NWRC Open File Report 86-7
May 1986

THE FUNCTIONAL ASSESSMENT OF SELECTED WETLANDS OF CHINCOTEAGUE ISLAND, VIRGINIA

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THE FUNCTIONAL ASSESSMENT OF SELECTED WETLANDS OF CHINCOTEAGUE ISLAND, VIRGINIA

by

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Performed for
National Wetlands Research Center
Fish and Wildlife Service
U.S. Department of the Interior
Washington, D.C. 20240

Funded by
Wetlands and Marine Policy Section
U.S. Environmental Protection Agency
Region 3
Philadelphia, Pennsylvania 19107

DISCLAIMER

The use of the Adamus and Stockwell Wetland Evaluation Procedure in this study for the U.S. Fish and Wildlife Service (FWS) does not imply FWS endorsement of this method for evaluating wetland functions. In April 1987, a revised operational draft of this method is expected for testing and review, in which FWS will participate.

This report may be cited as:

Odum, W. E., J. Harvey, L. Rozas, and R. Chambers. 1986. The functional assessment of selected wetlands of Chincoteague Island, Virginia. U.S. Fish Wildl. Serv. NWRC Open File Rep. 86-7. 127 pp.

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CONVERSION TABLE

Metric to U.S. Customary

Multiply	By	To Obtain
millimeters (mm)	0.03937	inches
centimeters (cm)	0.3937	inches
meters (m)	3.281	feet
kilometers (km)	0.6214	miles
square meters (m^2)	10.76	square feet
square kilometers (km^2)	0.3861	square miles
hectares (ha)	2.471	acres
liters (l)	0.2642	gallons
cubic meters (m^3)	35.31	cubic feet
cubic meters	0.0008110	acre-feet
milligrams (mg)	0.00003527	ounces
grams (g)	0.03527	ounces
kilograms (kg)	2.205	pounds
metric tons (t)	2205.0	pounds
metric tons	1.102	short tons
kilocalories (kcal)	3.968	British thermal units
Celsius degrees	1.8(°C) + 32	Fahrenheit degrees

U.S. Customary to Metric

inches	25.40	millimeters
inches	2.54	centimeters
feet (ft)	0.3048	meters
fathoms	1.829	meters
miles (mi)	1.609	kilometers
nautical miles (nmi)	1.852	kilometers
square feet (ft^2)	0.0929	square meters
acres	0.4047	hectares
square miles (mi^2)	2.590	square kilometers
gallons (gal)	3.785	liters
cubic feet (ft^3)	0.02831	cubic meters
acre-feet	1233.0	cubic meters
ounces (oz)	28.35	grams
pounds (lb)	0.4536	kilograms
short tons (ton)	0.9072	metric tons
British thermal units (Btu)	0.2520	kilocalories
Fahrenheit degrees	0.5556(°F - 32)	Celsius degrees

1. PROJECT SETTING

1.1 INTRODUCTION

This study was done at the request of the Region III office of the U.S. Environmental Protection Agency (EPA) and was conducted under the joint guidance of that office and the National Coastal Ecosystems Team of the U.S. Fish and Wildlife Service (FWS). The assignment was to conduct an assessment of the potential hydrologic and ecologic functions of eight wetland sites on Chincoteague Island, Virginia. These sites ranged in size from approximately 4 ha to 21 ha. The wetlands included estuarine emergent and scrub/shrub along with palustrine emergent, scrub/shrub, and forested.

The Adamus/Stockwell (1983) assessment technique was specified as the method of choice. In addition, we agreed to provide general descriptions of the eight sites and also comment on the apparent effectiveness of the Adamus/Stockwell technique for assessing these wetlands. These descriptions, assessment results, and comments are contained in this report.

1.2 GEOLOGY

1.2.1 Developmental History

Chincoteague Island is a coastal barrier island of recent geological origin located at 75°22' west longitude and 37°56' north latitude. It is approximately 13.3 km long and 2.8 km wide at its widest point (at Piney Island). Chincoteague was formed 2,000 to 4,000 years ago during the mid-Holocene period, a time of lower but rising sea level and abundant sand supply along the mid-Atlantic coast (Halsey, 1979; Kraft et al., 1979). The island is composed of a series of parallel beach ridges and swales that rise less than three m above sea level.

The ridge-swale system at Chincoteague trends roughly from the southwest to the northeast. The oldest ridges (formed first) lie to the northwest. The continued formation of younger ridges (Figure 1) caused Chincoteague's ancestral barrier island to accrete towards the southeast. Approximately 1,000 years ago the formation of inlets to the north and south gave the present-day shape to the island's shoreline. During early colonial times the

tip of Assateague Island grew southward, shielding Chincoteague Island from direct exposure to the Atlantic Ocean (Halsey, 1979; see Figure 1).

1.2.2 Stratigraphy

The shallow geology of Chincoteague Island has not been extensively studied. However, it is likely to be similar to that of other barrier islands of similar age and developmental history. Holocene barrier islands are primarily composed of beds of sand or sand and shell with intervening layers of finer sands, silts and organic materials (Kraft, 1979; Missimer, 1973; Bartberger, 1976). These relatively recent geological formations are usually situated on top of confining layers of compacted peat or beds of clay and silt mixed with sand (Kraft et al., 1979; Bartberger, 1976; Missimer, 1973; Wiegle, 1974). The confining layers underlying barrier islands are usually located six to ten meters below sea level. Figure 2 is a profile view of the stratigraphy of a typical Holocene barrier island.

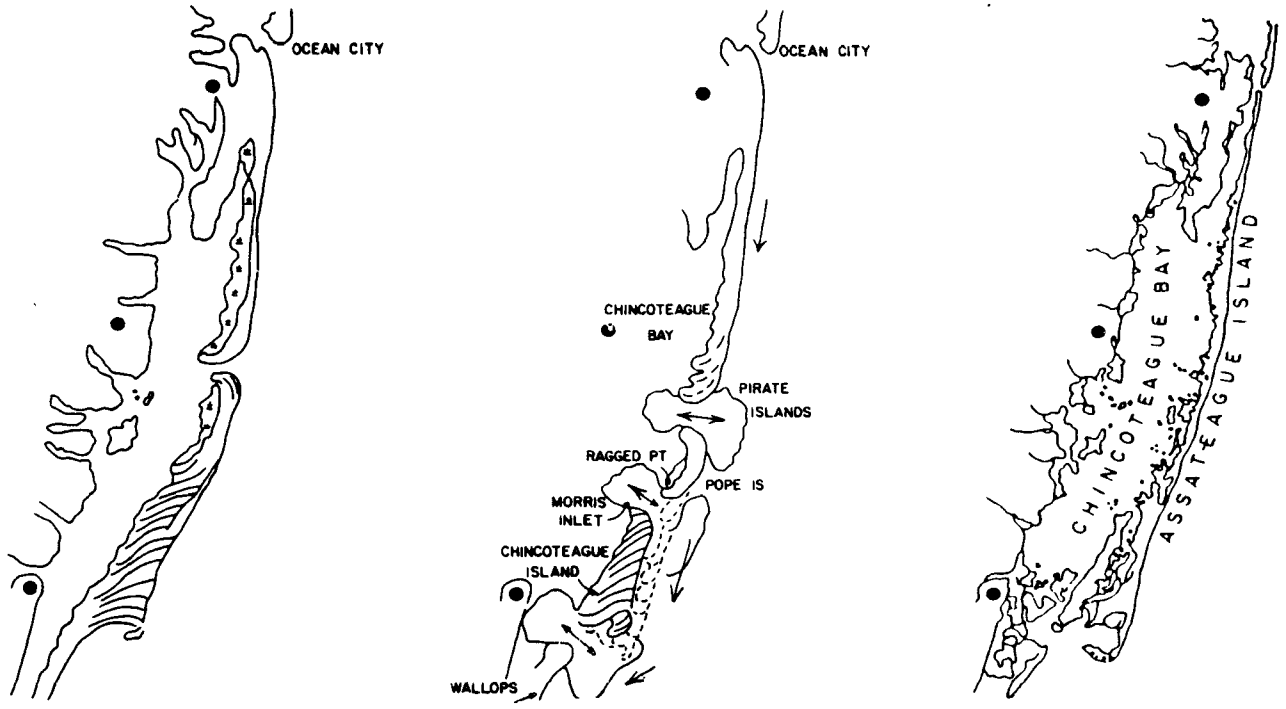


Figure 1. Developmental history of Chincoteague Island (modified from Halsey, 1979).

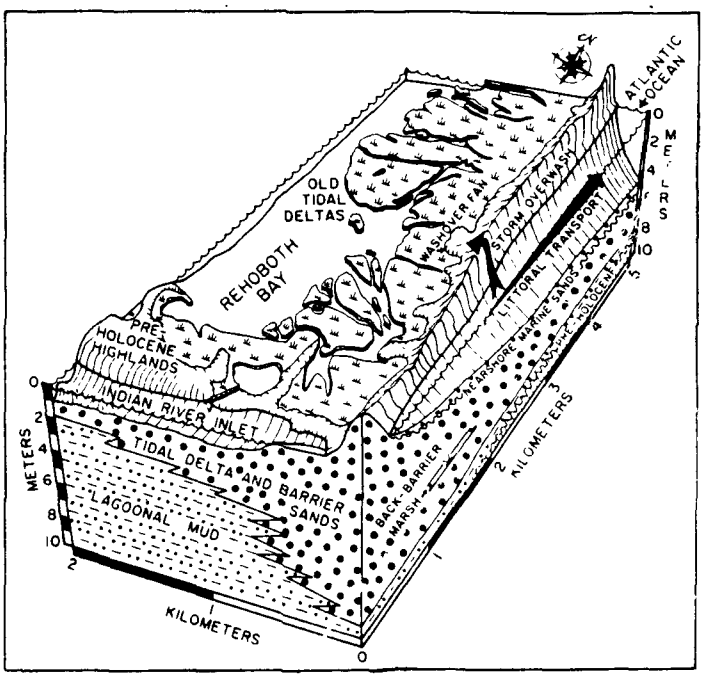


Figure 2. Stratigraphy of a typical Holocene barrier island (from Kraft et al., 1979).

Below the first confining layer at Chincoteague are a series of deep, sandy aquifers and aquicludes which extend downward to the crystalline rock basement which occurs about 7,000 ft below sea level (State Water Control Board, 1975).

1.3 HYDROLOGY

1.3.1 Groundwater

Chincoteague Island is underlain by five or more sandy aquifers enclosed by relatively impervious sediments which function as aquicludes (Department of Agriculture, 1975; Environmental Protection Agency, 1982). Only the two nearest the surface (The Pocomoke and the Manokin) hold appreciable fresh water resources. These aquifers are located between 30 and 90 m below the surface at Chincoteague (Biggs, 1970; State Water Control Board, 1975). Near the surface, the unconfined, water table aquifer may be as much as 6 to 9 m thick before it intersects the first aquiclude. The water reserves of this aquifer are brackish (State Water Control Board, 1975) except for some localized lenses of freshwater that occur above sea level (Grant Goodell - pers. comm.). Unlike the Pocomoke and Manokin aquifers which are recharged with freshwater some 50 to 100 km to the northwest (Biggs, 1970), the water table aquifer is

recharged locally by precipitation. Saltwater contamination of the unconfined aquifer probably occurs periodically as a result of severe storm tides (Winner, 1978). The average annual rainfall is approximately 105 cm in the Chincoteague area (Bolyard, 1978). Yet, the runoff of precipitation rarely occurs on the sandy soils of barrier islands (Bolyard et al., 1979; Winner, 1978). Most of the precipitation infiltrates directly into the soil whereupon it drains vertically under the force of gravity through the unsaturated zone. Once reaching the water table, subsurface water moves laterally in the direction of the water table surface slope. This drainage generally follows the land surface slope toward the interior wetland swales and ponds or toward the Bay waters that surround the Island. Discharge from Chincoteague's water table aquifer occurs by evaporation, transpiration, seepage into surface water bodies which drain interior portions of the island by channel flow, and seepage into the Bay and saltwater channels that surround Chincoteague. A schematic representation of the hydrologic cycle of a typical Holocene barrier island is shown in Figure 3.

Fluctuations in the elevation of the water table are controlled by climatic conditions and human activities on barrier islands (Kimmel and Vecchioli, 1979). The water table rises when recharge exceeds discharge and falls when the opposite condition prevails. Natural recharge of groundwater is inhibited by paving and compacting soils over large areas and by directly channeling storm waters off the island. If recharge by precipitation is sufficiently inhibited, recharge will eventually begin to occur laterally by salt water intrusion (Freeze and Cherry, 1979; Bear, 1979).

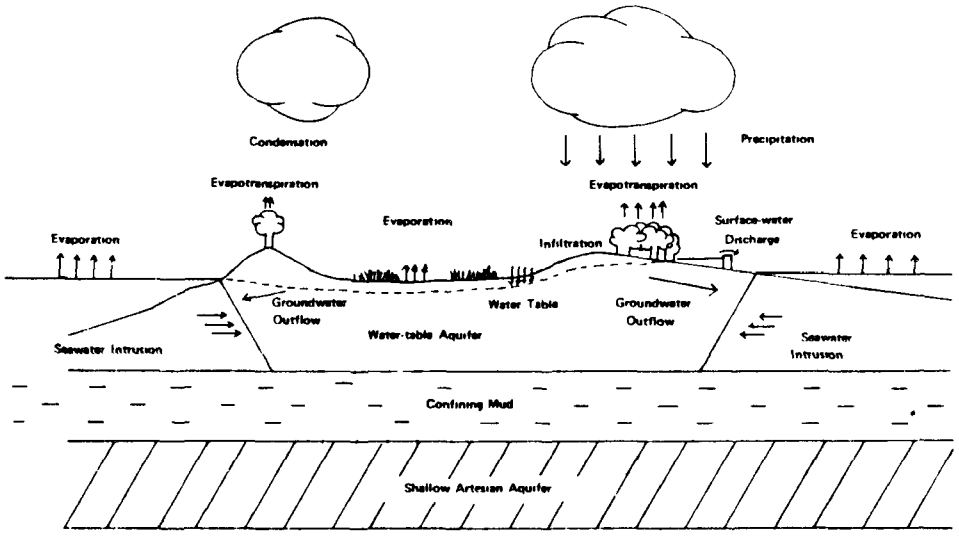


Figure 3. Hydrologic cycle of a typical Holocene barrier island (from Missimer, 1976).

1.3.2 Surface Water

Elevations on Chincoteague Island range from approximately -0.5 to +2.5 m (relative to mean sea level). As stated before the island possesses a ridge and swale topography related to its developmental history. The parallel systems of ridges and swales have bands of vegetation which correspond to the absolute elevation of the ridge tops and swale bottoms as well as the local height and variability of the water table. Lowland areas are composed of low ridges and wide swales that are seasonally or semipermanently flooded and primarily support wetland vegetation. Naturally occurring upland areas consist of higher, broader ridges and narrower swales which are characterized by less frequent incidences of flooding and a greater percentage of upland vegetation. The topography of much of the lowland area of the island has been extensively modified by grading and filling. Dredging, ditching, and road construction have also changed natural drainage patterns on the island.

Major surface drainage pathways that are relevant to this study are shown in Figure 4. Drainage is effectively divided by County road 2104 which crosses the island near the northeastern section of the town of Chincoteague. North of 2104 the wetlands drain primarily toward the jeep trail ditch. County road 2102 creates another surface drainage divide that runs lengthwise through the central portion of the island. To the west of 2102 the system is drained primarily by Fowling Gut. To the east drainage flows into Andrews Landing Gut and several smaller creek systems. The major drainage systems will be described separately below.

Historically, surface drainage into Oyster Bay and Little Oyster Bay was blocked by filling along the shorelines of these water bodies; first along County road 2104 and more recently by dredging and filling of homesites along Oyster Bay. Instead of exiting into the Oyster Bays, surface water now drains to the south into the jeep trail ditch and then to the west into Chincoteague Bay near the High School. The jeep trail ditch is permanently flooded and tidal. A small diameter culvert under County road 2101 tends to maintain a substantial head of brackish water which promotes steady drainage into Chincoteague Bay during rainy periods.

Fowling Gut is a natural, interior drainage system that runs lengthwise across the southern two-thirds of the island. In its upper reaches above Mire Pond it has been modified by channelization; culverting beneath roadways has occurred along its entire length. A 1943 U.S.G.S. topographic map and aerial photographs from the 1940's indicate that at one time Fowling Gut probably had tidal connections at both the northeast and southeast ends of the Island. The tidal connection at the southwest end of the island has been preserved through the use of

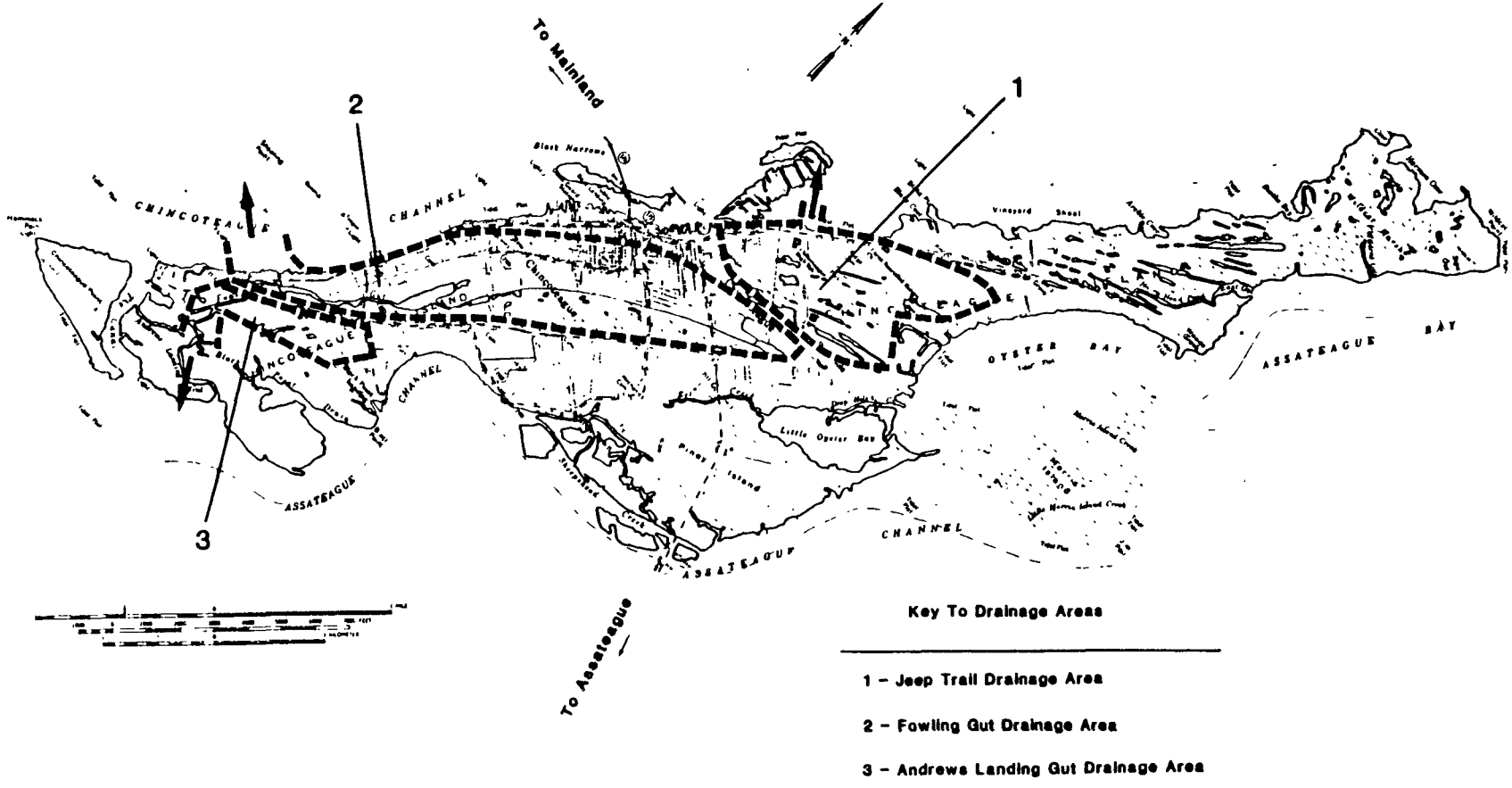


Figure 4. Major surface drainage areas on Chincoteague Island, Virginia.

culverts underneath County roads 2102, 2113, 2103, and 2126 and State road 175. However, flow has been substantially constricted by the culverts. A recent engineering study (Waterways Surveys 1985) reported that Fowling Gut exhibits tidal effects all along its length although the amplitude of tidal fluctuations at its headwaters are increasingly diminished. The timing of peaks and low tides are considerably delayed relative to the tides in Chincoteague Bay. The study also showed that the waterway responds quickly to even moderate rainfalls by collecting stormwater and shunting it over a period of days into Chincoteague Bay. It is not known whether alterations of the Fowling Gut system have increased or decreased surface drainage from the interior portions of the Island. Pavement drainage and surface channeling of stormwater by road-side ditches may promote more rapid drainage of precipitation following storms. Seasonal periodicities in the volume of water stored in the Fowling Gut system have not been studied as well.

