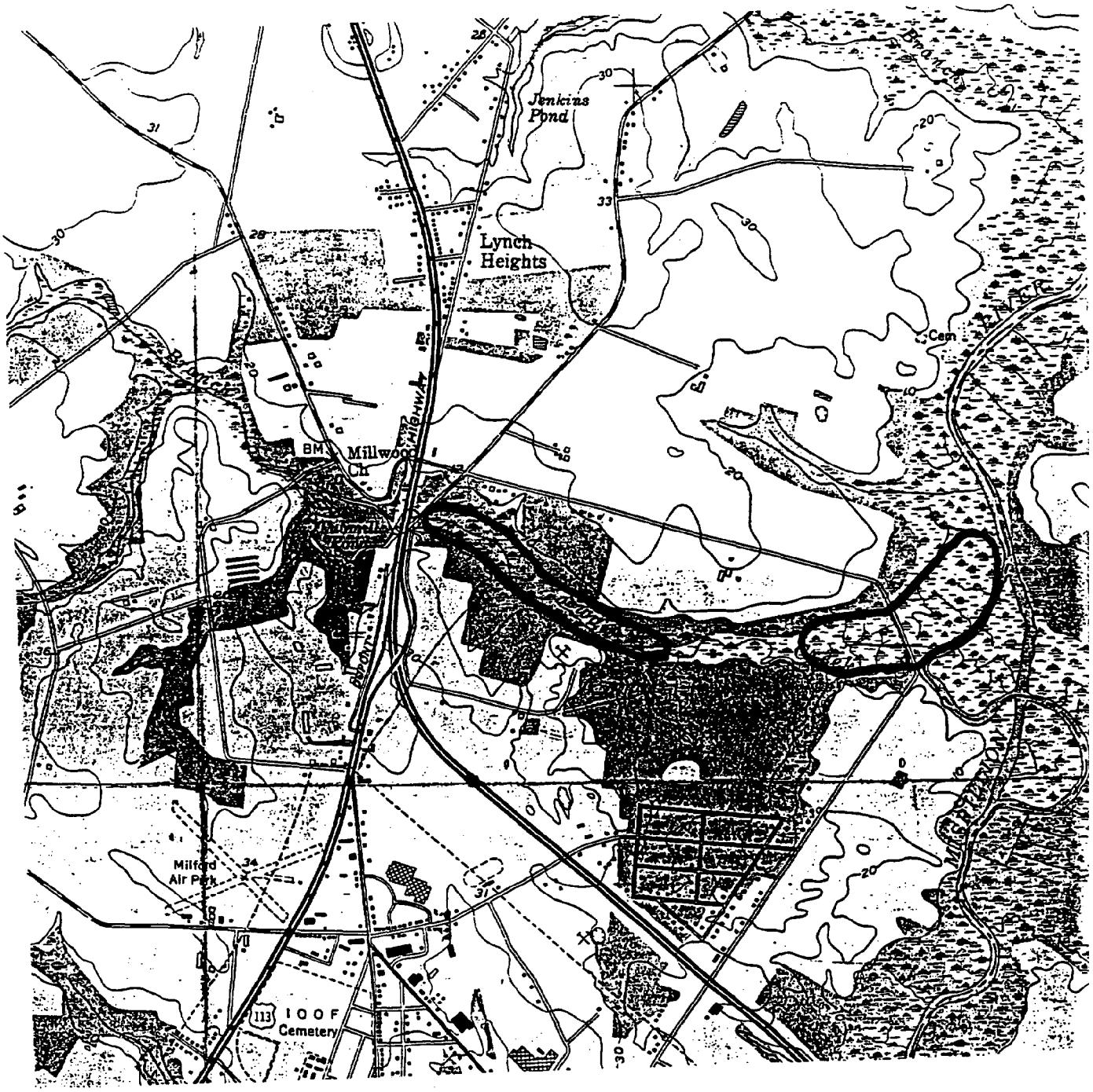


FIGURE 25. Swan Creek at New Wharf/Mispillion River; Milford Quadrangle.