Dredging and spoil placement at the headwaters of Andrews Landing Gut in addition to the recent development of a trailer park to the north have isolated a large section of salt marsh from surface water exchange with Fowling Gut. Recent road construction between Andrews Landing and Black Point Landing has further isolated this wetland from regular tidal exchange with Assateague Channel. Two, small-diameter culverts under the new road are flap gated to impede tidal influence and promote drainage of the marsh.

The wetlands chosen for study on Chincoteague were only a small subset of a large, interconnected, and, in many places, disturbed system of swales, seasonal ponds and ditches. Many of the wetlands are topographically isolated from surface water exchange with the jeep trail ditch, Fowling Gut, and Andrews Landing Gut during most times of the year. The sandy underlying substrate does, however, promote water exchange between the wetlands and the water table aquifer. Depending upon local topographic variation and recent climatic conditions, isolated wetlands can accept groundwater discharge from surrounding uplands or recharge the groundwater system. During extremely wet periods, overflow and redistribution of surface water to tidal channels can occur.

1.4 WETLAND ECOLOGY

1.4.1 Vegetation

The interior wetlands of Chincoteague Island exist primarily in the elongate swales between the relict beach ridges and intertidal marshes fringe the island's circumference and tidal waterways. Depending upon the proximity to Chincoteague Bay and the presence or absence of a tidal connection, salinities in

these wetlands range from almost totally freshwater to fully marine. Based upon the classification of Cowardin et al. (1979), there are five general wetland types present on Chincoteague Island; (1) estuarine emergent, (2) estuarine scrub-shrub, (3) palustrine emergent, (4) palustrine scrub-shrub, and (5) palustrine forested.

The ends of the swales which abut Chincoteague Bay and most of the wetland margins of Fowling Gut are dominated by estuarine emergents such as Spartina alterniflora, Spartina patens, and Distichlis spicata. Two wetland shrubs dominate the vegetation in more elevated areas: marsh elder (Iva frutescens) and salt bush (Baccharis halimifolia). Wax myrtle (Myrica cerifera) is present at the wetland-upland transition.

Surface water salinities decrease markedly as the swales are traversed toward the interior of the island. The wetland plant communities, in turn, become increasingly dominated by brackish and freshwater species including various sedges (Scirpus spp.), cattails (Typha spp.), smartweeds (Polygonum spp.), water dock (Rumex verticillatus), marsh hibiscus (Hibiscus moscheutos) and seashore mallow (Kosteletzkya virginica). Marsh elder dominates the higher, shrub zones in these palustrine wetlands. Hardwoods that can withstand seasonal flooding have attained dominance in some wetlands. Red maple (Acer rubrum) is the most common tree species in these situations although slippery elm (Ulmus rubra), sweet gum (Liquidambar styraciflua), and water oak (Quercus nigra) are also important constituents in the overstory of well developed, palustrine forested wetlands. Areas which have been filled or otherwise disrupted are usually covered with a thick stand of reed grass (Phragmites australis).

1.4.2 Fish Communities

Fish are present in Chincoteague's wetlands only where an open connection exists between the swales and the estuary. Where connections are absent, there is a lack of fish communities in these wetlands, which may experience a complete drying up of the swale pools during extended drought. Where surface water connections to the estuary exist, the fish communities are dominated by typical estuarine forage fishes such as killifishes (Fundulus spp.), and sheepshead minnow (Cyprinodon variegatus), and juveniles of commercially important species such as bluefish (Pomatomus saltartix), menhaden (Brevoortia tyrannus), spot (Leiostomus xanthurus), and Atlantic croaker (Micropogonias undulatus). Estuarine invertebrates such as blue crabs (Callinectes sapidus) and grass shrimp (Paleomentes pugio) are also present. Dense concentrations of marine and estuarine fish use the marshes and tidal creeks of estuarine wetlands as primary nursery habitats (McHugh, 1966; Cain and Dean, 1976; Weinstein, 1979; Bozeman and Dean, 1980; Rozas and Hackney, 1983). A wetland system the size of Chincoteague, however, does not have

sufficient freshwater discharges like a riverine system's to support anadromous species such as shad and striped bass.

1.4.3 Avian Communities

Chincoteague Island is situated within the Atlantic Coast Flyway, a migratory bird corridor which is heavily used by a wide range of avian groups. Depending on the time of year, many different species of birds may be observed using the wetland resources of Chincoteague Island for feeding and resting. Very large populations of swans, geese, and dabbling ducks have been reported for the Chincoteague vicinity along with smaller numbers of diving and sea ducks (Odum et al., 1984). The extent of local use is controlled by the size of the wetland and the types of food sources present (particularly freshwater plants). Plants of particular importance to waterfowl include Scirpus spp., Polygonum spp., and Echinochloa walteri, all of which are abundant on Chincoteague. Herons, egrets, and other wading birds are common summer inhabitants of Chincoteague's wetlands. They forage primarily in estuarine, emergent wetlands for their preferred diet of small fish. In addition, a large number of seed-eating birds such as blackbirds, and insectivorious birds such as flycatchers, are known to use palustrine wetlands similar to those on Chincoteague (Odum et al., 1984).

2. METHODOLOGY

2.1 GENERAL PROCEDURES

Eight sites on Chincoteague Island were selected by EPA for evaluation (Figure 5). Wetland evaluations were made using the methodology described in A Method for Wetland Functional Assessment (Adamus and Stockwell 1983). The evaluations began with a field investigation. Each site was visited at least twice during field trips to Chincoteague Island in August and September of 1985. Very wet conditions were prevalent at the sites during August following the recent passage of Hurricane Danny. Normal to dry conditions were present during September.

During the field investigation, each site was surveyed on foot. The dominant vegetation was identified, soils were examined, and notes were made on the physiochemical (salinity, water depth, pH) and biological (fish and wildlife observations) factors that are relevant to the evaluation procedure.

The major wetland types within each site were identified as defined by Cowardin et al. (1979). As defined in the specified assessment technique, each site was considered to be a separate Wetland Impact Area (WIA) a term that is synonymous with "wetland study area." Two exceptions exist: the Fowling Gut and Mire Pond Scrub-Shrub Systems were separated into estuarine and palustrine portions based on the findings of the field investigations and each portion was evaluated separately.

After the field investigation was completed, the questions from Adamus (1983) on Forms A and B were answered and recorded on Response Sheets A1 and B1, respectively, for each WIA. Comments were recorded where necessary to clarify interpretations of some questions on Forms A and B.

These data were used to assess each WIA for the following functions (Sections 2.1.2 and 2.2.2, in Adamus 1983):

Groundwater Recharge and Discharge
Flood Storage
Shoreline Anchoring
Sediment Trapping
Long-Term and Seasonal Nutrient Retention
Downstream and In-Basin Food Chain Support

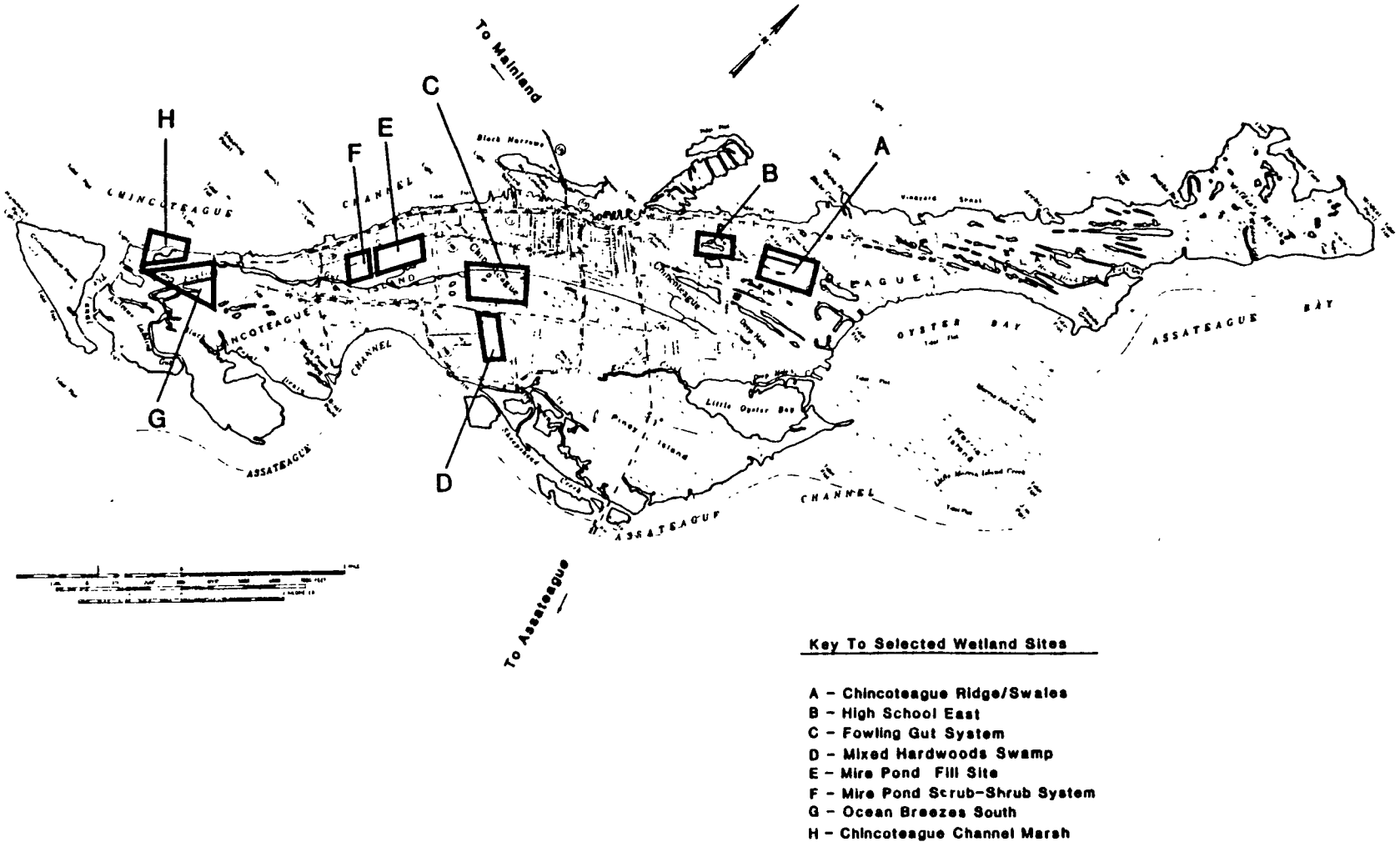


Figure 5. Location map for selected wetlands on Chincoteague Island, Virginia.

Fishery Habitat
Wildlife Habitat
Active Recreation
Passive Recreation and Heritage

Form C was not used in this project in accordance with previous agreements with EPA and FWS. The ratings that resulted from this assessment were recorded on Summary Sheet D for each WIA.

The results of the site evaluations are summarized in table form in Subsection 4.2. A site description, Forms A1 and B1, Summary Sheet D, and Comments regarding questions on Forms A and B are provided in Chapter 3 for each WIA. The Adamus (1983) method should be consulted for the questions answered on Forms A1 and B1 and the keys used to derive the ratings on Summary Sheet D.

2.2 MAPPING

Maps in this document do not meet mapping specifications and are for schematic purposes only. These maps (Figures 6-12) should not be used for Federal or State jurisdiction determination.

2.3 DEFINITIONS AND WETLAND TERMINOLOGY

Wetlands terminology is from Cowardin et al. (1979). Definitions of terminology from Adamus and Stockwell (1983) are as follows. See original reference for detailed explanation.

Basin - The aquatic area is composed of the wetland plus adjoining deep open water, if any.

Functional Watershed - (This term is not described for each site on Chincoteague because of its vague nature.) The total of all areas, including the subwatershed, as well as areas lower and perhaps higher, which drain into a focal point where the effect of the wetland's services to society would hypothetically be felt to the greatest degree.

Subwatershed - The terrestrial areas whose runoff drains into the wetland or basin, and not into lakes, streams or wetlands which are not contiguous to the wetland or basin.

Wetland Impact Area (WIA) - The portion of the wetland that will experience any of a series of possible changes (described in Adamus and Stockwell, 1983). For the purposes of this study, the chosen wetland study sites are the WIA's.

2.4 AERIAL PHOTOGRAPHY

Recent aerial photography was provided by the EPA. Historical photography from as early as 1943 came from the photographic collection at the University of Virginia.

2.5 DETERMINATION OF HYDROLOGIC FUNCTION

Detailed hydrological studies were outside the scope (and budget) of this study. Numerous observations were made during periods of seasonally low and high water. Statements made in the site description sections are based on our experience as hydrologists and represent only our expert opinion. Estimations about hydrologic circulation, flood storage capacity, groundwater recharge and discharge and nutrient retention capacity were made before calculating the Adamus values.

3. SITE DESCRIPTIONS

3.1 CHINCOTEAGUE RIDGE/SWALES STUDY SITE

3.1.1 Qualitative Site Description

Physical description. This WIA (Figure 6) is composed of a series of low upland ridges and shallow swales covering approximately 13 ha. These ridges and swales run roughly northeast to southwest. Some of the swales have open water, some have shrub communities, and some have emergent vegetation. Historical photography shows that the swale wetland areas at the northern and eastern end of the site were once connected to estuarine emergent wetlands. This connection has been blocked-off by the construction of the road, borrow pit, and filled areas in the Oyster Point development to the north and northeast. To the south and southwest the ridges and swales run unimpeded until they strike the so-called jeep trail and jeep trail ditch which runs east and west near the high school.

Definitions. The WIA consists of the site as outlined by EPA. The sub-watershed consists of the various ridges which run from the northeast to the southwest. The basin for this site extends to the jeep trail ditch which lies approximately 500 m to the south of the site. Some surface water leaves the site via the swales and drains into the jeep trail ditch (but only during very wet periods) and then drains westward into Chincoteague Bay. The culverted outlet of the jeep trail canal allows some intrusion of saltwater during periods of dry weather and high tides. Salinity measurements indicate that tidal influences extend only a short distance northeastward into the swales.

Qualitative vegetation description. Vegetation on this site breaks down into basically two types - the wetland dominated swales and the pine forest dominated ridges. The swale wetlands which lie to the north and northeast side of the site are dominated by emergent vegetation largely dictated by the former estuarine characteristics of the site. This includes *Spartina patens*, *Distichlis spicata*, *Scirpus olneyi*, and the seashore mallow (*Kosteletzkya virginica*). Further south these swales are dominated by *Iva* and other shrubs including *Myrica*. The swales which lie on the southwest and western side of the site are dominated by somewhat different plants such as *Hibiscus*, *Polygonum* (which dominates many of the sites), *Kosteletzkya*, the

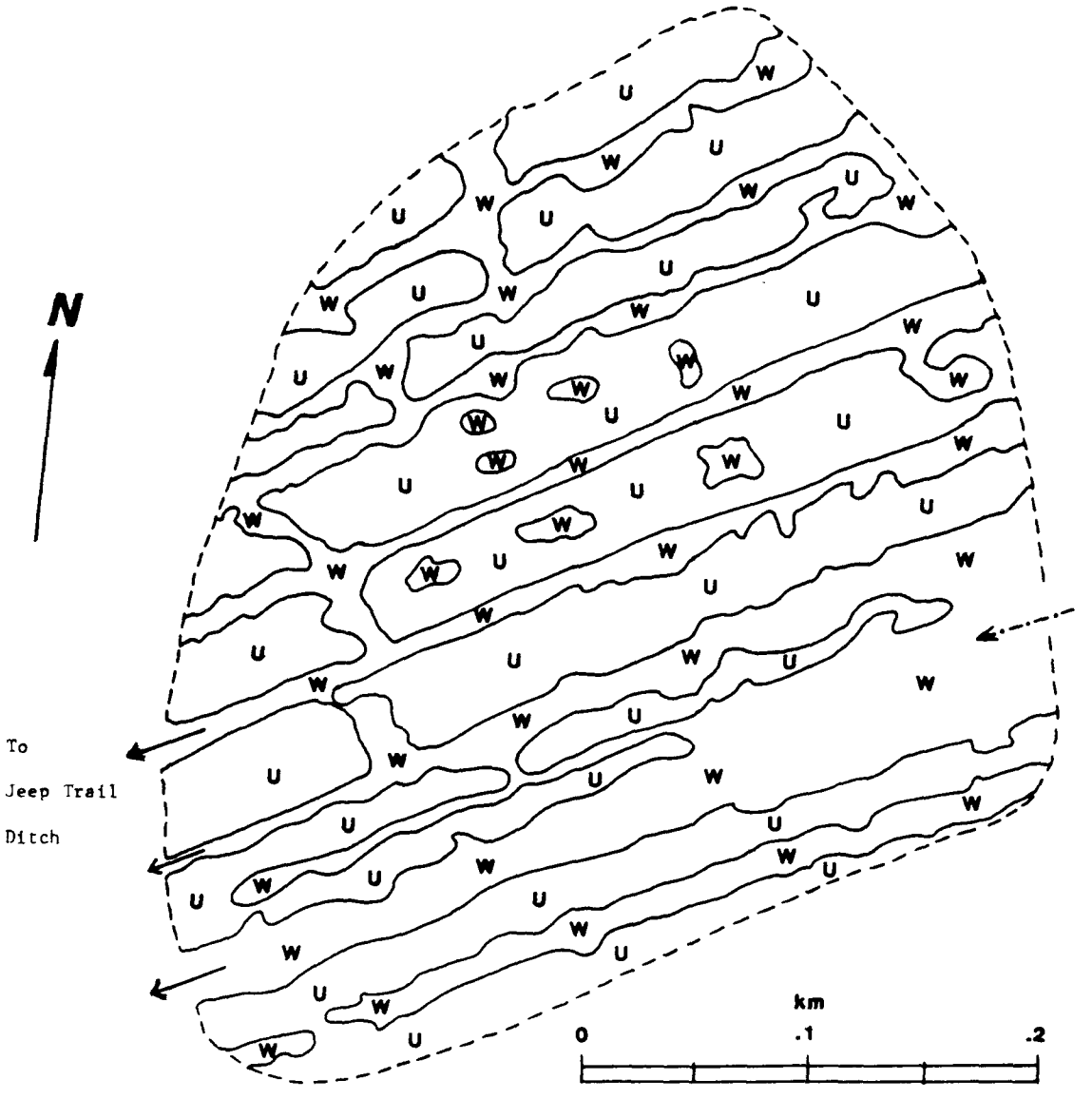


Figure 6. Map of Chincoteague Ridge/Swales WIA showing wetland (w) and upland (u) areas. Major outlets are indicated by solid arrows which depict the direction of water movement from the site. Broken arrow indicates an ephemeral inlet from a borrow pit to the northeast.

swamp rose, Rosa palustris, and a variety of other primarily freshwater wetland plants. There is no S. patens nor Distichlis. In other words, the wetlands at this site appear to fall into two groups - those to the north and northeast which were formerly connected closely to the emergent estuarine wetlands to the northeast and those to the west and southwest which apparently had a much more tenuous connection and were much further removed from estuarine influence. Along the northern edge of this site

there is a great deal of Phragmites associated with the disruption which has occurred around the Oyster Point development and the borrow pit. The ridges, which are considered upland, are dominated by loblolly pine (Pinus taeda), tangles of poison ivy (Toxicodendron radicans), and greenbriers (Smilax spp.). There are also scattered shrubs such as wax myrtle (Myrica cerifera).

Wetland classification. The ridge areas are upland. The swales are made up of several classifications. The shrub areas are classified as palustrine scrub/shrub. The areas of the swales (north and northeast end of site) which were formerly estuarine can be classified either as estuarine or palustrine scrub/shrub, depending upon vegetation type. We recommend palustrine since the vegetation appears to be changing to this type. Similarly, areas of emergent vegetation can be classified as palustrine or estuarine.

Substrates, water salinity. Soils underlying the site are composed of sand or sandy loam with a thin layer of organic matter (10 cm). Ridge soils may also contain some loam along with sand. Salinities (during average conditions) ranged from 3-5 ppt. at the south end of the swales to 0.5-1.0 at the north end of the site.

Wildlife use. The more open ends of the swales (at their northeastern ends) appear to be moderately to heavily used by wading birds and migratory waterfowl. The narrow ends of the swales, particularly where dominated by shrubs, were not observed to be used by waterfowl during the study period. There was ample evidence of use by raccoons and other small and medium-sized mammals. There were few indications of fish utilization, indicating that these areas may occasionally dry out completely and that their connection with areas of repopulation such as the estuary are far removed.

Hydrologic functions. In general, surface drainage is to the south and southwest to the jeep trail and eventually to Chincoteague Bay, but only during very wet conditions. The former drainage connection to the north and northeast has been blocked by the Oyster Point development. In fact, during periods of heavy rain there appears to be a small amount of sheet flow from the borrow pit across the road and into the northern part of this site. During dry periods much of the drainage at this site occurs vertically into the near-surface water table aquifer system, indicating a high ground water recharge potential. Because of the numerous swales, this site also appears to have a high potential for both flood water storage and nutrient retention.

3.1.2 Adamus and Stockwell Evaluation: Chincoteague Ridge/Swales

Summary Sheet D

This form is the appropriate place for recording the ratings that result from use of the interpretation procedures and keys in Sections 2.1.2. and 2.2.2. As each analysis is completed, enter its rating (high,moderate, or low; or A, B, or C) in the relevant box until all boxes for functions of interest are filled.

Begin by labeling the context of the analysis (pre- or post- construction, with or without mitigation, name of basin and WIA). Then enter the data, using the numbered footnotes to help locate the associated analyses. For the evaluation of each function's Effectiveness, enter whichever rating is higher--That for the basin or that for the WIA. The evaluation of the impact vector is optional.

BASIN _____ WIA _____ PROJECT _____

EVALUATION TIME FRAME (PRE/POST) _____ MITIGATION PLAN # _____

FUNCTION	EFFECTIVENESS[1]	OPPORTUNITY[1]	FUNCTIONAL RATING[2]	SIGNIFICANCE[3]	FUNCTIONAL SIGNIFICANCE[4]
GROUND WATER RECHARGE[5]	moderate	moderate	moderate	moderate	moderate
GROUND WATER DISCHARGE[6]	moderate		moderate	moderate	moderate
FLOOD STORAGE[7]	high	low	moderate	high	high
SHORELINE ANCHORING[8]	high	low	moderate	moderate	moderate
SEDIMENT TRAPPING[9]	moderate	moderate	moderate	high	high
NUTRIENT RETENTION					
LONG-TERM[10]	moderate	high	high	high	very high
SEASONAL[11]	high	high	high		very high
FOOD CHAIN SUPPORT					
DOWNSTREAM[12]	moderate		moderate	moderate	moderate
IN-BASIN[13]	moderate		moderate		moderate
FISHERY HABITAT					
WARMWATER[14]	low		low	moderate	low
COLDWATER[14]					
COLDW.RIVERINE[14]					
ANADROMOUS RIV.					
SPECIES[15] _____					
WILDLIFE HABITAT					
GENERAL DIVERSITY[16]	high		high		high
WATERFOWL GP.[17] 1	Breeding	Winter			
WATERFOWL GP.[17] 2	NA	Moderate	moderate	moderate	moderate
SPECIES[18] Wood Duck	moderate	moderate	moderate		moderate
SPECIES[18] _____			moderate		moderate
SPECIES[18] _____					
ACTIVE RECREATION[19]					
SWIMMING	low		low		low
BOAT LAUNCHING	low		low	moderate	low
POWER BOATING	low		low		low
CANOEING	low		low		low
SAILING	low		low		low
PASSIVE RECREATION AND HERITAGE[20]				moderate	moderate
IMPACT VECTOR RATING[21]					

FOOTNOTES
These entries will be based on analyses in the following parts of Volume II (numbers correspond to footnotes above):
[1]-Forms A, A1 (p. 6, 51); [2]-Section 2.1.2.2. (p. 97); [3]-Forms B, B1 (p. 38, 54); [4]-Section 2.1.2.2. (p. 97); [5]-Interpretation key in Section 2.1.2.1. p. 57; [6]-p. 59; [7]-p. 60; [8]-p. 62; [9]-p. 64; [10]-p. 67; [11]-p. 67; [12]-p. 69; [13]-p. 71; [14]-p. 73; [15]-p. 75; [16]-p. 79; [17]-p. 80; [18]-p. 84; [19]-p. 91; [20]-p. 92; [21]-p. 93.

Response Sheet A1

THRESHOLD ANALYSIS: FUNCTIONAL OPPORTUNITY AND EFFECTIVENESS

This sheet is the appropriate place for recording the responses to corresponding questions in Form A. A "yes" (Y) or "no" (N) response must be circled for all parts of each question, even when the response seems obvious. This response sheet has two major columns--"WIA" and "BASIN", and within each of these, three subcolumns entitled "$\bar{X}$", "W", and "D", which address, when relevent, the seasonal changes in some of the predictors, as follows:

> $\bar{X}$ column responses are those addressing either (a) the average annual condition, or (b) the condition intermediate between the wettest and driest annual conditions (e.g., late June in most Prairie pothole wetlands), or (c) the condition of maximum annual standing crop of wetland plants, or (d) if tidal, the average daily mid-tide condition.
>
> W column responses are those addressing what the area would look like (a) during the wettest time of an average year, or (b) if the area is tidal, what it would look like during an average daily high tide (flooded) condition.
>
> D column responses are those addressing what the area would look like during either the driest time of the year (questions pertaining to hydrology) or if the question pertains to vegetation, then during the dormant time of the year. If the area is tidal, "D" refers to its daily low tide (exposed) condition.

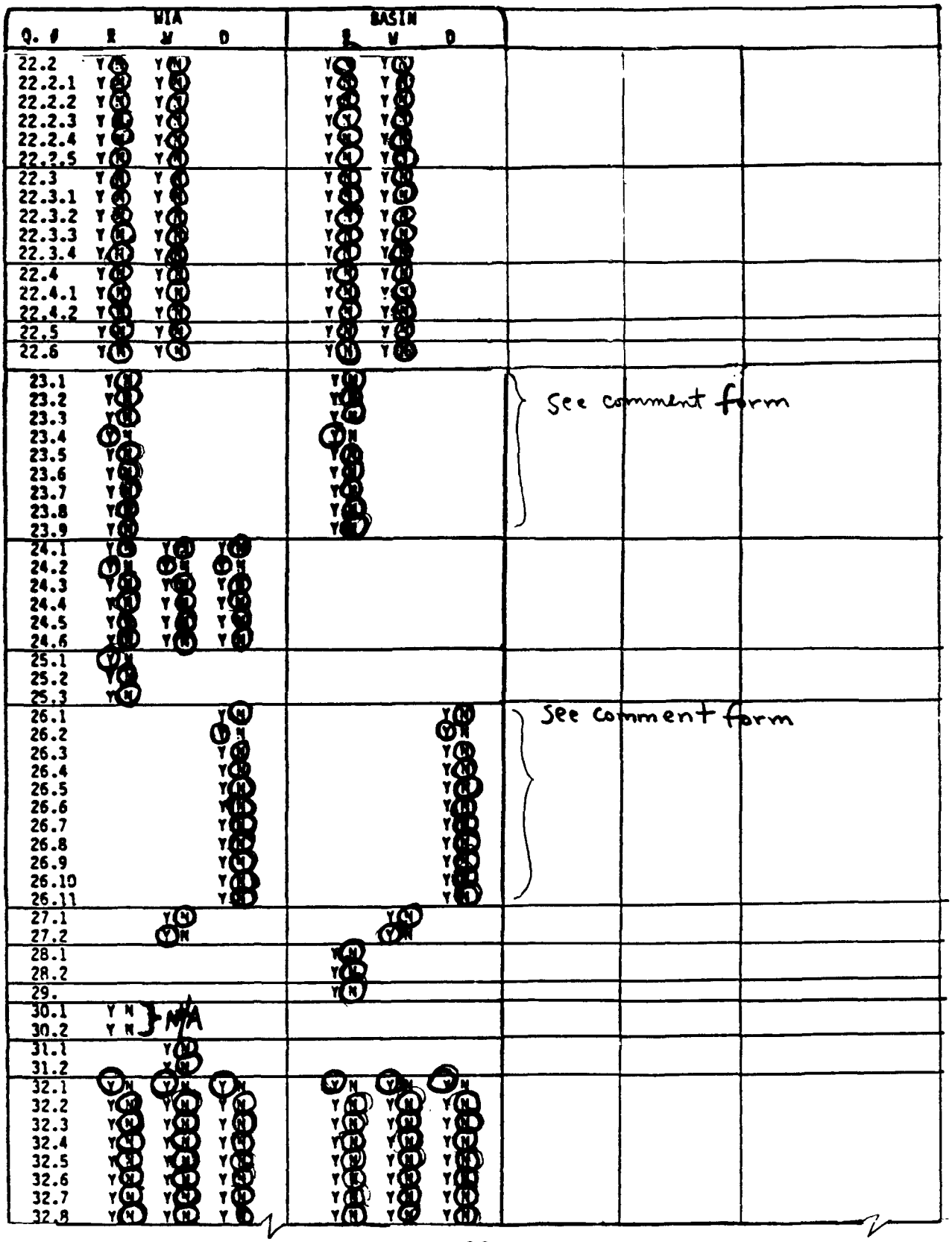
For example, question 2.1.1 should first be asked and answered in the context of the WIA's (wetland impact area's) average condition, then in terms of its wettest condition, then the basin's average condition, and finally the basin's wettest condition. This should then be repeated for question 2.1.2. Because no Y/N choice is given in either "D" column, the area's dry or dormant condition need not be evaluated for this question. Similarly, some questions will require responses only for the WIA or basin, but not both.

Q. #	WIA $\bar{X}$	WIA W	WIA D	BASIN $\bar{X}$	BASIN W	BASIN D	
Office-type Data							
1.1	Y (N)	(Y) N	Y (N)	(Y) N	(Y) N	Y (N)	See Comment form
1.2	(Y) N	(Y) N	Y (N)	(Y) N	(Y) N	Y (N)	See Comment form
1.3	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	(Y) N	See Comment form
1.3.1	Y (N)	(Y) N	(Y) N	(Y) N	(Y) N	Y (N)	See Comment form

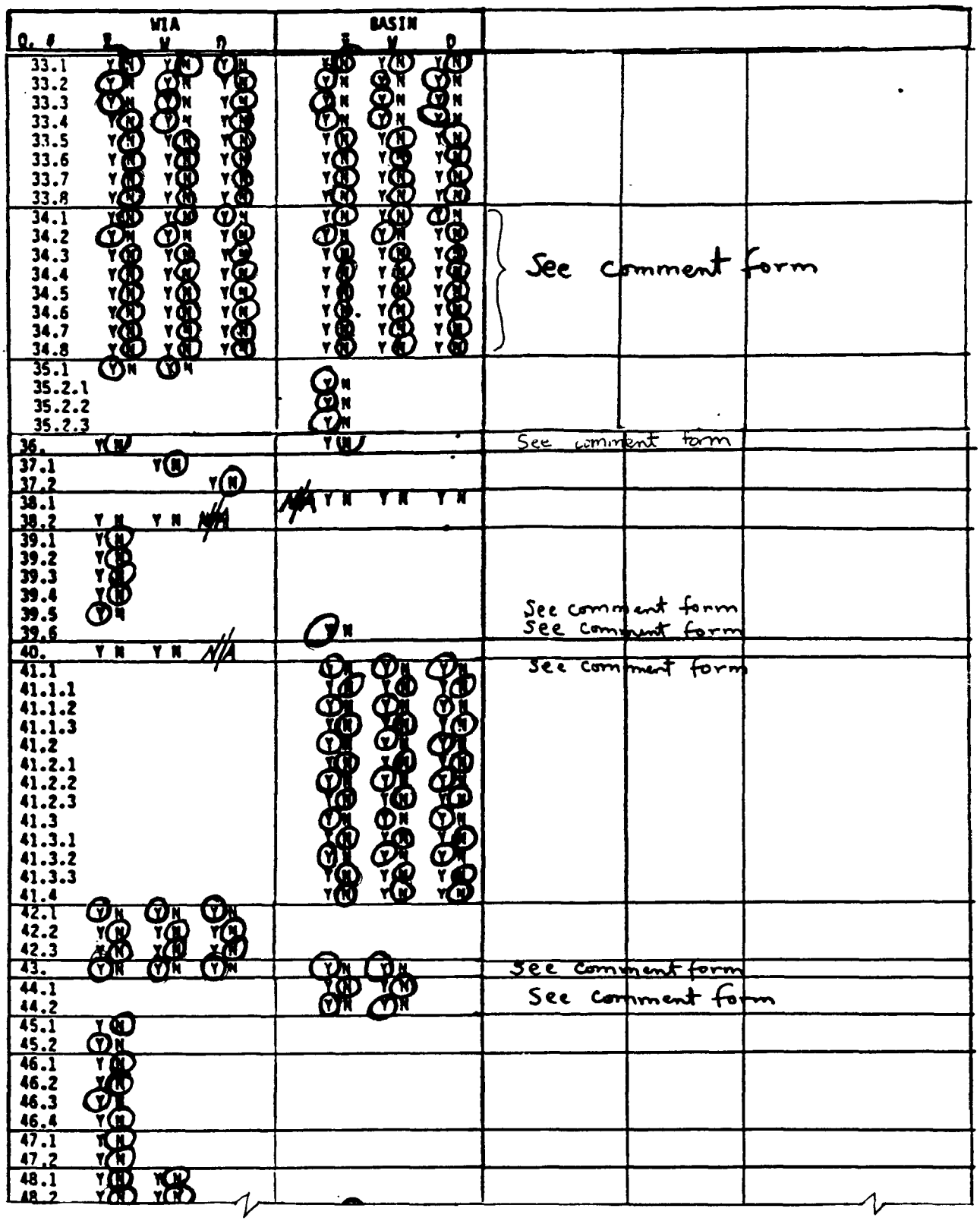
Chincoteague Ridge/Swales

Q. #	WIA R	WIA W	WIA O	BASIN R	BASIN W	BASIN O	
2.1.1	Y (N)	Y (N)		Y (N)	Y (N)		
2.1.2	Y (N)	Y (N)		Y (N)	Y (N)		
2.2.1	Y (N)	Y (N)		Y (N)	Y (N)		
2.2.2	Y (N)	Y (N)		Y (N)	Y (N)		
3.1					Y (N)		
3.2					Y (N)		
4.1	Y (N)						
4.2	Y (N)						
5.1					Y (N)		See comment form
5.2					Y (N)		
6.1		Y (N)					See comment form
6.2		Y (N)					
7.1				Y N			See comment form
7.2				Y N			
8.1					Y (N)		See comment form
8.2					Y (N)		
9.1				Y N			See comment form
9.2				Y N			
10.1	Y (N)						
10.2	Y (N)						
10.3	Y (N)						
10.4	Y (N)						
11.1	Y (N)						
11.2	Y (N)						
12.1		Y (N)					
12.2		Y (N)					
13.1				Y N			
13.2				Y N			N/A *
14.	Y (N)			Y (N)			
15.1	Y (N)						
15.2	Y (N)						
15.3	Y (N)						
15.4	Y (N)						
15.5	Y (N)						
15.6	Y (N)						
15.7	Y (N)						
16.	Y (N)						
17.1	Y (N)						
17.2	Y (N)						
18.	Y (N)						
19.	Y (N)						
20.				Y (N)			
21.1	Y (N)						
21.2	Y (N)						
21.3	Y (N)						
21.4	Y (N)						
21.5	Y (N)						
21.6	Y (N)						
Field-type Data							
22.1	Y (N)	Y (N)		Y (N)	Y (N)		See comment form
22.1.1	Y (N)	Y (N)		Y (N)	Y (N)		
22.1.2	Y (N)	Y (N)		Y (N)	Y (N)		
22.1.3	Y (N)	Y (N)		Y (N)	Y (N)		
22.1.4	Y (N)	Y (N)		Y (N)	Y (N)		
22.1.5	Y (N)	Y (N)		Y (N)	Y (N)		

Chincoteague Ridge/Swales



Chincoteague Ridge/Swales



Chincoteague Ridge/Swales

Q. #	WIA E	WIA W	WIA D	BASIN E	BASIN W	BASIN D	
49.1				Y (N)			
49.2				(Y) N			
50.	(Y) N	(Y) N	(Y) N				See Comment form
51.		Y (N)					See Comment form
Detailed Data							
52.1.1	Y N	N/A					
52.1.2	Y N						
52.2.1	(Y) N						See Comment form
52.2.2	Y (N)						
53.1	Y N	N/A					
53.2	Y N						
54.1	Y N	N/A					
54.2	Y N						
55.	Y (N)						
56.		N/A			Y N		
57.1	Y N	N/A					
57.2	Y N						
57.3	Y N						
57.4	Y N						
58.1	Y N	N/A					
58.2	Y N						
58.3	Y N						
58.4	Y N						
59.1				Y N			
59.2				Y N	N/A		
59.3				Y N			
60.1						Y N N/A	
60.2				Y N			
60.3				Y N	N/A		
61.1	Y N	N/A					
61.2	Y N						
62.	Y (N)						
63.1						Y N	
63.2					N/A	Y N	
64.					N/A	Y N	See Comment form
65.	(Y) N						
66.1		Y N	N/A	N/A		Y N	
66.2		Y N				Y N	
67.1		Y N	N/A	N/A		Y N	
67.2		Y N				Y N	
68.1	Y N		N/A	N/A		Y N	
68.2	Y N					Y N	
Derived Responses							
69.1	Y N						
69.2	Y N						
70.1	Y N						
70.2	Y N						
71.1	Y N						
71.2	Y N						
72.1	Y N						
72.2	Y N						
73.1	Y N						
73.2	Y N						
74.1	Y N						
74.2	Y N						
75.1	Y N						
75.2	Y N						

After responses to all possible questions (Form A) have been recorded above, turn to Form B (page 38). You will(as an option) return to this sheet (in Section 2.1.2) to interpret the above responses.

* N/A (Not Applicable) used for questions that are not relevant to the site or questions for which we have no measurements.

Chincoteague Ridge/Swales

Response Sheet B1

THRESHOLD ANALYSIS: SIGNIFICANCE

This sheet is the appropriate place for recording the responses to the corresponding questions in Form B. Circle Y (yes) or N (no), being careful to note that the order of Y and N below frequently reverses.

General
1.1 (N) Y — See comment form
1.2 (N) Y
1.3 (Y) N
1.4 (Y) N
1.5 (N) Y
1.6 (N) Y
2. Y (N) — See comment form

Recharge
3. Y (N) — See comment form
4. Y (N)
5. Y (N) — See comment form
6. Y (N)
7. (Y) N
8. (Y) N — See comment form
9. (Y) N
10. (N) Y — See comment form

Discharge
11. Y (N) — See comment form
12. (Y) N
13. Y (N)
14. (Y) N — See comment form
15. (N) Y — See comment form

Flood Storage
16. (Y) N — See comment form
17. (Y) N
18. (Y) N — See comment form
19. (Y) N
20. (Y) N
21. (Y) N
22. (N) Y — See comment form

Shoreline Anchoring
23. Y (N) — See comment form
24. (Y) N
25. (Y) N
26. (Y) N
27. Y (N)
28. Y (N)
29. (N) Y

Sediment Trapping
30. Y (N) — See comment form
31. Y (N)
32. (Y) N — See comment form
33. (Y) N
34. (Y) N
35. (Y) N
36. (N) Y — See comment form

Nutrient Retention
37. Y N ?
38. Y (N)
39. (Y) N
40. (Y) N
41. (Y) N
42. (N) Y — See comment form

Fish Food Chain/ Habitat
43. Y (N)
44. Y (N)
45. Y (N)
46. (Y) N
47. Y (N)
48. (Y) N
49. Y (N)
50. (Y) N
51. (Y) N
52. Y (N)
53. (N) Y — See comment form

Wildlife Habitat
54. Y N ?
55. Y (N) — See comment form
56. (Y) N
57. (Y) N
58. Y (N)
59. Y (N)
60. (N) Y — See comment form

Active Recreation
61. Y (N)
62. (Y) N
63. Y (N)
64. (Y) N
65. Y (N)
66. Y (N)
67. N (Y)

Passive
68. Y (N)
69. Y (N)
70. Y (N)
71. (Y) N
72. (Y) N
73. Y (N)
74. Y (N)
75. (Y) N
76. (Y) N — See comment form
77. (Y) N
78. (N) Y

Form "A" Comments (Chincoteague Ridge/Swales)

1.1	Slight drainage from northern borrow pit during high water periods
1.1	(Basin) Drainage into jeep trail ditch occurs from High School East borrow pit during normal and wet periods
1.2	(Basin) Jeep trail is tidal from Chincoteague Bay eastward for at least 1 km
1.3	(Basin) Under dry and normal conditions tidal waves may extend toward site through swale accesses but does not reach it
1.3.1	"Inlet" from drainage basin during wet periods
5.2	See site map (Figure 6) and definitions for this site
6.1-6.2	We are considering only the swale areas as wetlands (pine ridges are not wetlands)
7	Predictor not used
8	Sub-watershed = forest ridges. Within WIA, ridges along swales contiguous with jeep trail ditch and developed area along jeep trail ditch
9	Predictor not used
22.1	Although site is predominantly forested, there are extensive areas of emergent wetlands within the site
23.1-23.9	Forest soils (which predominate in area) are sands; swale areas have sandy soil bottoms with a surface layer of organic material
26.1-26.11	Refers only to swales
26.1-26.11	(Basin) While much of the wetland areas in this area are intermittently exposed, the jeep trail canal is both permanent and also tidal near Chincoteague Bay
34	This refers to swales and excludes ridge areas which are not considered wetlands

36	Estimated with no measurements; shallow swale waters are probably poorly oxygenated due to excess organic matter on the bottom
39.5	Filled area (dike) has prevented movement of fishes from estuarine creeks
39.6	Jeep trail canal
41.1	Answers refer to wetland areas (swales)
43	The only sheet flow into the site occurs during flooding periods when small amounts of water flow from the borrow pit south across the dike
44	Considering vegetated areas along Chincoteague Bay
50	Evidence of duck use and feeding on species such as Polygonum, Scirpus, etc.
51	Answered "no" because no open water with a depth greater than 6 ft within WIA
52.2	High areas have Spartina patens, Polygonum, Iva. There are no low areas
64	Bottom of swales may not always be above 5 pm

Form "B" Comments (Chincoteague Ridge/Swales and High School East)

1	Answers depend upon whether potential future development takes place. Future development not taken into consideration unless imminent (present development underway)
2	Answered relative to specific impact areas, not general area
5-7	Water supply from mainland. Human use considered only (e.g., aspect of natural recharge to maintain vegetation not considered)
8	Chincoteague Ridge/Swale Site is significantly larger than the High School East site; of more importance to the island's aquifer
12 + 14	Seems to be asking same question only for fish and wildlife only, not other functions
15	Judged to be not economically feasible
18	Probably - but need to consult predicted storm surge maps for Chincoteague
23-29	All wetlands ranked as low opportunity
30	High quality water interpreted to mean classified as potable water source
32	Outlet pipe of jeep trail ditch (basin of both sites) could require maintenance clearing
3,11,16, 17,30,54	Official designations unknown. Answered 17,30,54 tentatively based on impression (followed with question mark)
10	Answers necessarily a matter of opinion
15,22,26, 42,53,55,60	Net experience with small, unincorporated communities such as Chincoteague show that wetland functions tend to be undervalued or ignored, and not replaced if compromised. The lack of comprehensive planning for the island suggests that methods such as zoning or transferring rights away from the most important wetlands will not be undertaken
76	Chincoteague Ridge/Swales site has high potential for out of classroom learning (school located next door)

3.2 HIGH SCHOOL EAST STUDY SITE

3.2.1 Qualitative Site Description

Physical description. The site (Figure 7) covering approximately four ha is composed of a large borrow pit from which fill for the high school site was taken. In addition, there is an area of shrubs and small trees which was extensively altered. Historical photography shows that these alterations occurred some time between 1949-59. Previously these areas were Chincoteague ridge and swale terrain. The boundary of the site on the western and northwestern side runs along the edge of the high school fill. The northern boundary is the so-called jeep trail which runs across the island. The eastern side of the boundary runs through a forested area close to another smaller, open water area which lies off the site.