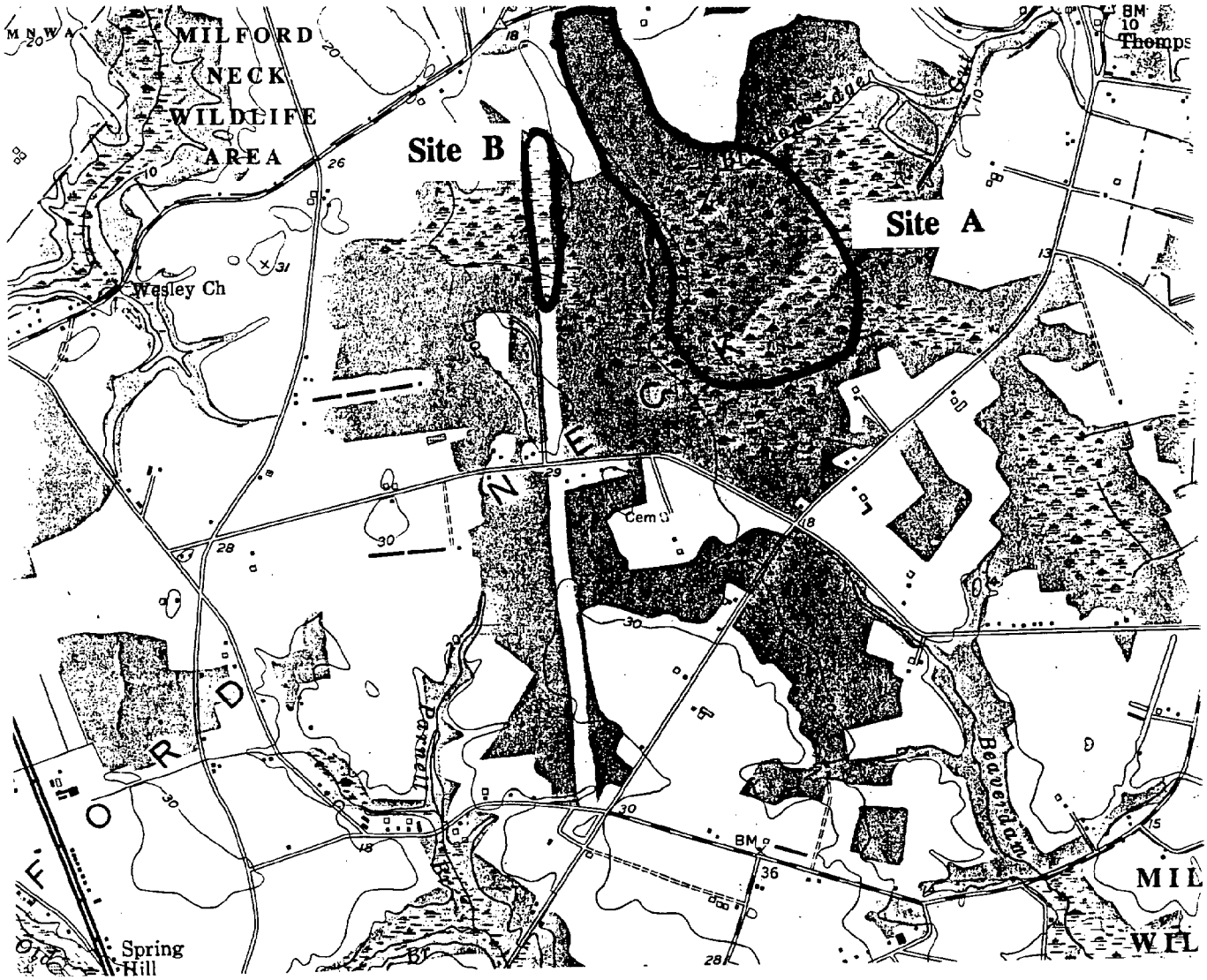


FIGURE 26. Brockenbridge Gut Mesic Woods (Site A) and Powerline R-O-W (Site B); Milford Quadrangle.