Definitions. The WIA consists of the site as outlined by the EPA (boundaries described above). The basin for this site includes the borrow pit, the ditch which runs from the borrow pit to the jeep trail, and the jeep trail ditch itself as it runs west into Chincoteague Bay. The sub-watershed for the site consists of one or two ridges of large pines which lie along the southeast edge of the site and forested areas which lie to the south and southeast of the site.

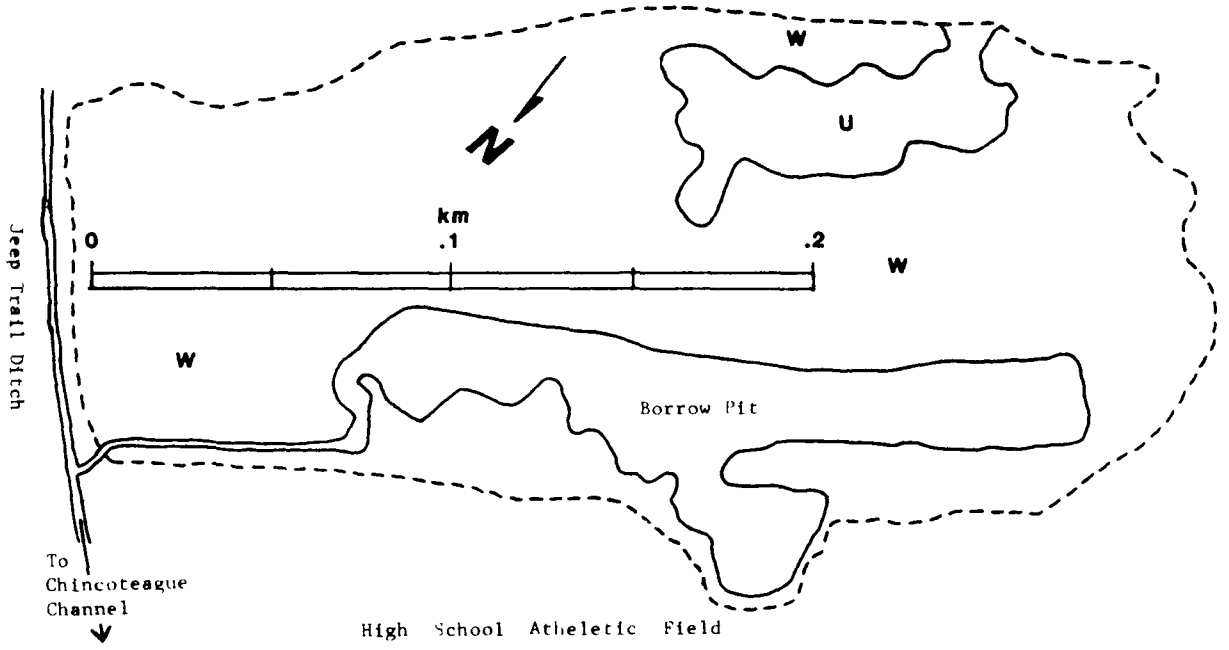


Figure 7. Map of High School East WIA showing wetland (w) and upland (u) areas. Major outlet is indicated by arrow that depicts the direction of water movement from the site.

Qualitative vegetation description. There is an area of emergent wetlands which lies around the borrow pit. This is dominated by Phragmites, Spartina patens, Iva and other shrubs and wetland plants. Much of the site consists of a disturbed shrub/scrub community along with limited areas identifiable as remnant upland ridges dominated by loblolly pine and swales dominated by red maples. The cover in the disturbed areas consists of honeysuckle, wax myrtle, poison ivy, greenbriar, and occasional mid-sized loblolly pines.

Wetland classification. Most wetlands at this site are palustrine scrub/shrub and palustrine forested wetlands. The emergent wetland areas around the borrow pit are estuarine emergent (due to daily incursions of estuarine water through the ditch from the jeep trail ditch).

Substrate, salinities. Soils underlying the site are sand or sandy loam with a thin layer of organic matter. Upland areas may also contain some loam. Salinities in the borrow pit and associated ditches may range as high as 20-25 ppt during dry periods. Palustrine wetland adjacent to the borrow pit usually have salinities below 1 ppt and rarely above 5 ppt.

Wildlife use. There is ample evidence of use by waterfowl, small mammals, and fishes at this site. Both the borrow pit and the borrow pit to the east of the site appear to be utilized by ducks and wading birds during much of the year. There is evidence of use by animals such as raccoons, rabbits and other small mammals throughout the site. Because of the connection and close proximity of the jeep trail ditch and Chincoteague Bay there appears to be considerable access to the borrow pit and ditches by estuarine fishes.

Hydrologic functions. During wet periods, water appears to drain into this site from the south and southwest by sheet flow. There is a drainage ditch which connects the borrow pit in this site with a similar pit to the east. There appears to be drainage from the eastern areas through the drainage ditch to the borrow pit at this site during wet periods. Surface flow leaves the site via the drainage ditch which connects the borrow pit with the jeep trail ditch and ultimately Chincoteague Bay. There is some tidal fluctuation as far up the drainage ditch as the borrow pit. During dry periods drainage in palustrine areas probably occurs vertically into the surface aquifer.

Because of the extent of wetland and borrow pit area, this site probably has moderate to high ground water recharge potential and high flood water storage potential. The wetland vegetation and soils should produce high nutrient retention potential.

3.2.2 Adamus and Stockwell Evaluations: High School East

Summary Sheet D

This form is the appropriate place for recording the ratings that result from use of the interpretation procedures and keys in Sections 2.1.2, and 2.2.2. As each analysis is completed, enter its rating (high,moderate, or low; or A, B, or C) in the relevant box until all boxes for functions of interest are filled.

Begin by labeling the context of the analysis (pre- or post- construction, with or without mitigation, name of basin and WIA). Then enter the data, using the numbered footnotes to help locate the associated analyses. For the evaluation of each function's Effectiveness, enter whichever rating is higher--That for the basin or that for the WIA. The evaluation of the impact vector is optional.

BASIN _____ WIA _____ PROJECT _____

EVALUATION TIME FRAME (PRE/POST) _____ MITIGATION PLAN # _____

FUNCTION	EFFECTIVENESS[1]	OPPORTUNITY[1]	FUNCTIONAL RATING[1]	SIGNIFICANCE[2]	FUNCTIONAL SIGNIFICANCE[4]
GROUND WATER RECHARGE[3]	moderate	moderate	moderate	moderate	moderate
GROUND WATER DISCHARGE[6]	moderate		moderate	high	high
FLOOD STORAGE[7]	high	low	moderate	high	high
SHORELINE ANCHORING[8]	high	low	moderate	moderate	moderate
SEDIMENT TRAPPING[9]	moderate	moderate	moderate	high	high
NUTRIENT RETENTION					
LONG-TERM[10]	moderate	high	high	high	very high
SEASONAL[11]	high	high	high	high	very high
FOOD CHAIN SUPPORT					
DOWNSTREAM[12]	moderate		moderate	moderate	moderate
IN-BASIN[13]	moderate		moderate	moderate	moderate
FISHERY HABITAT					
WARMWATER[14]	low		low	moderate	low
COLDWATER[14]					
COLDW.RIVERINE[14]					
ANADROMOUS RIV. SPECIES[14] Winter Fl.*	moderate		moderate		moderate
WILDLIFE HABITAT	high		high	moderate	high
GENERAL DIVERSITY[16]	breeding	winter			
WATERFOWL GP.[17] 1 **	NA	moderate	moderate		moderate
WATERFOWL GP [17] 2	moderate	NA	moderate		moderate
SPECIES[18] Wood Duck		moderate	moderate		moderate
SPECIES[18] _____					
SPECIES[18] _____					
ACTIVE RECREATION[19]				moderate	
SWIMMING	low		low		low
BOAT LAUNCHING	moderate		moderate		moderate
POWER BOATING	low		low		low
CANOEING	low		low		low
SAILING	low		low		low
PASSIVE RECREATION AND HERITAGE[20]				moderate	moderate
IMPACT VECTOR RATING[21]					

FOOTNOTES

These entries will be based on analyses in the following parts of Volume II (numbers correspond to footnotes above):

[1]Forms A, A1 (p. 6, 51); [2]Section 2.1.2.2. (p. 97); [3]Forms B, B1 (p. 38, 54); [4]Section 2.1.2.2. (p. 97); [5]Interpretation key in Section 2.1.2.1. p. 57; [6]p. 59; [7]p. 60; [8]p. 62; [9]p. 64; [10]p. 67; [11]p. 67; [12]p. 69; [13]p. 71; [14]p. 73; [15]p. 75; [16]p. 79; [17]p. 80; [18]p. 84; [19]p. 91; [20]p. 92; [21]p. 93.

*Winter Flounder **Winter Only

High School East

Response Sheet A1

THRESHOLD ANALYSIS: FUNCTIONAL OPPORTUNITY AND EFFECTIVENESS

This sheet is the appropriate place for recording the responses to corresponding questions in Form A. A "yes" (Y) or "no" (N) response must be circled for all parts of each question, even when the response seems obvious. This response sheet has two major columns--"WIA" and "BASIN", and within each of these, three subcolumns entitled "X̄", "W", and "D", which address, when relevent, the seasonal changes in some of the predictors, as follows:

X̄ column responses are those addressing either (a) the average annual condition, or (b) the condition intermediate between the wettest and driest annual conditions (e.g., late June in most Prairie pothole wetlands), or (c) the condition of maximum annual standing crop of wetland plants, or (d) if tidal, the average daily mid-tide condition.

W column responses are those addressing what the area would look like (a) during the wettest time of an average year, or (b) if the area is tidal, what it would look like during an average daily high tide (flooded) condition.

D column responses are those addressing what the area would look like during either the driest time of the year (questions pertaining to hydrology) or if the question pertains to vegetation, then during the dormant time of the year. If the area is tidal, "D" refers to its daily low tide (exposed) condition.

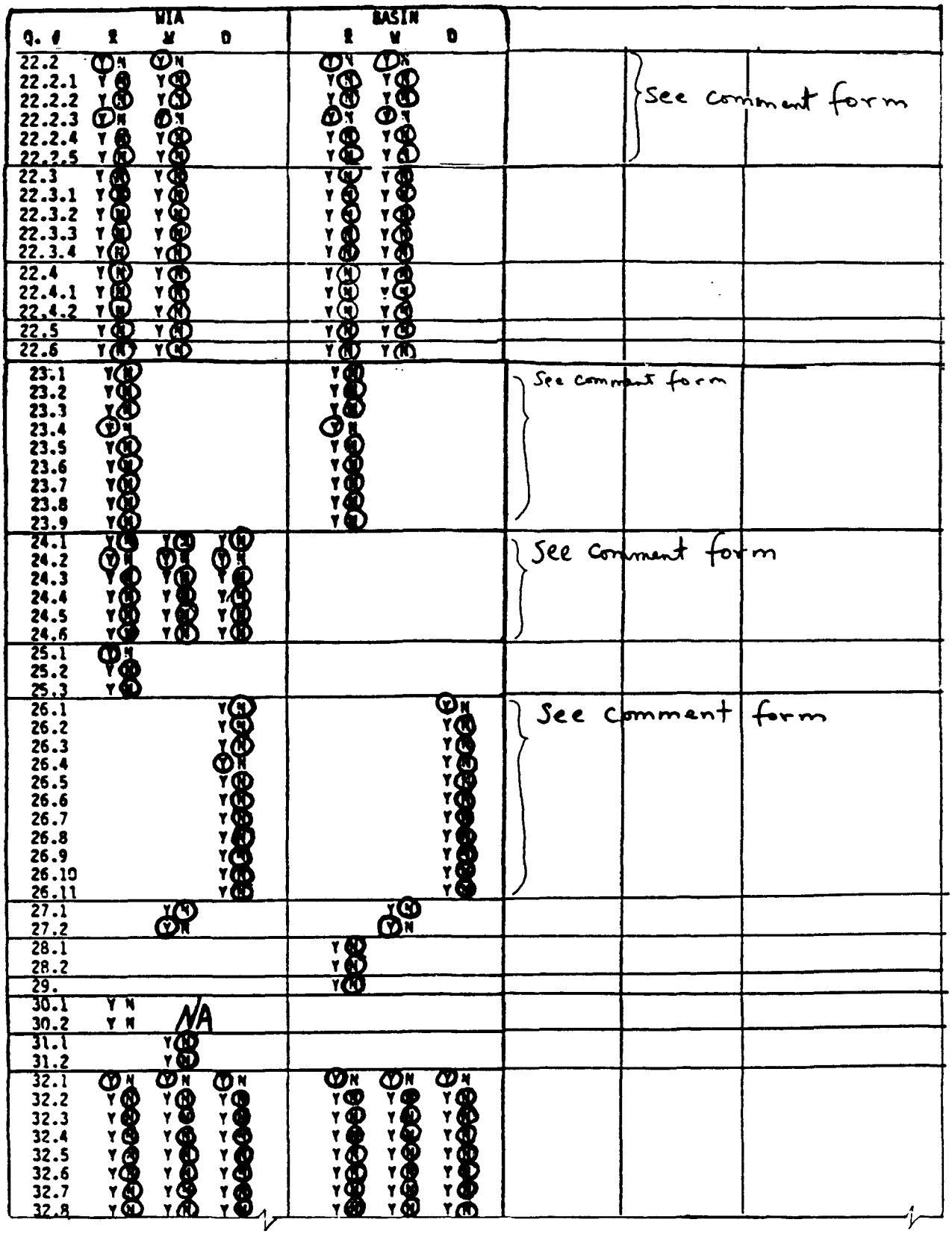
For example, question 2.1.1 should first be asked and answered in the context of the WIA's (wetland impact area's) average condition, then in terms of its wettest condition, then the basin's average condition, and finally the basin's wettest condition. This should then be repeated for question 2.1.2. Because no Y/N choice is given in either "D" column, the area's dry or dormant condition need not be evaluated for this question. Similarly, some questions will require responses only for the WIA or basin, but not both.

Q. #	WIA X̄	WIA W	WIA D	BASIN X̄	BASIN W	BASIN D	
Office-type Data							
1.1	(Y) N	(Y) N	Y (N)	(Y) N	(Y) N	Y (N)	See comment form
1.2	(Y) N	(Y) N	Y (N)	(Y) N	(Y) N	Y (N)	See comment form
1.3	Y (N)	Y (N)	(Y) N	Y (N)	Y (N)	(Y) N	See comment form
1.3.1	(Y) N	(Y) N	Y (N)	(Y) N	(Y) N	Y (N)	

High School East

Q. #	WIA E	WIA W	WIA D	BASIN E	BASIN W	BASIN D			
2.1.1	Y N	Y N		Y N	Y N				
2.1.2	Y N	Y N		Y N	Y N				
2.2.1	Y N	Y N		Y N	Y N				
2.2.2	Y N	Y N		Y N	Y N				
3.1									
3.2									
4.1	Y N								
4.2	Y N								
5.1									
5.2							See	Comment	form
6.1		Y N					See	comment	form
6.2		Y N					See	Comment	form
7.1				Y N					
7.2				Y N			See	Comment	form
8.1									
8.2							See	Comment	form
9.1				Y N					
9.2				Y N			See	Comment	form
10.1	Y N								
10.2	Y N								
10.3	Y N								
10.4	Y N								
11.1	Y N								
11.2	Y N								
12.1		Y N							
12.2		Y N							
13.1		NA		Y N					
13.2				Y N					
14.	Y N			Y N					
15.1	Y N						See	Comment	form
15.2	Y N						See	Comment	form
15.3	Y N						See	Comment	form
15.4	Y N						See	Comment	form
15.5	Y N						See	Comment	form
15.6	Y N						See	Comment	form
15.7	Y N						See	Comment	form
16.	Y N						See	Comment	form
17.1	Y N								
17.2	Y N								
18.	Y N								
19.	Y N								
20.				Y N					
21.1	Y N								
21.2	Y N								
21.3	Y N								
21.4	Y N								
21.5	Y N								
21.6	Y N								
Field-type Data									
22.1	Y N	Y N		Y N	Y N				
22.1.1	Y N	Y N		Y N	Y N				
22.1.2	Y N	Y N		Y N	Y N				
22.1.3	Y N	Y N		Y N	Y N				
22.1.4	Y N	Y N		Y N	Y N				
22.1.5	Y N	Y N		Y N	Y N				

High School East



High School East

Q. #	MIA R	MIA W	MIA D	BASIN E	BASIN W	BASIN D			
33.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)			
33.2	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N			
33.3	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N			
33.4	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N			
33.5	Y (N)	(Y) N	Y (N)	Y (N)	Y (N)	Y (N)			
33.6	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)			
33.7	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)			
33.8	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)			
34.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	See Comment form		
34.2	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N			
34.3	Y (N)	(Y) N	Y (N)	Y (N)	Y (N)	Y (N)			
34.4	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)			
34.5	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)			
34.6	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)			
34.7	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)			
34.8	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)			
35.1	(Y) N	(Y) N					See Comment form		
35.2.1				Y (N)					
35.2.2				Y (N)					
35.2.3				Y (N)					
36.	(Y) N			(Y) N			See Comment form		
37.1		Y (N)							
37.2			Y (N)						
38.1				Y N	Y N	Y N			
38.2	Y N	Y N	NA						
39.1	Y (N)								
39.2	Y (N)								
39.3	Y (N)								
39.4	Y (N)								
39.5	Y (N)								
39.6				(Y) N			See comment form		
40.	Y N	Y N	NA						
41.1				(Y) N	(Y) N	(Y) N			
41.1.1				Y (N)	Y (N)	Y (N)			
41.1.2				(Y) N	(Y) N	(Y) N			
41.1.3				Y (N)	Y (N)	Y (N)			
41.2				(Y) N	(Y) N	(Y) N			
41.2.1				Y (N)	Y (N)	Y (N)			
41.2.2				(Y) N	(Y) N	(Y) N			
41.2.3				Y (N)	Y (N)	Y (N)			
41.3				(Y) N	(Y) N	(Y) N			
41.3.1				Y (N)	Y (N)	Y (N)			
41.3.2				(Y) N	(Y) N	(Y) N			
41.3.3				Y (N)	Y (N)	Y (N)			
41.4				Y (N)	Y (N)	Y (N)			
42.1	Y (N)	Y (N)	Y (N)				See Comment form		
42.2	(Y) N	(Y) N	(Y) N						
42.3	Y (N)	Y (N)	Y (N)						
43.	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N				
44.1				Y (N)	Y (N)		See Comment form		
44.2				(Y) N	(Y) N				
45.1	Y (N)								
45.2	(Y) N								
46.1	Y (N)								
46.2	Y (N)								
46.3	(Y) N								
46.4	Y (N)								
47.1	Y (N)								
47.2	Y (N)								
48.1	Y (N)	Y (N)							
48.2	Y (N)	Y (N)							

High School East

Q. #	MIA E	MIA W	MIA D	BASIN E	BASIN W	BASIN D			
49.1				Y (N)					
49.2				(Y) N					
50.	Y (N)	Y (N)	Y (N)				See comment form		
51.		Y (N)					See comment form		
Detailed Data									
52.1.1	Y N } NA								
52.1.2	Y N }								
52.2.1	(Y) N						See comment	form	
52.2.2	(Y) N								
53.1	Y N								
53.2	Y N NA								
54.1	Y N								
54.2	Y N NA								
55.	Y (N)								
56.	NA				Y N				
57.1	Y N								
57.2	Y N								
57.3	Y N NA								
57.4	Y N								
58.1	Y N								
58.2	Y N								
58.3	Y N NA								
58.4	Y N								
59.1				Y N					
59.2				Y N					
59.3				Y N NA					
60.1						Y N			
60.2				Y N					
60.3				Y N NA					
61.1	Y N								
61.2	Y N NA								
62.	Y N NA								
63.1						Y N			
63.2				NA		Y N			
64.				NA		Y N	See comment form		
65.	(Y) N								
66.1		Y N				Y N			
66.2		Y N NA		NA		Y N			
67.1		Y N				Y N			
67.2		Y N NA		NA		Y N			
68.1	Y N					Y N			
68.2	Y N NA			NA		Y N			
Derived Responses									
69.1	Y N								
69.2	Y N								
70.1	Y N								
70.2	Y N								
71.1	Y N								
71.2	Y N								
72.1	Y N								
72.2	Y N								
73.1	Y N								
73.2	Y N								
74.1	Y N								
74.2	Y N								
75.1	Y N								
75.2	Y N								

After responses to all possible questions (Form A) have been recorded above, turn to Form B (page 38). You will(as an option) return to this sheet (in Section 2.1.2) to interpret the above responses.

High School East

Response Sheet B1

THRESHOLD ANALYSIS: SIGNIFICANCE

This sheet is the appropriate place for recording the responses to the corresponding questions in Form B. Circle Y (yes) or N (no), being careful to note that the order of Y and N below frequently reverses.

General

1.1 N Y
1.2 N Y
1.3 N Y
1.4 N Y
1.5 N Y
1.6 N Y
2. Y N

See comment form for Chincoteague Ridge/swales

Recharge

3. Y N ?
4. Y N
5. Y N
6. Y N
7. Y N
8. Y N
9. Y N
10. N Y

See Comment form for Chincoteague Ridge/Swales

Discharge

11. Y N
12. Y N
13. Y N
14. Y N
15. N Y

See Comment form for Chincoteague Ridge/Swales

Flood Storage

16. Y N
17. Y N
18. Y N
19. Y N
20. Y N
21. Y N
22. N Y

See Comment form for Chincoteague Ridge/Swales

Shoreline Anchoring

23. Y N
24. Y N
25. Y N
26. Y N
27. Y N
28. Y N
29. N Y

See Comment form for Chincoteague Ridge/Swales

Sediment Trapping

30. Y N
31. Y N
32. Y N
33. Y N
34. Y N
35. Y N
36. N Y

See comment form for Chincoteague Ridge/Swales

Nutrient Retention

37. Y N
38. Y N
39. Y N
40. Y N
41. Y N
42. N Y

See comment form for Chincoteague Ridge/swales

Fish Food Chain/ Habitat

43. Y N
44. Y N
45. Y N
46. Y N
47. Y N
48. Y N
49. Y N
50. Y N
51. Y N
52. Y N
53. N Y

See comment form for Chincoteague Ridge/Swales

Wildlife Habitat

54. Y N
55. Y N
56. Y N
57. Y N
58. Y N
59. Y N
60. N Y

See Comment form for Chincoteague Ridge/swales

See Comment form for Chincoteague Ridge/Swales

Active Recreation

61. Y N
62. Y N
63. Y N
64. Y N
65. Y N
66. Y N
67. N Y

Passive

68. Y N
69. Y N
70. Y N
71. Y N
72. Y N
73. Y N
74. Y N
75. Y N
76. Y N
77. Y N
78. N Y

Form "A" Comments (High School East Study Site)

1.1	Water enters this site through ditch from borrow pit/wetland area to the east except during dry periods
1.1	(Basin) Drainage into jeep trail ditch from other areas during normal and wet periods
1.2	(Basin) Jeep trail ditch is tidal for at least a kilometer from Chincoteague Bay east
1.3	(Basin) Tidal waves move up jeep trail ditch during dry and normal conditions
5.2	See site map (Figure 7) and definitions for this site
6.1-6.2	The combination of borrow pit, drainage ditches, and wetlands exceeds 2 ha but is less than 16 ha
7	Predictor not used
8	Sub-watershed = forested ridges within WIA and developed area along jeep trail ditch. Basin area = greater than 20% area of sub-watershed
9	Predictor not used
15.0	Much of the sub-watershed is scrub/shrub along with considerable areas of forest
16.0	Disturbance (school construction, land grading, borrow pit) occurred more than 10 years ago. Because of extensive areas of scrub/shrub (vegeation less than 6 m tall), area is not predominantly forest
22.2	While pines make up a significant part of the vegetation, Myrica is the dominant vegetation. Probably in a few years pines will dominate
23.1-23.9	Soils are predominantly sand; however, there are spots under the borrow pit and under certain wetland areas where there is a thin layer of organic material on top of the sand
24.1-24.6	Salt water intrusion occurs along the jeep trail and into the borrow pit during normal and dry periods

26.1-26.11	Borrow pit and canal are permanently flooded. WIA is seasonally flooded
34	Mean depth is difficult to estimate (borrow pit = deep; other wetlands = very shallow): this is our best guess (ridges and sub-watershed ignored)
35.2	Unvegetated area (borrow pit) is greater than 8 m
36	These are estimates: we have no measurements
39.6	Jeep trail canal
42	Area of borrow pit and canals exceed 10% of WIA
44	Considering areas along Chincoteague Bay
50	Some duck activity and food, but not 10% of area
51	Answered "no" because there is no open water (defined as greater than 2 m) in the WIA
52.2	Tree dominated wetland = low (primarily red maple) Phragmites, etc. = high
64	Bottom of borrow pit, and canal may not always be above 5 ppm due to accumulated organic matter on the bottom

3.3 FOWLING GUT SYSTEM STUDY SITES

3.3.1 Qualitative Site Description

Physical description. This is a complex site (Figure 8) covering 21 ha and consisting of many parallel ridges and swales, emergent freshwater marshes, and emergent estuarine marshes adjacent to Fowling Gut. Because of this complexity we have divided the site into two sections (estuarine and palustrine). The estuarine portion consists of the western side of the site which is composed of estuarine emergent marshes associated with Fowling Gut. The palustrine portion consists of the eastern side of the site and is dominated by freshwater palustrine wetlands and pine ridges. The site has been altered on all four sides by development and the encroachment of houses, filled areas, and borrow pits.

Definitions. The WIA consists of the site as outlined by the EPA. The basin for the estuarine portion includes Fowling Gut from its origin to Mire Pond. The basin for the palustrine portion includes the estuarine portion and Fowling Gut, although it should be noted that surface drainage from the palustrine

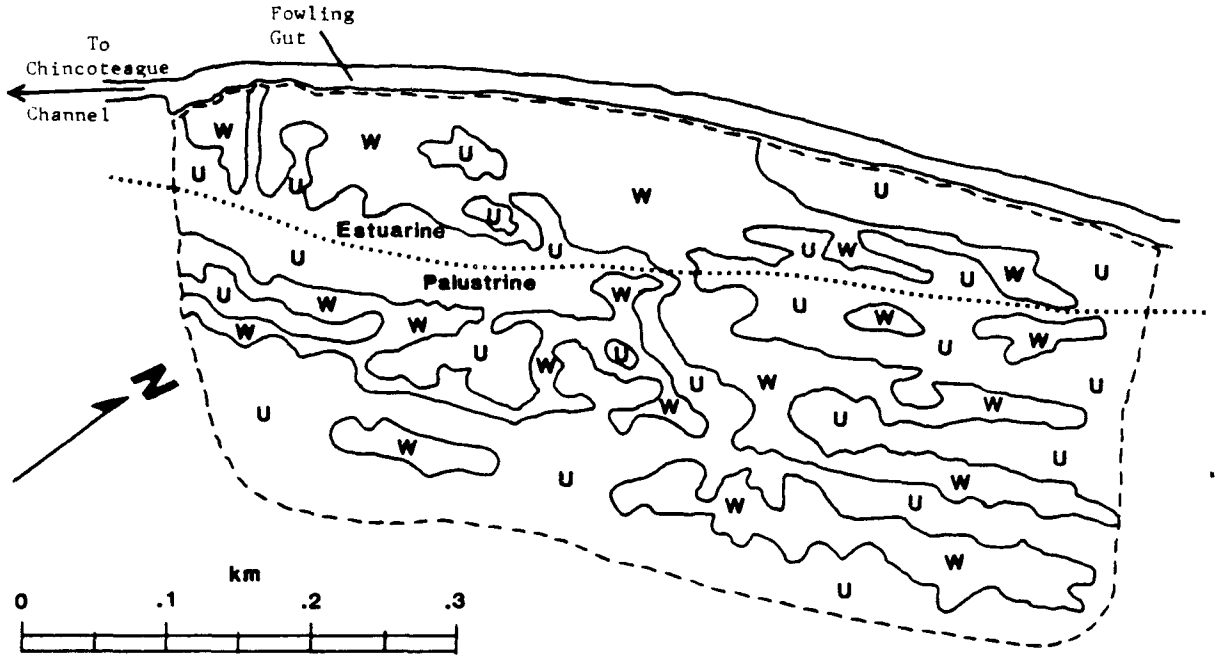


Figure 8. Map of Fowling Gut System WIA showing wetland (w) and upland (u) areas. Major outlet is indicated by arrow that depicts the direction of water movement from the site. Estuarine and palustrine portions of the WIA are separated by dotted line.

portion occurs only during wet, rainy periods. The sub-watershed for both sites consists of the forested ridges and developed homesites within close proximity to the wetland impact areas and basins.

Qualitative vegetation description. The emergent estuarine wetlands in the estuarine portion are dominated by Spartina patens, Distichlis spicata, Iva, Scirpus robustus and Spartina alterniflora. Phragmites dominates along the northwestern corner of the site and along the northern edge of the site where considerable disruption and filling has occurred. The wetlands on the palustrine portion are dominated by Hibiscus, Kosteletzkya, Typha and Spartina patens in certain areas. Walter's millet (Echinochloa walteri) dominates a small marsh at the northern end of the site. The borrow pit ponds which lie along the eastern side of the site are surrounded by Typha, Peltandra, and red maples.

Wetland classification. The forested ridge areas in both sites are upland communities. The estuarine wetlands are estuarine emergent. The palustrine wetlands are palustrine emergent.

Substrate, water salinity. Substrates underlying these areas are largely sandy or sandy loam soils with small amounts of accumulated organic matter near the surface (15 cm). Water adjacent to and in Fowling Gut has a salinity of approximately 10-20 ppt depending upon the amount of recent rainfall. Water in the interior areas of the palustrine portion has a salinity of from 1 to 4 ppt.

Wildlife use. There are numerous signs (footprints, feces, etc.) of use by waterfowl including black ducks and wood ducks and wading birds at both sites. There is much evidence of both juvenile and salt marsh fishes in the ponds and wetlands adjacent to Fowling Gut. Most areas of the site are apparently utilized by raccoons and other small mammals.

Hydrologic functions. The estuarine portion experiences limited, daily tidal exchange with Fowling Gut. During wet periods drainage is principally out of the wetland and southeast along Fowling Gut. The palustrine portion, under dry conditions, drains internally into the water table aquifer. During wet, rainy periods there are several small surface outlets to the estuarine portion and ultimately to Fowling Gut. Because of these characteristics the palustrine portion probably has a very high groundwater recharge potential. Both portions of the site probably have high flood storage and nutrient retention potential.

3.3.2 Adamus and Stockwell Evaluations: Fowling Gut System - Estuarine Portion

Summary Sheet D

This form is the appropriate place for recording the ratings that result from use of the interpretation procedures and keys in Sections 2.1.2. and 2.2.2. As each analysis is completed, enter its rating (high,moderate, or low; or A, B, or C) in the relevant box until all boxes for functions of interest are filled.

Begin by labeling the context of the analysis (pre- or post- construction, with or without mitigation, name of basin and WIA). Then enter the data, using the numbered footnotes to help locate the associated analyses. For the evaluation of each function's Effectiveness, enter whichever rating is higher--that for the basin or that for the WIA. The evaluation of the impact vector is optional.

BASIN _____ WIA _____ PROJECT _____

EVALUATION TIME FRAME (PRE/POST) _____ MITIGATION PLAN # _____

FUNCTION	EFFECTIVENESS[1]	OPPORTUNITY[1]	FUNCTIONAL RATING[1]	SIGNIFICANCE[2]	FUNCTIONAL SIGNIFICANCE[4]
GROUND WATER RECHARGE[5]	low	moderate	low	moderate	low
GROUND WATER DISCHARGE[6]	low		low	high	low
FLOOD STORAGE[7]	high	low	moderate	high	high
SHORELINE ANCHORING[8]	high	low	moderate	moderate	moderate
SEDIMENT TRAPPING[9]	moderate	high	high	high	very high
NUTRIENT RETENTION					
LONG-TERM[10]	moderate	high	high	high	very high
SEASONAL[11]	moderate	high	high		very high
FOOD CHAIN SUPPORT					
DOWNSTREAM[12]	moderate		moderate	moderate	moderate
IN-BASIN[13]	moderate		moderate		moderate
FISHERY HABITAT					
WARMWATER[14]	low				
COLDWATER[14]			low	moderate	low
COLDW.RIVERINE[14]					
ANADROMOUS BY SPECIES[15] Bl.Fish,Hd. Cl. Win Fl.*	moderate		moderate		moderate
WILDLIFE HABITAT					
GENERAL DIVERSITY[16]	moderate		moderate	moderate	moderate
WATERFOWL GP.[17] 1	summer low	winter low	low		low
WATERFOWL GP.[17] 2	low	low	low		low
SPECIES[18] Common Egret	high		high		high
SPECIES[18] _____					
SPECIES[18] _____					
ACTIVE RECREATION[19]					
SWIMMING	low		low	moderate	low
BOAT LAUNCHING	low		low		low
POWER BOATING	low		low		low
CANOEING	low		low		low
SAILING	low		low		low
PASSIVE RECREATION AND HERITAGE[20]				moderate	moderate
IMPACT VECTOR RATING[21]					

FOOTNOTES

These entries will be based on analyses in the following parts of Volume II (numbers correspond to footnotes above):

[1]-Forms A, A1 (p. 6, 51); [2]-Section 2.1.2.2. (p. 97); [3]-Forms B, B1 (p. 38, 54); [4]-Section 2.1.2.2. (p. 97); [5]-Interpretation key in Section 2.1.2.1. p. 57; [6]-p. 59; [7]-p. 60; [8]-p. 62; [9]-p. 64; [10]-p. 67; [11]-p. 67; [12]-p. 69; [13]-p. 71; [14]-p. 73; [15]-p. 75; [16]-p. 79; [17]-p. 80; [18]-p. 84; [19]-p. 91; [20]-p. 92; [21]-p. 93.

* Blue Fish, Hard Clam, Winter Flounder

Response Sheet A1

THRESHOLD ANALYSIS: FUNCTIONAL OPPORTUNITY AND EFFECTIVENESS

This sheet is the appropriate place for recording the responses to corresponding questions in Form A. A "yes" (Y) or "no" (N) response must be circled for all parts of each question, even when the response seems obvious. This response sheet has two major columns--"WIA" and "BASIN", and within each of these, three subcolumns entitled "X", "W", and "D", which address, when relevent, the seasonal changes in some of the predictors, as follows:

> X column responses are those addressing either (a) the average annual condition, or (b) the condition intermediate between the wettest and driest annual conditions (e.g., late June in most Prairie pothole wetlands), or (c) the condition of maximum annual standing crop of wetland plants, or (d) if tidal, the average daily mid-tide condition.
>
> W column responses are those addressing what the area would look like (a) during the wettest time of an average year, or (b) if the area is tidal, what it would look like during an average daily high tide (flooded) condition.
>
> D column responses are those addressing what the area would look like during either the driest time of the year (questions pertaining to hydrology) or if the question pertains to vegetation, then during the dormant time of the year. If the area is tidal, "D" refers to its daily low tide (exposed) condition.

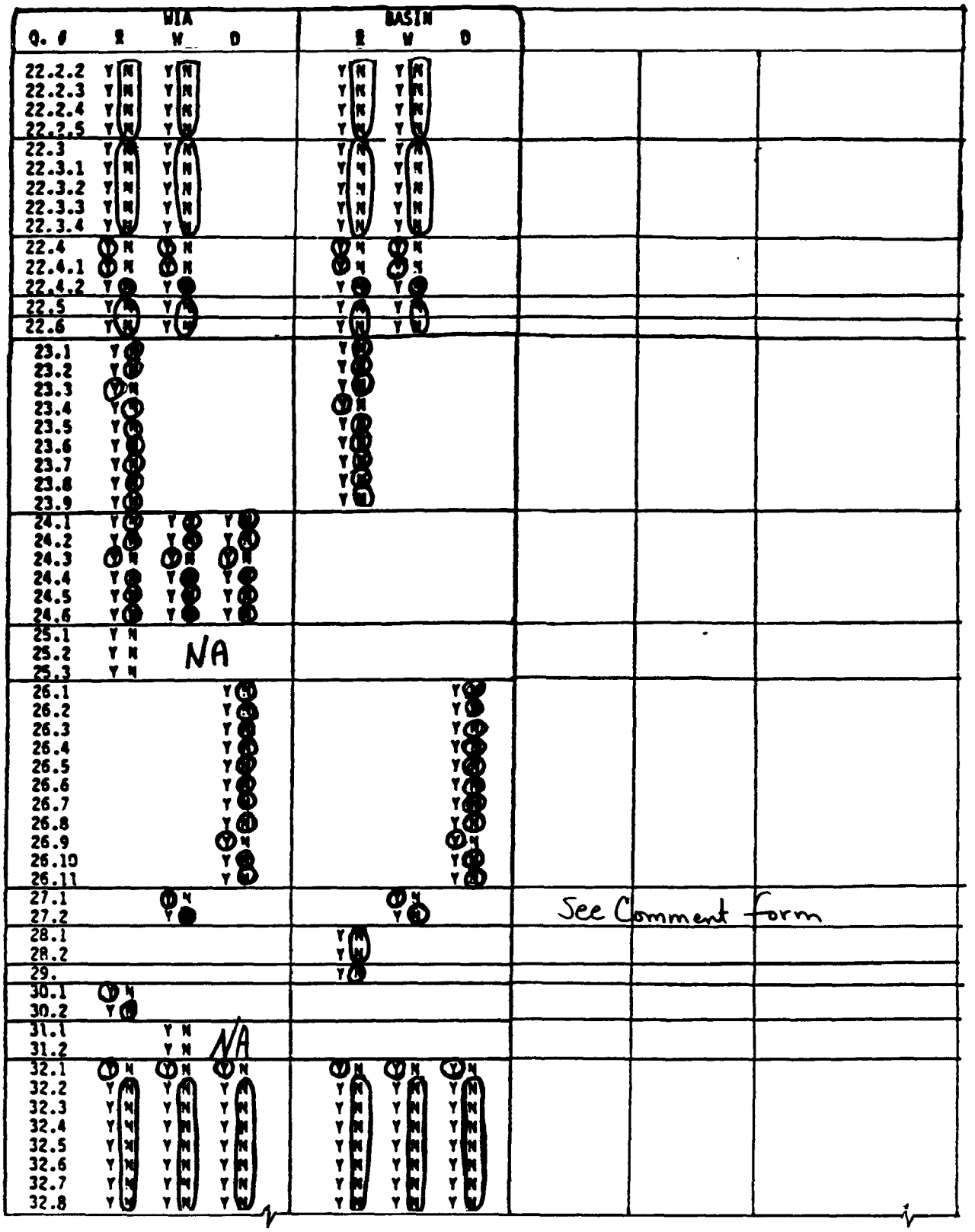
For example, question 2.1.1 should first be asked and answered in the context of the WIA's (wetland impact area's) average condition, then in terms of its wettest condition, then the basin's average condition, and finally the basin's wettest condition. This should then be repeated for question 2.1.2. Because no Y/N choice is given in either "D" column, the area's dry or dormant condition need not be evaluated for this question. Similarly, some questions will require responses only for the WIA or basin, but not both.