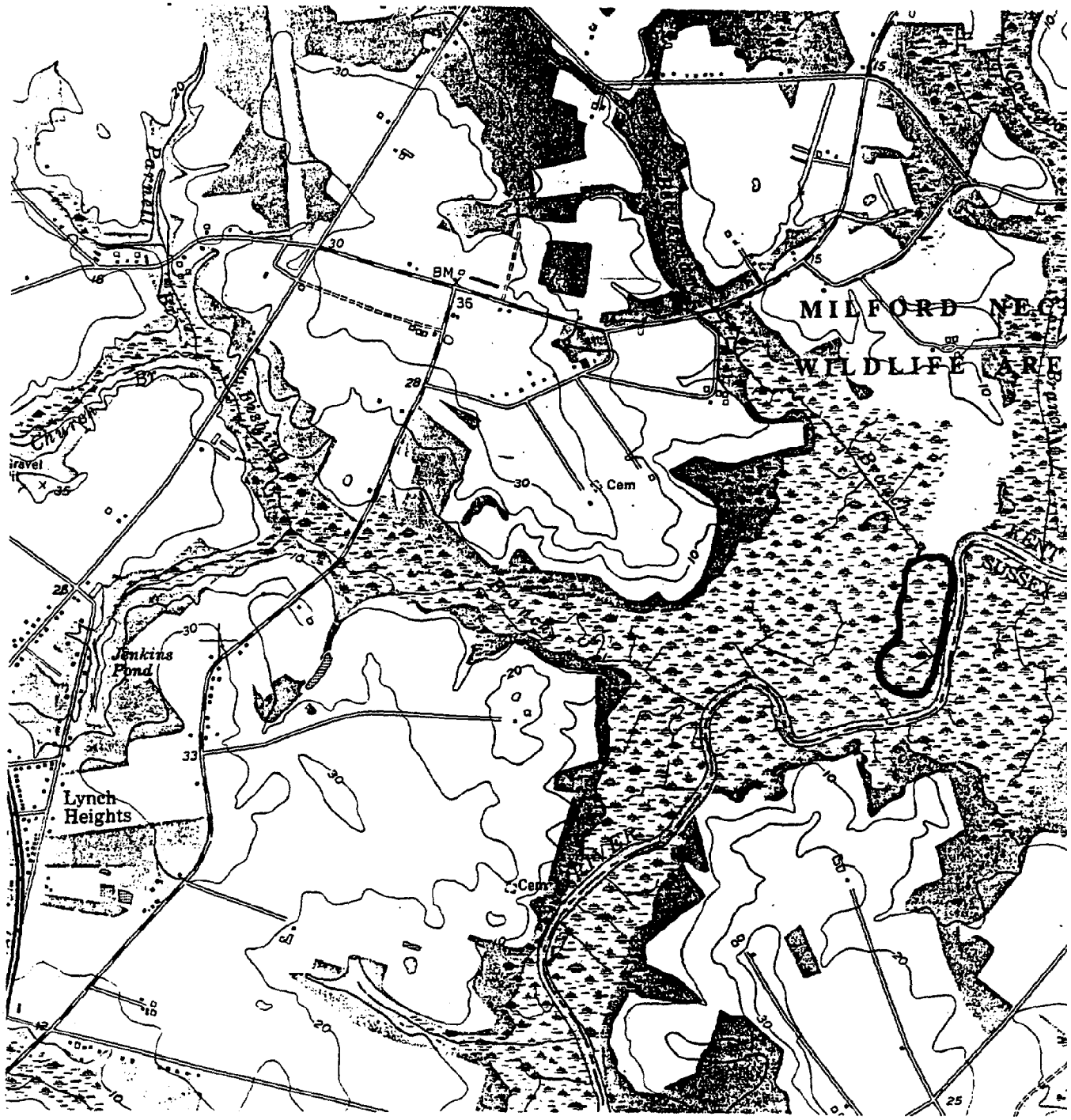


FIGURE 27. Mispillion River at Beaverdam Branch; Milford Quadrangle.