Q. #	WIA X	WIA W	WIA D	BASIN X	BASIN W	BASIN D	
Office-type Data							
1.1	Y (N)	(Y) N	Y (N)	Y (N)	(Y) N	Y (N)	See comment form
1.2	Y (N)	(Y) N	Y (N)	Y (N)	(Y) N	Y (N)	
1.3	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	
1.3.1	Y (N)	(Y) N	Y (N)	Y (N)	(Y) N	Y (N)	

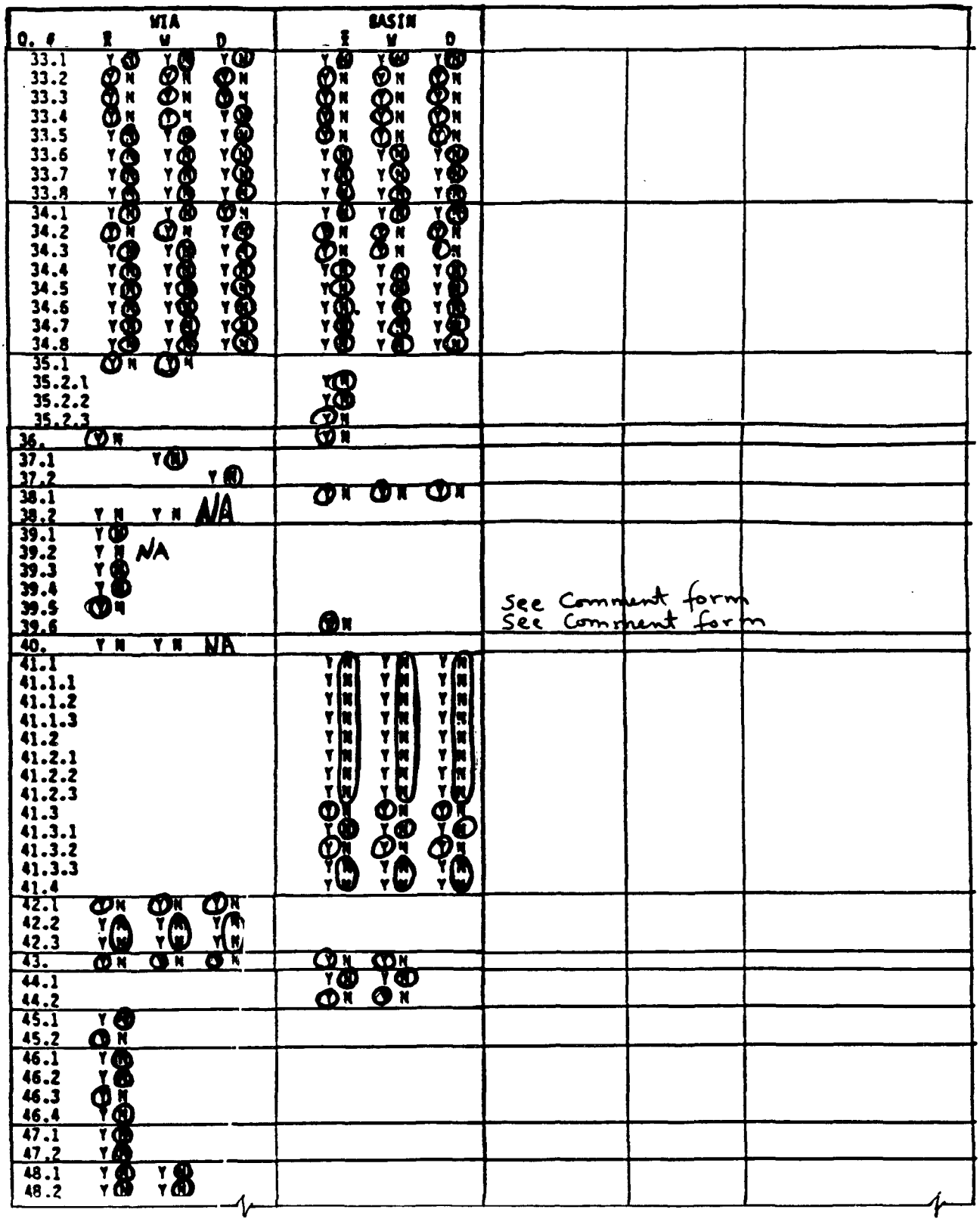
Fowling Gut System - Estuarine Portion

Q. #	MIX E	MIX W	MIX D	BASIN E	BASIN W	BASIN D			
2.1.1 2.1.2 2.2.1 2.2.2	N Y N Y	N Y N Y		N Y N Y	Y Y N Y		see comment form		
3.1 3.2					N Y				
4.1 4.2	N Y								
5.1 5.2					Y Y		See Comment form		
6.1 6.2		Y Y							
7.1 7.2				Y N Y N			See comment form		
8.1 8.2					Y N		See comment form		
9.1 9.2				Y N Y N			see comment form		
10.1 10.2 10.3 10.4	Y Y Y Y	NA							
11.1 11.2	Y N								
12.1 12.2		Y N Y N	NA						
13.1 13.2				Y N Y N	NA				
14.	Y			Y					
15.1 15.2 15.3 15.4 15.5 15.6 15.7	N Y Y Y Y Y Y						See comment form		
16.	Y								
17.1 17.2	Y Y								
18.	Y								
19.	Y								
20.				Y	N				
21.1 21.2 21.3 21.4 21.5 21.6	Y Y Y Y N Y								
Field-type Data									
22.1 22.1.1 22.1.2 22.1.3 22.1.4 22.1.5	Y N Y N Y N Y N Y N Y N	Y N Y N Y N Y N Y N Y N		Y N Y N Y N Y N Y N Y N	Y N Y N Y N Y N Y N Y N				
22.2 22.2.1	Y N Y N	Y N Y N		Y N Y N	Y N Y N				

Fowling Gut System - Estuarine Portion



Fowling Gut System - Estuarine Portion



Fowling Gut System - Estuarine Portion

Q. #	MIA E	MIA W	MIA D	BASIN E	BASIN W	BASIN D			
49.1				Y (N)					
49.2				Y (N)					
50.	(Y) N	(Y) N	(Y) N						
51.		(Y) N							
Detailed Data									
52.1.1	Y N	NA							
52.1.2	Y N								
52.2.1	(Y) N								
52.2.2	Y (N)								
53.1	Y N								
53.2	Y N	NA							
54.1	Y N								
54.2	Y N	NA							
55.	Y N	NA							
56.		NA			Y N				
57.1	Y N								
57.2	Y N								
57.3	Y N	NA							
57.4	Y N								
58.1	Y N								
58.2	Y N	NA							
58.3	Y N								
58.4	Y N								
59.1				Y N					
59.2				Y N	NA				
59.3				Y N					
60.1						Y N			
60.2				Y N	NA				
60.3				Y N					
61.1	Y N								
61.2	Y N	NA							
62.	Y N	NA							
63.1						Y N			
63.2				NA		Y N			
64.				NA		Y N			
65.	(Y) N								
66.1			Y N			Y N			
66.2	NA		Y N	NA		Y N			
67.1			Y N			Y N			
67.2	NA		Y N	NA		Y N			
68.1	Y N					Y N			
68.2	Y N	NA		NA		Y N			
Derived Responses									
69.1	Y N								
69.2	Y N								
70.1	Y N								
70.2	Y N								
71.1	Y N								
71.2	Y N								
72.1	Y N								
72.2	Y N								
73.1	Y N								
73.2	Y N								
74.1	Y N								
74.2	Y N								
75.1	Y N								
75.2	Y N								

After responses to all possible questions (Form A) have been recorded above, turn to Form B (page 38). You will(as an option) return to this sheet (in Section 2.1.2) to interpret the above responses.

Fowling Gut System - Estuarine Portion

Response Sheet B1

THRESHOLD ANALYSIS: SIGNIFICANCE

This sheet is the appropriate place for recording the responses to the corresponding questions in Form B. Circle Y (yes) or N (no), being careful to note that the order of Y and N below frequently reverses.

General
1.1 N Y
1.2 N Y
1.3 N Y
1.4 N Y
1.5 N Y
1.6 N Y
2. Y N

Recharge
3. Y N
4. Y N
5. Y N
6. Y N
7. Y N
8. Y N
9. Y N
10. N Y

Discharge
11. Y N
12. N N
13. N N
14. N N
15. N Y

Flood Storage
16. N N
17. Y N See Comment form
18. N N
19. N N
20. N N
21. Y N See Comment form
22. N Y

Shoreline Anchoring
23. Y N
24. N N
25. N N
26. N N See Comment form
27. N N
28. Y N
29. N Y

Sediment Trapping
30. Y N
31. Y N
32. N N
33. N N
34. N N
35. N N
36. N Y

Nutrient Retention
37. Y N
38. Y N
39. N N
40. N N
41. N N
42. N Y

Fish Food Chain/ Habitat
43. Y N
44. N N
45. N N
46. N N
47. Y N
48. N N
49. Y N
50. Y N
51. Y N
52. Y N
53. N Y

Wildlife Habitat
54. Y N
55. Y N
56. N N
57. N N
58. Y N
59. Y N
60. N Y

Active Recreation
61. Y N
62. N N
63. Y N
64. N N
65. Y N
66. Y N
67. N Y

Passive
68. Y N
69. Y N
70. Y N
71. Y N
72. Y N
73. Y N
74. Y N
75. N N
76. Y N
77. Y N
78. N N

Form "A" Comments (Fowling Gut System - Estuarine Portion)

WIA	= area inside dashed line answers concerning specific wetland characteristics refer to wetland areas only within WIA (Figure 8)
Basin	= WIA + Fowling Gut from origin to Mire Pond (bordering the Mire Pond fill site and the Mire Pond Scrub-Shrub System)
1.1	At least two confined channels deliver water from 4B to 4A during wet conditions
2.2.1	WIA constricted because most exchange with Fowling Gut occurs through a narrow tidal channel
7	Predictor not used
8	Sub-watershed = all areas that drain into Fowling Gut from origin to Mire Pond
5.2	See site map (Figure 8) and definitions for this site
9	Predictor not used
15	Forested ridges dominate sub-watershed
23	< 30 cm porous organic over sand
27.1-27.2	WIA and Basin are tidal and surrounded by uplands. During flooding the aerial extent of water coverage is only slightly expanded
39.5	Constriction by six or more small culverts between WIA and Chincoteague Bay
39.6	Nonpoint discharge around Fowling Gut

3.3.3 Adamus and Stockwell Evaluations: Fowling Gut System - Palustrine Portion

Summary Sheet D

This form is the appropriate place for recording the ratings that result from use of the interpretation procedures and keys in Sections 2.1.2, and 2.2.2. As each analysis is completed, enter its rating (high,moderate, or low; or A, B, or C) in the relevant box until all boxes for functions of interest are filled.

Begin by labeling the context of the analysis (pre- or post- construction, with or without mitigation, name of basin and WIA). Then enter the data, using the numbered footnotes to help locate the associated analyses. For the evaluation of each function's Effectiveness, enter whichever rating is higher--That for the basin or that for the WIA. The evaluation of the impact vector is optional.

BASIN _____ WIA _____ PROJECT _____

EVALUATION TIME FRAME (PRE/POST) _____ MITIGATION PLAN # _____

FUNCTION	EFFECTIVENESS[1]	OPPORTUNITY[1]	FUNCTIONAL RATING[2]	SIGNIFICANCE[3]	FUNCTIONAL SIGNIFICANCE[4]
GROUND WATER RECHARGE[5]	high	moderate	high	moderate	high
GROUND WATER DISCHARGE[6]	moderate		moderate	high	high
FLOOD STORAGE[7]	high	high	high	high	very high
SHORELINE ANCHORING[8]	high	low	moderate	high	high
SEDIMENT TRAPPING[9]	high	high	high	high	very high
NUTRIENT RETENTION					
LONG-TERM[10]	high	high	high	moderate	high
SEASONAL[11]	moderate	high	high		high
FOOD CHAIN SUPPORT					
DOWNSTREAM[12]	moderate		moderate	moderate	moderate
IN-BASIN[13]	moderate		moderate		moderate
FISHERY HABITAT					
WARMWATER[14]	low		low	moderate	low
COLDWATER[14]					
COLDW.RIVERINE[14]					
ANADROMOUS RIV.					
SPECIES[15] _____					
WILDLIFE HABITAT	moderate		moderate		moderate
GENERAL DIVERSITY[16]	summer	winter			
WATERFOWL GP.[17] 1	low	low	low		low
WATERFOWL GP.[17] 2	low	low	low	moderate	low
SPECIES[18] Black Duck	low	low	low		low
SPECIES[18] _____					
SPECIES[18] _____					
ACTIVE RECREATION[19]					
SWIMMING	low		low		low
BOAT LAUNCHING	low		low	moderate	low
POWER BOATING	low		low		low
CANOEING	low		low		low
SAILING	low		low		low
PASSIVE RECREATION AND HERITAGE[20]				high	high
IMPACT VECTOR RATING[21]					

FOOTNOTES

These entries will be based on analyses in the following parts of Volume II (numbers correspond to footnotes above):

[1]·Forms A, A1 (p. 6, 51); [2]·Section 2.1.2.2. (p. 97); [3]·Forms B, B1 (p. 38, 54); [4]·Section 2.1.2.2. (p. 97); [5]·Interpretation key in Section 2.1.2.1. p. 57; [6]·p. 59; [7]·p. 60; [8]·p. 62; [9]·p. 64; [10]·p. 67; [11]·p. 67; [12]·p. 69; [13]·p. 71; [14]·p. 73; [15]·p. 75; [16]·p. 79; [17]·p. 80; [18]·p. 84; [19]·p. 91; [20]·p. 92; [21]·p. 93.

Response Sheet A1

THRESHOLD ANALYSIS: FUNCTIONAL OPPORTUNITY AND EFFECTIVENESS

This sheet is the appropriate place for recording the responses to corresponding questions in Form A. A "yes" (Y) or "no" (N) response must be circled for all parts of each question, even when the response seems obvious. This response sheet has two major columns--"WIA" and "BASIN", and within each of these, three subcolumns entitled "$\bar{x}$", "W", and "D", which address, when relevent, the seasonal changes in some of the predictors, as follows:

> $\bar{x}$ column responses are those addressing either (a) the average annual condition, or (b) the condition intermediate between the wettest and driest annual conditions (e.g., late June in most Prairie pothole wetlands), or (c) the condition of maximum annual standing crop of wetland plants, or (d) if tidal, the average daily mid-tide condition.
>
> W column responses are those addressing what the area would look like (a) during the wettest time of an average year, or (b) if the area is tidal, what it would look like during an average daily high tide (flooded) condition.
>
> D column responses are those addressing what the area would look like during either the driest time of the year (questions pertaining to hydrology) or if the question pertains to vegetation, then during the dormant time of the year. If the area is tidal, "D" refers to its daily low tide (exposed) condition.

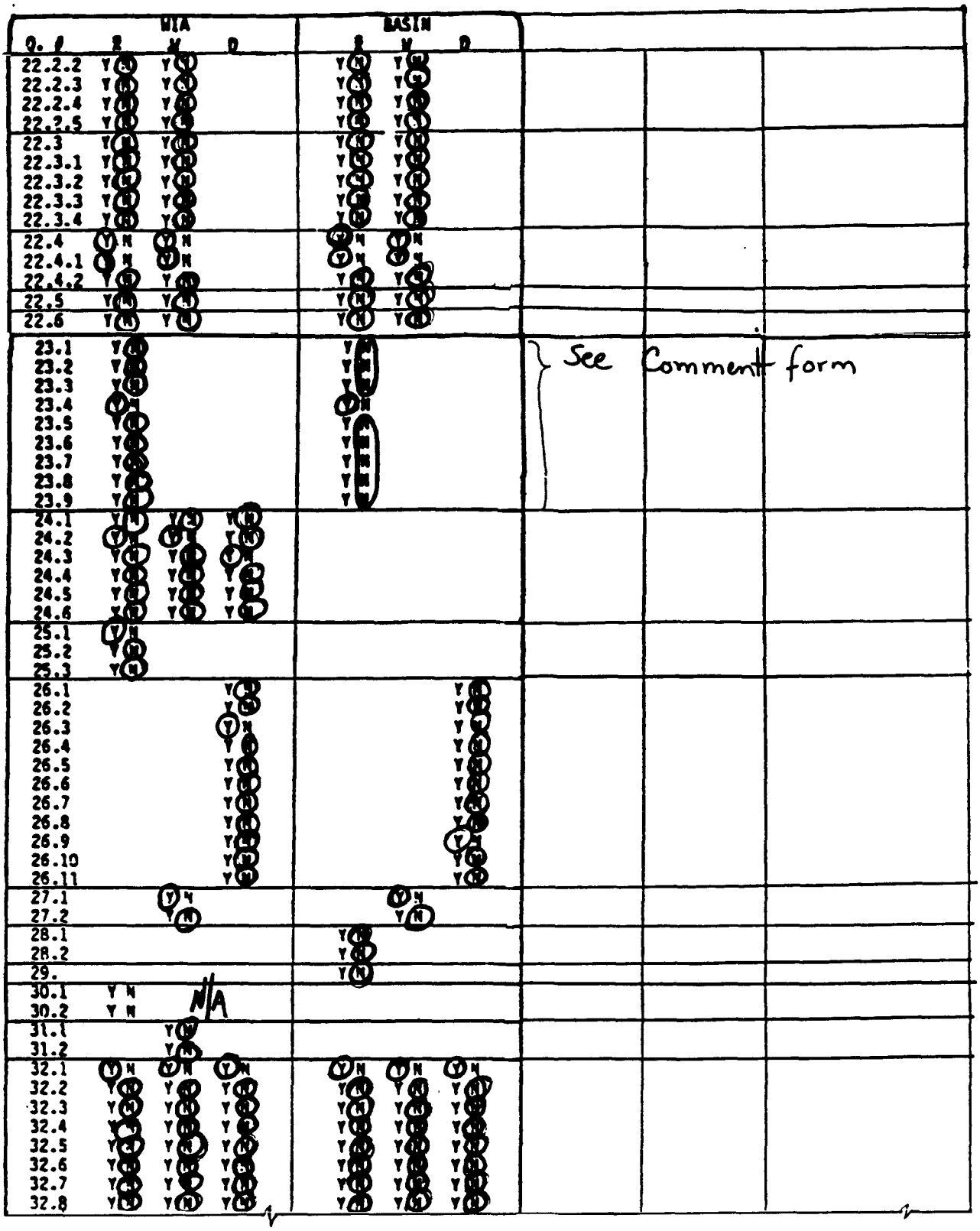
For example, question 2.1.1 should first be asked and answered in the context of the WIA's (wetland impact area's) average condition, then in terms of its wettest condition, then the basin's average condition, and finally the basin's wettest condition. This should then be repeated for question 2.1.2. Because no Y/N choice is given in either "D" column, the area's dry or dormant condition need not be evaluated for this question. Similarly, some questions will require responses only for the WIA or basin, but not both.