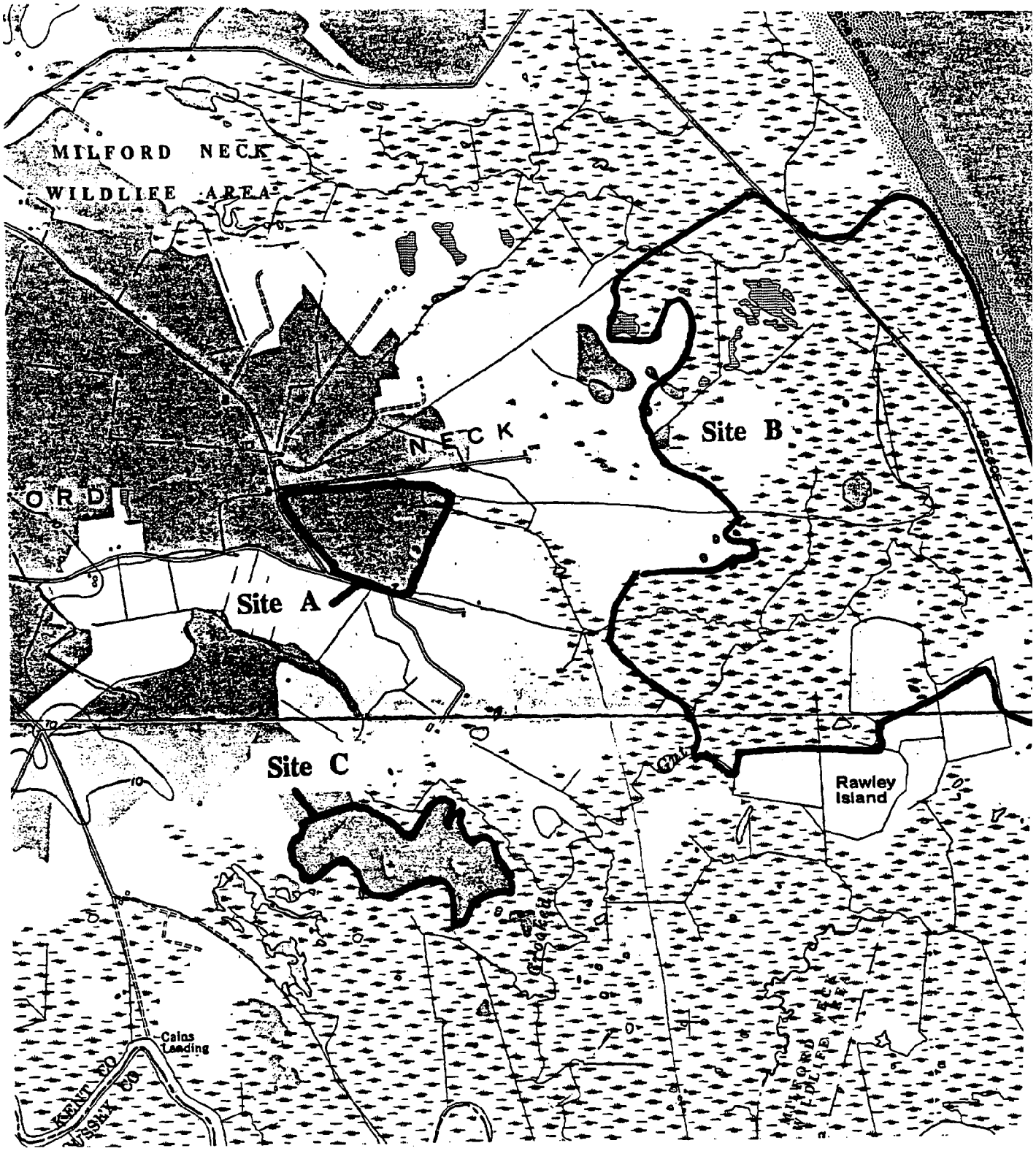


FIGURE 28. The Nature Conservancy Preserve on Milford Neck, showing Site A (Palustrine Forest) Site B (Salt Marshes) and Site C (Penninsular Forest); Mispillion River Quadrangle.