Q. #	WIA $\bar{x}$	WIA W	WIA D	BASIN $\bar{x}$	BASIN W	BASIN D
Office-type Data						
1.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)
1.2	Y (N)	(Y) N	Y (N)	Y (N)	Y (N)	Y (N)
1.3	Y (N)	Y (N)	Y (N)	(Y) N	(Y) N	(Y) N
1.3.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)

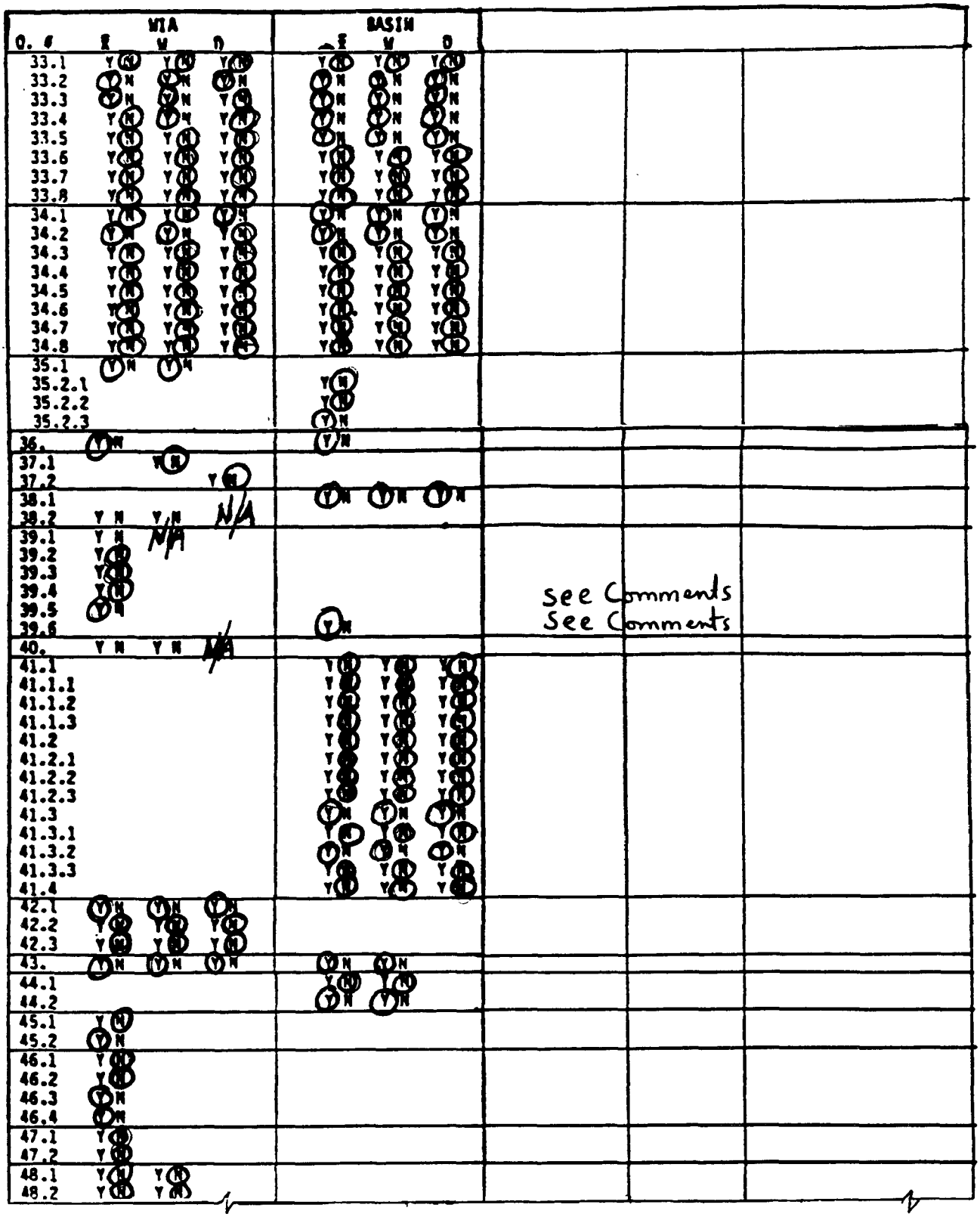
Fowling Gut System - Palustrine Portion

Q. #	WIA			BASIN					
	E	W	D	E	W	D			
2.1.1	Y (N)	Y (N)		Y (N)	Y (N)				
2.1.2	Y (N)	Y (N)		Y (N)	Y (N)				
2.2.1	Y (N)	Y (N)		Y (N)	Y (N)				
2.2.2	Y (N)	Y (N)		Y (N)	Y (N)				
3.1				Y (N)					
3.2				Y (N)					
4.1	Y (N)								
4.2	Y (N)								
5.1				Y (N)					
5.2				Y (N)			See	Comment	form
6.1		Y (N)							
6.2		Y (N)							
7.1				Y N					
7.2				Y N			See	Comment	form
8.1				Y (N)					
8.2				Y (N)			See	Comment	form
9.1				Y N					
9.2				Y N			See	Comment	form
10.1	Y N								
10.2	Y N	N/A							
10.3	Y N								
10.4	Y N								
11.1	Y (N)								
11.2	Y (N)								
12.1		Y N							
12.2		Y N	N/A						
13.1				Y N					
13.2				Y N	N/A				
14.	Y N			Y (N)					
15.1	Y (N)								
15.2	Y (N)								
15.3	Y (N)								
15.4	Y (N)								
15.5	Y (N)								
15.6	Y (N)								
15.7	Y (N)								
16.	Y (N)								
17.1	Y (N)								
17.2	Y (N)								
18.	Y (N)								
19.	Y (N)								
20.				Y (N)					
21.1	(Y) N								
21.2	Y (N)								
21.3	Y (N)								
21.4	Y (N)								
21.5	Y (N)								
21.6	Y (N)								
Field-type Data									
22.1	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.1	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.2	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.3	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.4	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.5	Y (N)	Y (N)		Y (N)	Y (N)				
22.2	Y (N)	Y (N)		Y (N)	Y (N)				
22.2.1	Y (N)	Y (N)		Y (N)	Y (N)				

Fowling Gut System - Palustrine Portion



Fowling Gut System - Palustrine Portion



Fowling Gut System - Palustrine Portion

Q. #	AREA E	AREA W	AREA D	BASIN E	BASIN W	BASIN D			
49.1				Y (N)					
49.2				Y (N)					
50.	(Y) N	(Y) N	(Y) N						
51.		Y N							
Detailed Data									
52.1.1	Y N	N/A							
52.1.2	Y N								
52.2.1	Y N								
52.2.2	Y N								
53.1	Y N	N/A							
53.2	Y N								
54.1	Y N	N/A							
54.2	Y N								
55.	Y N	N/A							
56.				N/A	Y N				
57.1	Y N								
57.2	Y N	N/A							
57.3	Y N								
57.4	Y N								
58.1	Y N								
58.2	Y N	N/A							
58.3	Y N								
58.4	Y N								
59.1				Y N					
59.2				Y N	N/A				
59.3				Y N					
60.1						Y N			
60.2				Y N	N/A				
60.3				Y N					
61.1	Y N		N/A						
61.2	Y N								
62.	Y N		N/A						
63.1				N/A		Y N			
63.2						Y N			
64.				N/A		Y N			
65.	(Y) N								
66.1		Y N	N/A	N/A		Y N			
66.2		Y N				Y N			
67.1		Y N	N/A	N/A		Y N			
67.2		Y N				Y N			
68.1	Y N		N/A	N/A		Y N			
68.2	Y N					Y N			
Derived Responses									
69.1	Y N								
69.2	Y N								
70.1	Y N								
70.2	Y N								
71.1	Y N								
71.2	Y N								
72.1	Y N								
72.2	Y N								
73.1	Y N								
73.2	Y N								
74.1	Y N								
74.2	Y N								
75.1	Y N								
75.2	Y N								

After responses to all possible questions (Form A) have been recorded above, turn to Form B (page 38). You will(as an option) return to this sheet (in Section 2.1.2) to interpret the above responses.

Fowling Gut System – Palustrine Portion

Response Sheet B1

THRESHOLD ANALYSIS: SIGNIFICANCE

This sheet is the appropriate place for recording the responses to the corresponding questions in Form B. Circle Y (yes) or N (no), being careful to note that the order of Y and N below frequently reverses.

General
1.1 N Y
1.2 Y Y
1.3 N Y
1.4 N Y
1.5 N Y
1.6 N Y
2. Y N

Recharge
3. Y N
4. Y N
5. Y N
6. Y N
7. Y N
8. Y N
9. N N
10. N Y

Discharge
11. Y N
12. Y N
13. N N
14. N N
15. N Y

Flood Storage
16. Y N
17. Y N see comment form
18. Y N
19. N N
20. N N
21. N N see comment form
22. Y Y

Shoreline Anchoring
23. Y N
24. Y N
25. N N
26. N N see comment form
27. Y N
28. Y Y
29. N Y

Sediment Trapping
30. Y N
31. Y N
32. Y N
33. Y N
34. Y N
35. Y N
36. N Y

Nutrient Retention
37. Y N
38. Y Y
39. Y N
40. Y N
41. N N
42. N Y

Fish Food Chain/ Habitat
43. Y N
44. Y N
45. Y N
46. Y N
47. Y N
48. Y N
49. Y N
50. Y N
51. Y N
52. Y N
53. N Y

Wildlife Habitat
54. Y N
55. Y N
56. Y N
57. Y N
58. Y N
59. Y N
60. N Y

Active Recreation
61. Y N
62. Y N
63. Y Y
64. Y N
65. Y N
66. Y N
67. N Y

Passive
68. Y N
69. Y N
70. Y N
71. Y N
72. Y N
73. Y N
74. Y N
75. Y N
76. Y N
77. Y N
78. N Y

Form "A" Comments (Fowling Gut System - Palustrine Portion)

WIA	= Area inside dash line (Figure 8)
Basin	= WIA + Fowling Gut from origin to Mire Pond bordering the Mire Pond fill site and the Mire Pond scrub-shrub system
5.2	See site map (Figure 8) and definitions for this site
7	Predictor not used
8	Sub-watershed - Same as estuarine portion except includes developed areas surrounding WIA to east
9	Predictor not used
23	< 15 cm porous organic over sand
39.5	Constriction by six or more small culverts between WIA and Chincoteague Bay
39.6	Nonpoint discharge around Fowling Gut

Form "B" Comments (Fowling Gut System - Estuarine and Palustrine portions and Mixed Hardwoods Swamp)

21	Site E flooded daily, not as valuable for flood storage and desynchronization
17	Ditches from roads and yards drain into site P
17	Ditches from roads and yards drain into mixed hardwoods swamp, Chincoteague Ridge/Swales also
26	For Mixed Hardwoods Swamp Basin = WIA, sediment trapping of little value

3.4 MIXED HARDWOODS SWAMP

3.4.1 Qualitative Site Description

Physical description. This site (Figure 9) encompasses 6 ha and is very different from the other sites which we have surveyed during the project. It is surrounded on all four sides by intensive suburban development on filled land. It consists of several shallow basins separated by four low-lying ridges. The basins apparently were once swales that drained into Assateague Channel during wet periods. Vegetation on this site is almost exclusively trees with only a small area of emergent wetlands. Although encroachment has occurred from all sides, the site is still largely natural in character. At the center of the site a house encroaches on the area from the south and trailers encroach from the north so that the center is very constricted.

Definitions. The WIA consists of the site as outlined by the EPA. The site receives water from adjacent roads, ditches, and backyards and drains internally into the underlying water table aquifer. In this case the basin equals the WIA. The sub-watershed for the site consists of slightly elevated ridges which lie between the lower-lying swamps and a fringe of surrounding developed land.

Qualitative vegetation description. Most of the wetland areas which lie in this site are dominated by obligate or facultative wet tree species. Dominant trees are red maple (Acer rubrum) and sweet gum (Liquidambar styraciflua) while other

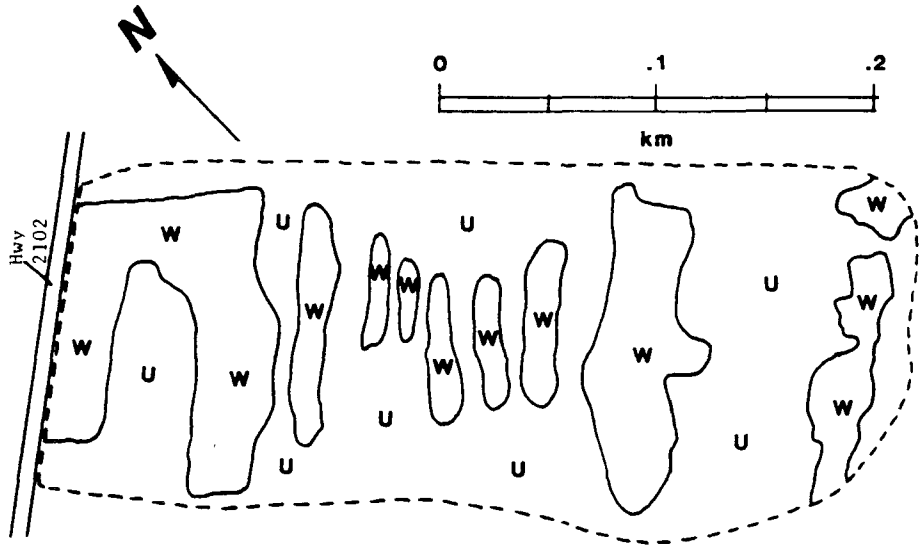


Figure 9. Map of Mixed Hardwoods Swamp WIA showing wetland (w) and upland (u) areas.

species such as slippery elm (Ulmus rubra), black gum (Nyssa sylvatica), and water oak (Quercus nigra) are present. The slightly elevated ridges are dominated by loblolly pine (Pinus taeda), patches of oaks (Querus spp.), some pines (Pinus spp.), dogwood (Cornus spp.), and sassafras (Sassafras albidum). There is a small emergent marsh in the southeast corner of the site which is dominated by Hibiscus, Polygonum, and willows (Salix spp.). In summary, this site is a swamp with lower lying areas dominated by red maples and sweet gum and higher areas by oak and pine.

Wetland classification. Most of the wetlands at this site are palustrine forested. The small area of emergent wetland in the southeast corner of the site is palustrine emergent.

Substrate, water salinity. The substrates on the site are sandy or sandy loam soils overlain by approximately 10-15 cm of organic material. Water levels in the swamp areas fluctuate seasonally from a standing depth of 20 cm to virtually dry during drought periods. Salinities are well below 1 ppt (freshwater).

Wildlife use. This small site appears to be heavily used by passerine birds. Night-herons were observed roosting in the emergent wetland areas in the southeast corner of the site. There is also evidence of use of the site by raccoons and other small mammals. There is no fishery utilization of this site.

Hydrologic functions. Water appears to drain vertically into the soils underlying the site. There is no inlet or outlet to the site. As a result the site has a high potential for ground-water recharge, flood water storage, and nutrient retention, but little potential for ground-water discharge (no outlet).

Special note. This is an unusual site on Chincoteague because of its red maple/sweet gum swamp character. While there are other swamp areas on Chincoteague, this is one of the best examples of this wetland type. In addition to aesthetic qualities, this site provides an unusual habitat and food chain support function of a type which is relatively rare on both Chincoteague and Assateague Islands.

3.4.2 Adamus and Stockwell Evaluations: Mixed Hardwoods Swamp

Summary Sheet D

This form is the appropriate place for recording the ratings that result from use of the interpretation procedures and keys in Sections 2.1.2, and 2.2.2. As each analysis is completed, enter its rating (high,moderate, or low; or A, B, or C) in the relevant box until all boxes for functions of interest are filled.

Begin by labeling the context of the analysis (pre- or post- construction, with or without mitigation, name of basin and WIA). Then enter the data, using the numbered footnotes to help locate the associated analyses. For the evaluation of each function's Effectiveness, enter whichever rating is higher--That for the basin or that for the WIA. The evaluation of the impact vector is optional.

BASIN _____ WIA _____ PROJECT _____

EVALUATION TIME FRAME (PRE/POST) _____ MITIGATION PLAN # _____

FUNCTION	EFFECTIVENESS[1]	OPPORTUNITY[1]	FUNCTIONAL RATING[2]	SIGNIFICANCE[3]	FUNCTIONAL SIGNIFICANCE[4]
GROUND WATER RECHARGE[5]	high	moderate	high	moderate	high
GROUND WATER DISCHARGE[6]	low		low	moderate	low
FLOOD STORAGE[7]	high	high	high	high	very high
SHORELINE ANCHORING[8]	high	low	moderate	low	moderate
SEDIMENT TRAPPING[9]	high	moderate	high	moderate	high
NUTRIENT RETENTION					
LONG-TERM[10]	high	high	high		very high
SEASONAL[11]	high	high	high	high	very high
FOOD CHAIN SUPPORT					
DOWNSTREAM[12]	moderate		moderate	moderate	moderate
IN-BASIN[13]	moderate		moderate		moderate
FISHERY HABITAT					
WARMWATER[14]	low		low	low	very low
COLDWATER[14]					
COLDW.RIVERINE[14]					
ANADROMOUS RIV.					
SPECIES[15] _____					
WILDLIFE HABITAT	low*		low		low
GENERAL DIVERSITY[16]	summer	winter			
WATERFOWL GP.[17] 1	low	low	low		low
WATERFOWL GP.[17] 2	low	moderate	moderate	moderate	moderate
SPECIES[18] Wood Duck		moderate	moderate		moderate
SPECIES[18] black duck		low	low		low
SPECIES[18] Blk.Cr.N.H.**	moderate		moderate		moderate
ACTIVE RECREATION[19]					
SWIMMING	low		low		very low
BOAT LAUNCHING	low		low	low	very low
POWER BOATING	low		low		very low
CANOEING	low		low		very low
SAILING	low		low		very low
PASSIVE RECREATION AND HERITAGE[20]				moderate	moderate
IMPACT VECTOR RATING[21]					

FOOTNOTES

These entries will be based on analyses in the following parts of Volume II (numbers correspond to footnotes above):

[1]Forms A, A1 (p. 6, 51); [2]Section 2.1.2.2. (p. 97); [3]Forms B, B1 (p. 38, 54); [4]Section 2.1.2.2. (p. 97); [5]Interpretation key in Section 2.1.2.1. p. 57; [6]p. 59; [7]p. 60; [8]p. 62; [9]p. 64; [10]p. 67; [11]p. 67; [12]p. 69; [13]p. 71; [14]p. 73; [15]p. 75; [16]p. 79; [17]p. 80; [18]p. 84; [19]p. 91; [20]p. 92; [21]p. 93.

* Bumped because of no open water (Q41.4) **Black-Crowned Night-Heron

Response Sheet A1

THRESHOLD ANALYSIS: FUNCTIONAL OPPORTUNITY AND EFFECTIVENESS

This sheet is the appropriate place for recording the responses to corresponding questions in Form A. A "yes" (Y) or "no" (N) response must be circled for all parts of each question, even when the response seems obvious. This response sheet has two major columns--"WIA" and "BASIN", and within each of these, three subcolumns entitled "X", "W", and "D", which address, when relevent, the seasonal changes in some of the predictors, as follows:

> X column responses are those addressing either (a) the average annual condition, or (b) the condition intermediate between the wettest and driest annual conditions (e.g., late June in most Prairie pothole wetlands), or (c) the condition of maximum annual standing crop of wetland plants, or (d) if tidal, the average daily mid-tide condition.
>
> W column responses are those addressing what the area would look like (a) during the wettest time of an average year, or (b) if the area is tidal, what it would look like during an average daily high tide (flooded) condition.
>
> D column responses are those addressing what the area would look like during either the driest time of the year (questions pertaining to hydrology) or if the question pertains to vegetation, then during the dormant time of the year. If the area is tidal, "D" refers to its daily low tide (exposed) condition.

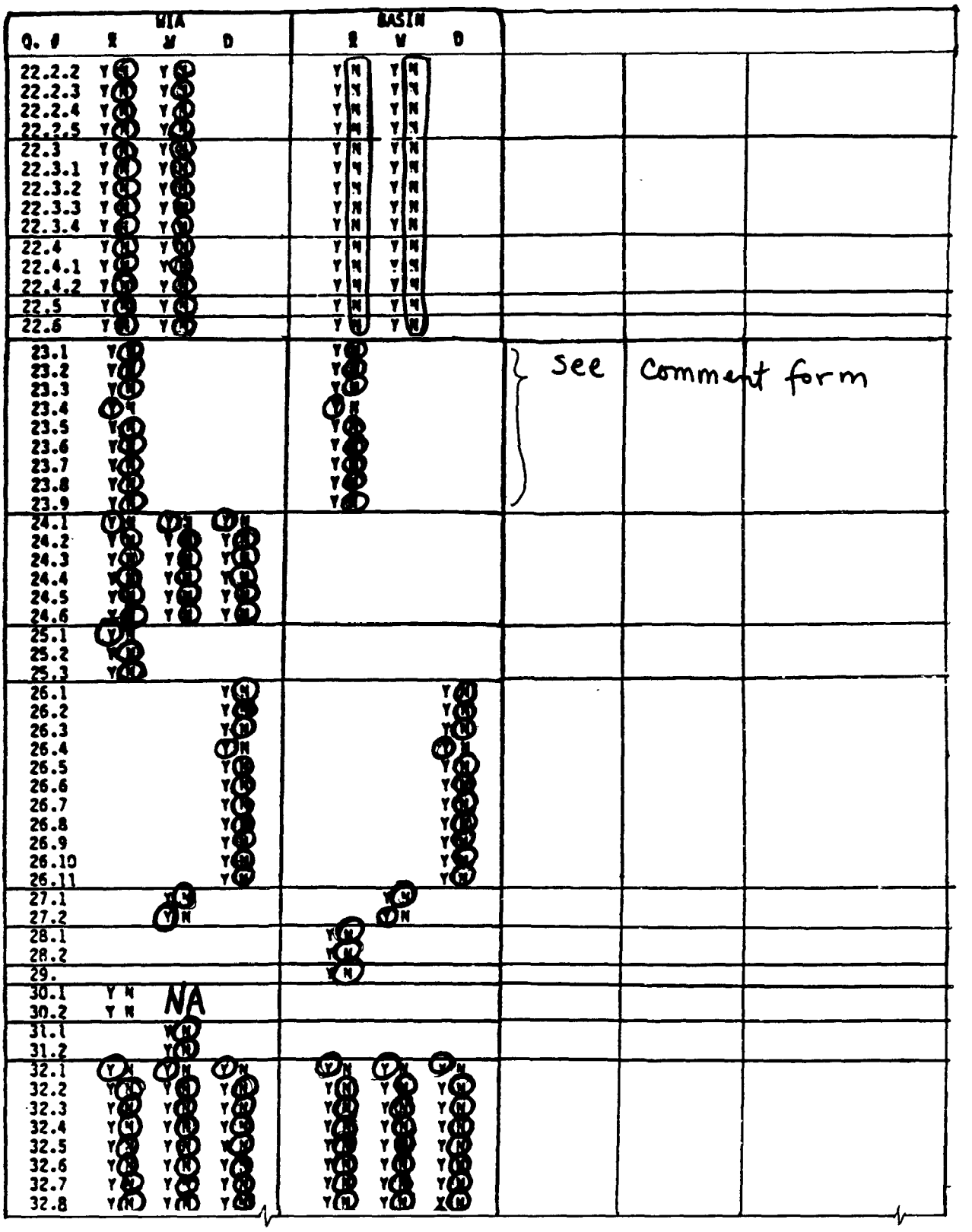
For example, question 2.1.1 should first be asked and answered in the context of the WIA's (wetland impact area's) average condition, then in terms of its wettest condition, then the basin's average condition, and finally the basin's wettest condition. This should then be repeated for question 2.1.2. Because no Y/N choice is given in either "D" column, the area's dry or dormant condition need not be evaluated for this question. Similarly, some questions will require responses only for the WIA or basin, but not both.