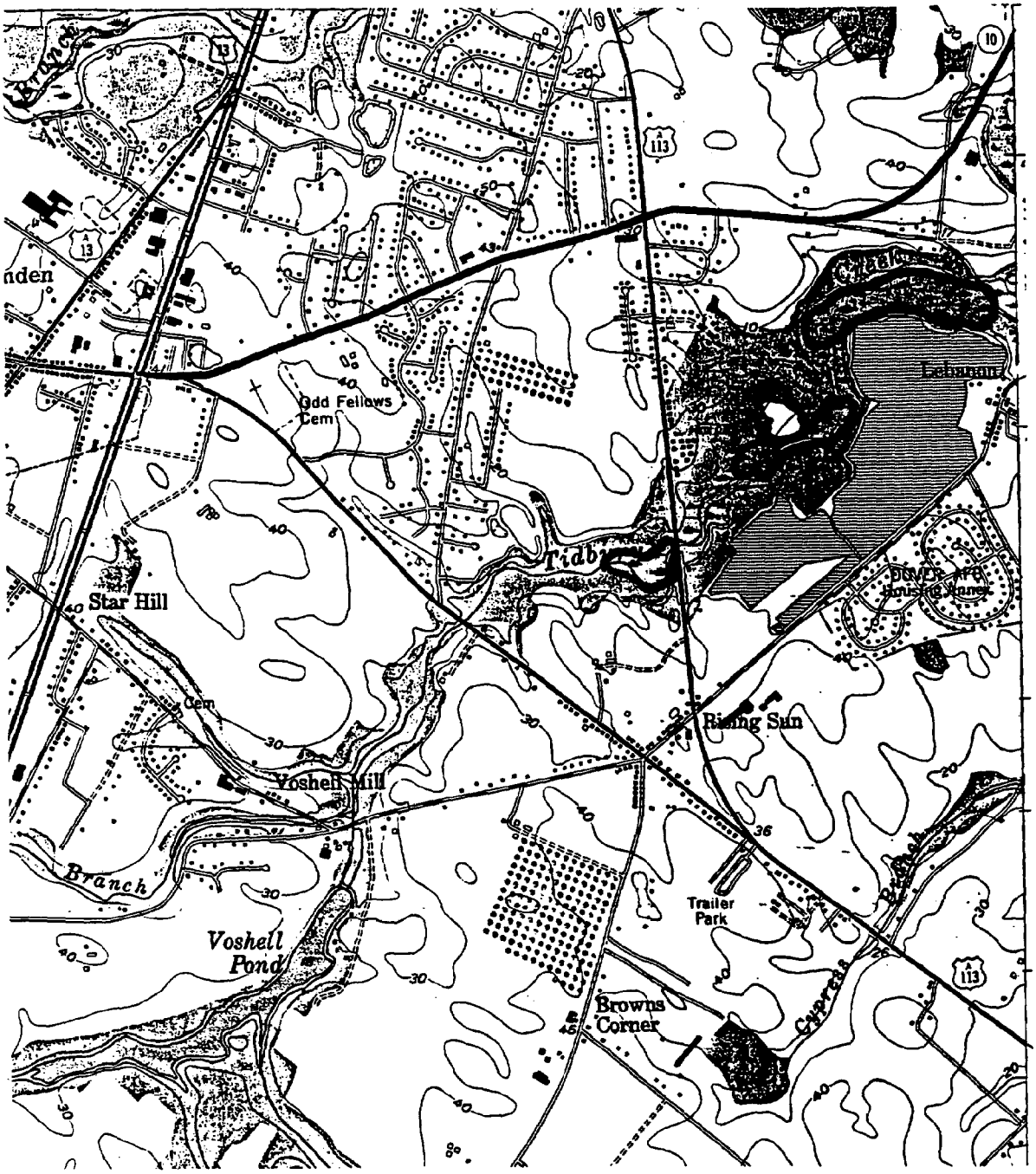


FIGURE 29. Tidbury Creek Marshes; Wyoming Quadrangle.

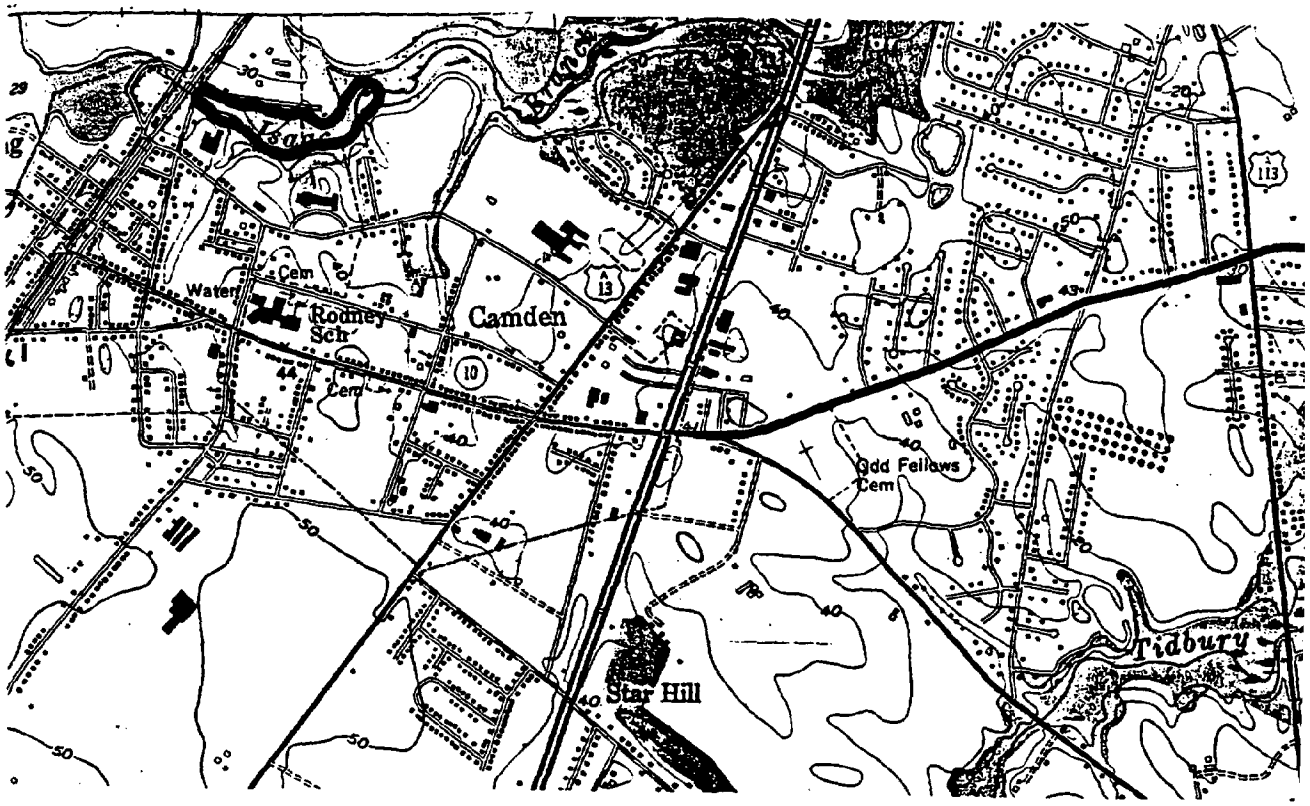


FIGURE 30. Isaac Branch at Wyoming/Camden; Wyoming Quadrangle.

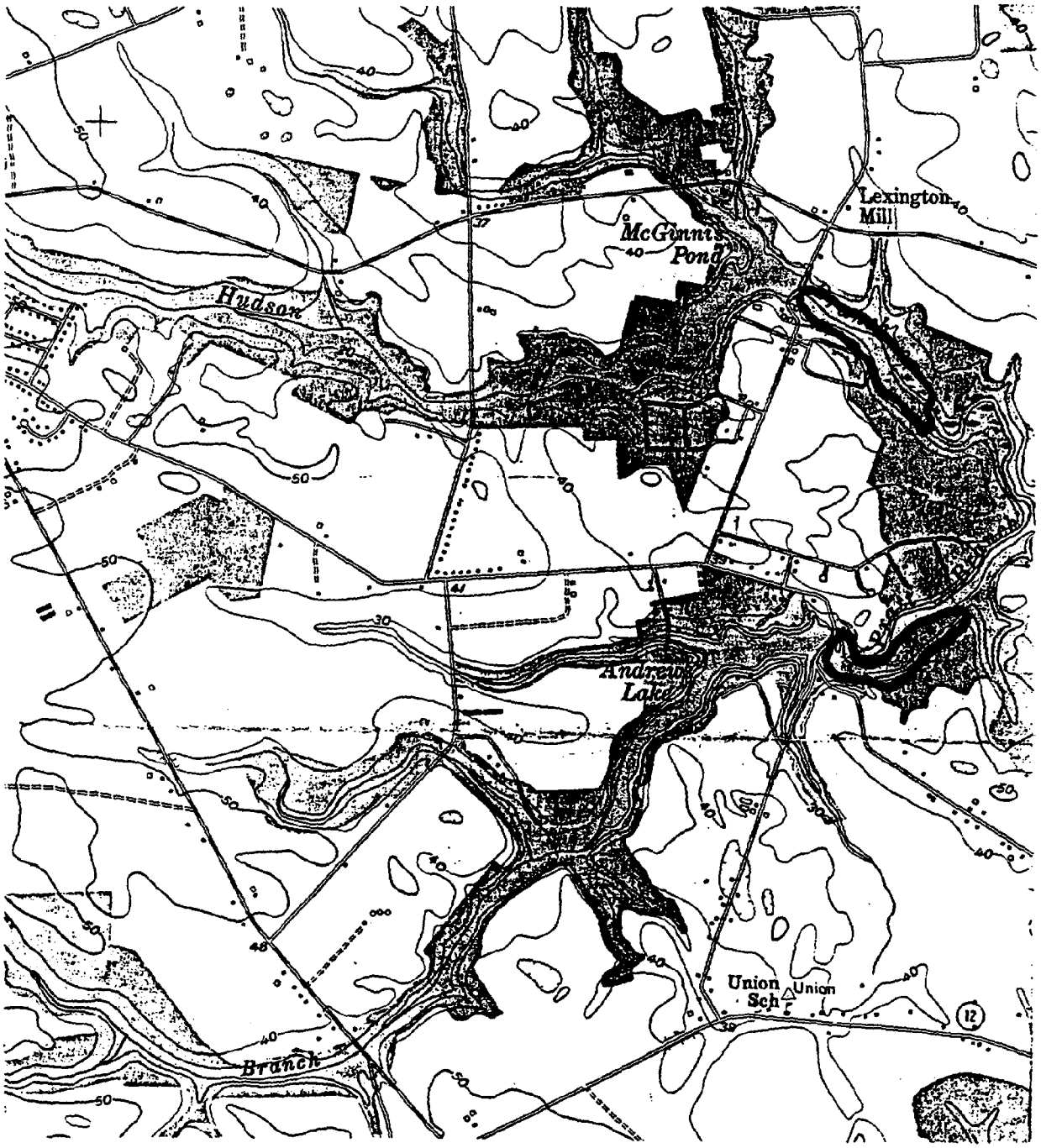


FIGURE 31. Hudson/Pratt Branches; Wyoming Quadrangle.

APPENDIX II. Rare Species State Ranking Criteria.

EXPLANATION OF STATE RANKS FOR SPECIES OF SPECIAL CONCERN

Ranks are based on a system developed by The Nature Conservancy to measure the rarity of a species. Each taxon is given a global and state rank. The global rank reflects the rarity of the species throughout the world and the state rank reflects the rarity within Delaware. State and global ranks are used to prioritize conservation and protection efforts so that the rarest of species receive immediate attention. The primary criteria for ranking species is the number of known distinct occurrences or populations. Ranks for individual species are annually updated and are based on current knowledge.

STATE RANKS

S1 Extremely rare; typically 5 or fewer known occurrences in the state; or only a few remaining individuals; may be especially vulnerable to extirpation.

S2 Very rare; typically between 6 and 20 known occurrences; may be susceptible to becoming extirpated.

S3 Rare to uncommon; typically 21 to 100 known occurrences; S3 ranked species are not yet susceptible to becoming extirpated in the state but may be if additional populations are destroyed.

S4 Common; apparently secure under present conditions; typically 100 or more known occurrences, but may be fewer with many large populations; usually not susceptible to immediate threats.

S5 Very common; demonstrably secure under present conditions.

SU Status uncertain; an uncommon species considered to be of concern and of conservation priority in the state, but there is inadequate data to determine rarity. Also includes uncommon species of uncertain nativity in the state.

SH Historically known from the state but not verified for an extended period (usually 15 years); there are expectations that the species may be rediscovered.

SX Species has been determined or presumed to be extirpated. All historical occurrences have been searched or all known sites have been destroyed, and a thorough search of potential habitat has been completed.

SA Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.

SB Regularly occurring species that are known to breed in the state (typically applies to birds).

SE Exotic in the state, not a part of the native flora; may be native elsewhere in North America (e.g. western United States).

SN Regularly occurring, usually migratory and typically non-breeding species for which no significant or effective habitat conservation measures can be taken in the state; this category includes migratory birds, bats, sea turtles, and cetaceans which do not breed in a given state but pass through twice a year or may remain in the winter (or, in a few cases, the summer).

SR Reported from the state, but without persuasive documentation that would provide a basis for either accepting or rejecting the report.

SRF Species reported falsely (in error) from the state, but this error persists in the literature.

ST Species whose taxonomic status are uncertain (i.e. may not be taxonomically distinct from other closely related taxa).

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