Q. #	WIA X	WIA W	WIA D	BASIN X	BASIN W	BASIN D	
Office-type Data							
1.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	see comment form
1.2	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
1.3	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
1.3.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	

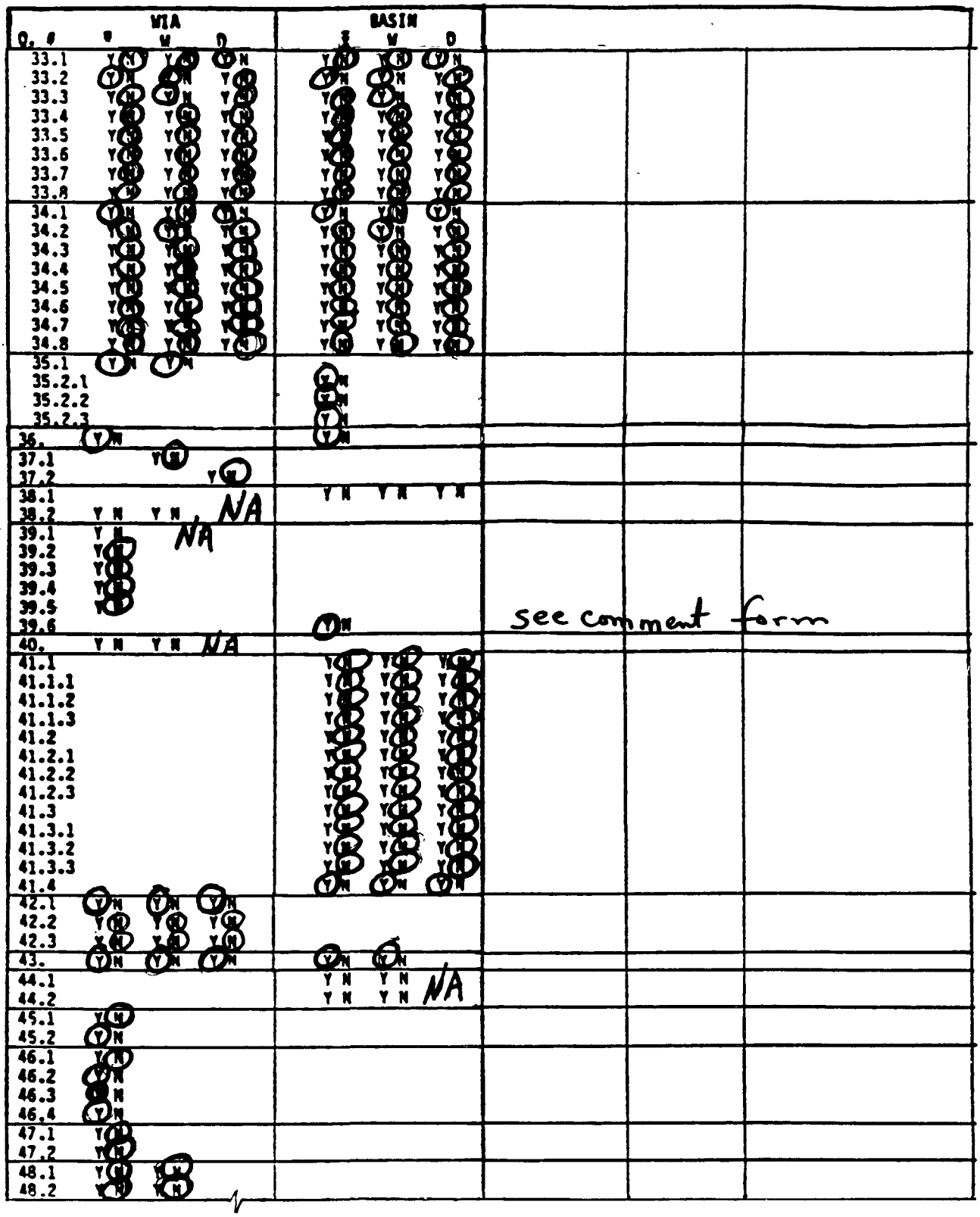
Mixed Hardwoods Swamp

Q. #	WIA E	WIA W	WIA D	BASIN E	BASIN W	BASIN D			
2.1.1	Y (N)	Y (N)		Y (N)	Y (N)				
2.1.2	Y (N)	Y (N)		Y (N)	Y (N)				
2.2.1	Y (N)	Y (N)		Y (N)	Y (N)				
2.2.2	Y (N)	Y (N)		Y (N)	Y (N)				
3.1					(Y) N				
3.2					Y (N)				
4.1	(Y) N								
4.2	Y (N)								
5.1					Y (N)				
5.2					Y (N)				See Comment form
6.1		Y (N)							
6.2		Y (N)							
7.1				Y N					
7.2				Y N					See Comment form
8.1					(Y) N				
8.2					Y (N)				See Comment form
9.1				Y N					
9.2				Y N					See Comment form
10.1	Y N								
10.2	Y N		NA						
10.3	Y N								
10.4	Y N								
11.1	Y (N)								
11.2	(Y) N								
12.1		Y N							
12.2		Y N	NA						
13.1				Y N					
13.2				Y N		NA			
14.	Y N			Y (N)					
15.1	Y (N)								See Comment form
15.2	Y (N)								
15.3	(Y) N								
15.4	Y (N)								
15.5	Y (N)								
15.6	Y (N)								
15.7	Y (N)								
16.	(Y) N								
17.1	Y (N)								
17.2	Y (N)								
18.	Y (N)								
19.	Y N		NA						
20.				Y (N)					
21.1	(Y) N								
21.2	Y (N)								
21.3	Y (N)								
21.4	Y (N)								
21.5	Y (N)								
21.6	Y (N)								
Field-type Data									
22.1	(Y) N	(Y) N		(Y) N	(Y) N				
22.1.1	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.2	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.3	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.4	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.5	(Y) N	(Y) N		(Y) N	(Y) N				
22.2	Y (N)	Y (N)		Y (N)	Y (N)				
22.2.1	Y (N)	Y (N)		Y (N)	Y (N)				

Mixed Hardwoods Swamp



Mixed Hardwoods Swamp



Mixed Hardwoods Swamp

Q. #	AREA E	AREA W	AREA D	BASIN E	BASIN W	BASIN D			
49.1				(Y) N					
49.2				Y (N)					
50.	Y (N)	Y (N)			Y (N)				
51.		(Y) N							
Detailed Data									
52.1.1	Y N } 3	NA							
52.1.2	Y N								
52.2.1	Y (N)								
52.2.2	Y (N)								
53.1	Y N	NA							
53.2	Y N								
54.1	Y N	NA							
54.2	Y N								
55.	Y (N)								
56.				NA	Y N				
57.1	Y N								
57.2	Y N	NA							
57.3	Y N								
57.4	Y N								
58.1	Y N								
58.2	Y N	NA							
58.3	Y N								
58.4	Y N								
59.1				Y N					
59.2				Y N	NA				
59.3				Y N					
60.1						Y N			
60.2				Y N	NA				
60.3				Y N					
61.1	Y N								
61.2	Y N	NA							
62.	Y N	NA							
63.1						Y N			
63.2				NA		Y N			
64.				NA		Y N			
65.	(Y) N								
66.1		Y N				Y N			
66.2		Y N	NA			Y N			
67.1		Y N				Y N			
67.2		Y N	NA			Y N			
68.1	Y N					Y N			
68.2	Y N		NA			Y N			
Derived Responses									
69.1	Y N								
69.2	Y N								
70.1	Y N								
70.2	Y N								
71.1	Y N								
71.2	Y N								
72.1	Y N								
72.2	Y N								
73.1	Y N								
73.2	Y N								
74.1	Y N								
74.2	Y N								
75.1	Y N								
75.2	Y N								

After responses to all possible questions (Form A) have been recorded above, turn to Form B (page 38). You will(as an option) return to this sheet (in Section 2.1.2) to interpret the above responses.

Mixed Hardwoods Swamp

Response Sheet B1

THRESHOLD ANALYSIS: SIGNIFICANCE

This sheet is the appropriate place for recording the responses to the corresponding questions in Form B. Circle Y (yes) or N (no), being careful to note that the order of Y and N below frequently reverses.

General
1.1 N Y
1.2 N Y
1.3 N Y
1.4 N Y
1.5 N Y
1.6 N Y
2. Y N

Recharge
3. Y N
4. Y N
5. Y N
6. Y N
7. Y N
8. Y N
9. Y N
10. N Y

Discharge
11. Y N
12. Y N
13. Y N
14. Y N
15. N Y

Flood Storage
16. Y N
17. Y N
18. Y N
19. Y N
20. Y N
21. Y N
22. N Y

Shoreline Anchoring
23. Y N
24. Y N
25. Y N
26. Y N
27. Y N
28. Y N
29. N Y

Sediment Trapping
30. Y N
31. Y N
32. Y N
33. Y N
34. Y N
35. Y N
36. N Y

Nutrient Retention
37. Y N
38. Y N
39. Y N
40. Y N
41. Y N
42. N Y

Fish Food Chain/ Habitat
43. Y N
44. Y N
45. Y N
46. Y N
47. Y N
48. Y N
49. Y N
50. Y N
51. Y N
52. Y N
53. N Y

Wildlife Habitat
54. Y N
55. Y N
56. Y N
57. Y N
58. Y N
59. Y N
60. N Y

Active Recreation
61. Y N
62. Y N
63. Y N
64. Y N
65. Y N
66. Y N
67. N Y

Passive
68. Y N
69. Y N
70. Y N
71. Y N
72. Y N
73. Y N
74. Y N
75. Y N
76. Y N
77. Y N
78. N Y

Form "A" Comments (Mixed Hardwoods Swamp)

WIA	= Area inside dashed line (Figure 9)
Basin	= WIA
1.1-1.3.1	Swamp is considered to be remnant of old swale systems blocked from original connections by road development. The swamp therefore has no inlet or outlet
5.2	See site map (Figure 9) and definitions for this site
7	Predictor not used
8	Sub-watershed = pine/oak ridges within WIA + narrow band of developed yards, roads, ditches surrounding this site
9	Predictor not used
15	Developed area dominates sub-watershed
23	< 10 cm porous organic over sand
39.6	Road ditches appear to drain into WIA

3.5 MIRE POND FILL STUDY SITE

3.5.1 Qualitative Site Description

Physical description. Most of this site (Figure 10) is composed of historically altered upland areas (nonwetlands) dominated by pines and shrubs. The total area of the site is about 7 ha. The only wetlands associated with this site are a fringe along Mire Pond and two small areas of isolated wetlands near State Route 2126. About one-third of the site has been recently altered through clearing of the understory and filling of wetland fringe up to Mire Pond. This part of the site lies at the southwestern edge adjacent to Mire Pond Scrub/Shrub System Study Site.

Definitions. The WIA consists of the site as outlined by the EPA and as described in the section above. The basin for

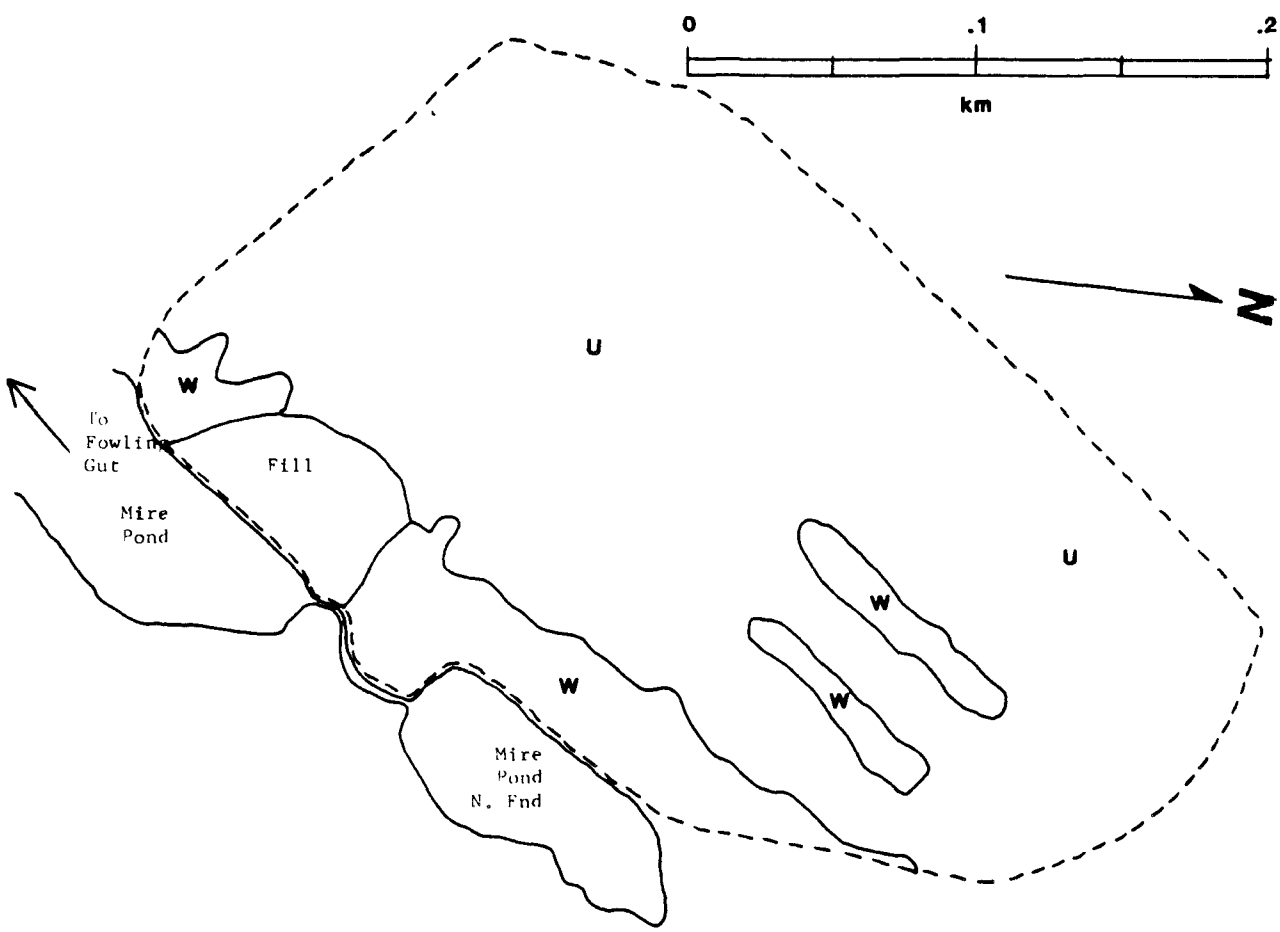


Figure 10. Map of Mire Pond Fill Site WIA showing wetland (w) and upland (u) areas. Major outlet is indicated by arrow that depicts the direction of water movement from the site.

this site includes Mire Pond and Fowling Gut up to the point where it empties into Chincoteague Bay. The sub-watershed for the site consists of the upland pine, emergent fringe marsh,and shrub-dominated areas which immediately surround Mire Pond and Fowling Gut to the exit into Chincoteague Bay.

Qualitative vegetation description. The wetland areas which lie along Mire Pond are dominated by Spartina patens, Distichlis spicata, and some S. alterniflora. The higher parts of this wetland consist of a shrub zone consisting of Myrica, Iva, and some Baccharis. Sections of the wetland lying nearest the study site which have been altered by limited filling are dominated by Phragmites. The upland areas are dominated by pine, small oaks, shrubs such as Myrica and sumac (Rhus sp.), and a variety of less common shrubs.

Wetland classification. The wetlands adjacent to Mire Pond are estuarine emergent and estuarine scrub/shrub, while the two isolated interior wetlands are palustrine scrub/shrub.

Wildlife use. The upland areas appear to be used by passerine birds and a variety of small mammals. The estuarine wetlands and Mire Pond are used seasonally by waterfowl and shorebirds. Mire Pond is probably an important nursery area for fishes because of its connection to the estuary through Fowling Gut. The small palustrine wetlands are probably utilized by small mammals and passerine birds (we made no direct observations in these areas).

Hydrologic functions. During wet periods this site drains from the upland areas down into Mire Pond and through Fowling Gut to Chincoteague Bay. This drainage is in the form of sheet flow and is probably very limited. During dry periods the wetland fringe exchanges limited quantities of water with Mire Pond by tidal action. On the uplands most drainage occurs below the surface and vertically within the site. For these reasons, the site probably has moderate potential for ground-water recharge and nutrient retention, but relatively moderate to low value for flood storage.

Substrate, water salinity. Soils in the upland areas are largely sandy and sandy loams. Soils underlying the wetlands and Mire Pond are sand with a thin layer of surface organic matter. Salinities in Mire Pond probably range seasonally from 10 to 25 ppt.

3.5.2 Adamus and Stockwell Evaluations: Mire Pond Fill Site

Summary Sheet D

This form is the appropriate place for recording the ratings that result from use of the interpretation procedures and keys in Sections 2.1.2, and 2.2.2. As each analysis is completed, enter its rating (high,moderate, or low; or A, B, or C) in the relevant box until all boxes for functions of interest are filled.

Begin by labeling the context of the analysis (pre- or post- construction, with or without mitigation, name of basin and WIA). Then enter the data, using the numbered footnotes to help locate the associated analyses. For the evaluation of each function's Effectiveness, enter whichever rating is higher--That for the basin or that for the WIA. The evaluation of the impact vector is optional.

BASIN _____ WIA _____ PROJECT _____

EVALUATION TIME FRAME (PRE/POST) _____ MITIGATION PLAN # _____

FUNCTION	EFFECTIVENESS[1]	OPPORTUNITY[1]	FUNCTIONAL RATING[2]	SIGNIFICANCE[3]	FUNCTIONAL SIGNIFICANCE[4]
GROUND WATER RECHARGE[5]	low	moderate	low	moderate	low
GROUND WATER DISCHARGE[6]	low		low	high	low
FLOOD STORAGE[7]	high	high	high	moderate	high
SHORELINE ANCHORING[8]	moderate	low	moderate	moderate	moderate
SEDIMENT TRAPPING[9]	moderate	high	high	high	very high
NUTRIENT RETENTION					
LONG-TERM[10]	moderate	high	high	high	very high
SEASONAL[11]	moderate	high	high		very high
FOOD CHAIN SUPPORT					
DOWNSTREAM[12]	moderate		moderate	moderate	moderate
IN-BASIN[13]	moderate		moderate		moderate
FISHERY HABITAT					
WARMWATER[14]	low		low		low
COLDWATER[14]				moderate	
COLDW.RIVERINE[14]					
ANADROMOUS RIV. SPECIES[15] Bl.Fish,Hd. Cl.,Win.Fl.*	moderate		moderate		moderate
WILDLIFE HABITAT					
GENERAL DIVERSITY[16]	moderate		moderate	moderate	moderate
WATERFOWL GP.[17] 1	low summer	low winter	low		low
WATERFOWL GP.[17] 2	low summer	low winter	low	moderate	low
SPECIES[18] Black Duck		low winter			low
SPECIES[19] Common Egret	high		high		high
SPECIES[18]					
ACTIVE RECREATION[19]					
SWIMMING	low		low		low
BOAT LAUNCHING	low		low		low
POWER BOATING	low		low	moderate	low
CANOEING	moderate		moderate		moderate
SAILING	low		low		low
PASSIVE RECREATION AND HERITAGE[20]				moderate	moderate
IMPACT VECTOR RATING[21]					

FOOTNOTES

These entries will be based on analyses in the following parts of Volume II (numbers correspond to footnotes above):

[1]-Forms A, A1 (p. 6, 51); [2]-Section 2.1.2.2. (p. 97); [3]-Forms B, B1 (p. 38, 54); [4]-Section 2.1.2.2. (p. 97); [5]-Interpretation key in Section 2.1.2.1. p. 57; [6]-p. 59; [7]-p. 60; [8]-p. 62; [9]-p. 64; [10]-p. 67; [11]-p. 67; [12]-p. 69; [13]-p. 71; [14]-p. 73; [15]-p. 75; [16]-p. 79; [17]-p. 80; [18]-p. 84; [19]-p. 91; [20]-p. 92; [21]-p. 93.

* Blue Fish, Hard Clam, Winter Flounder

Response Sheet A1

THRESHOLD ANALYSIS: FUNCTIONAL OPPORTUNITY AND EFFECTIVENESS

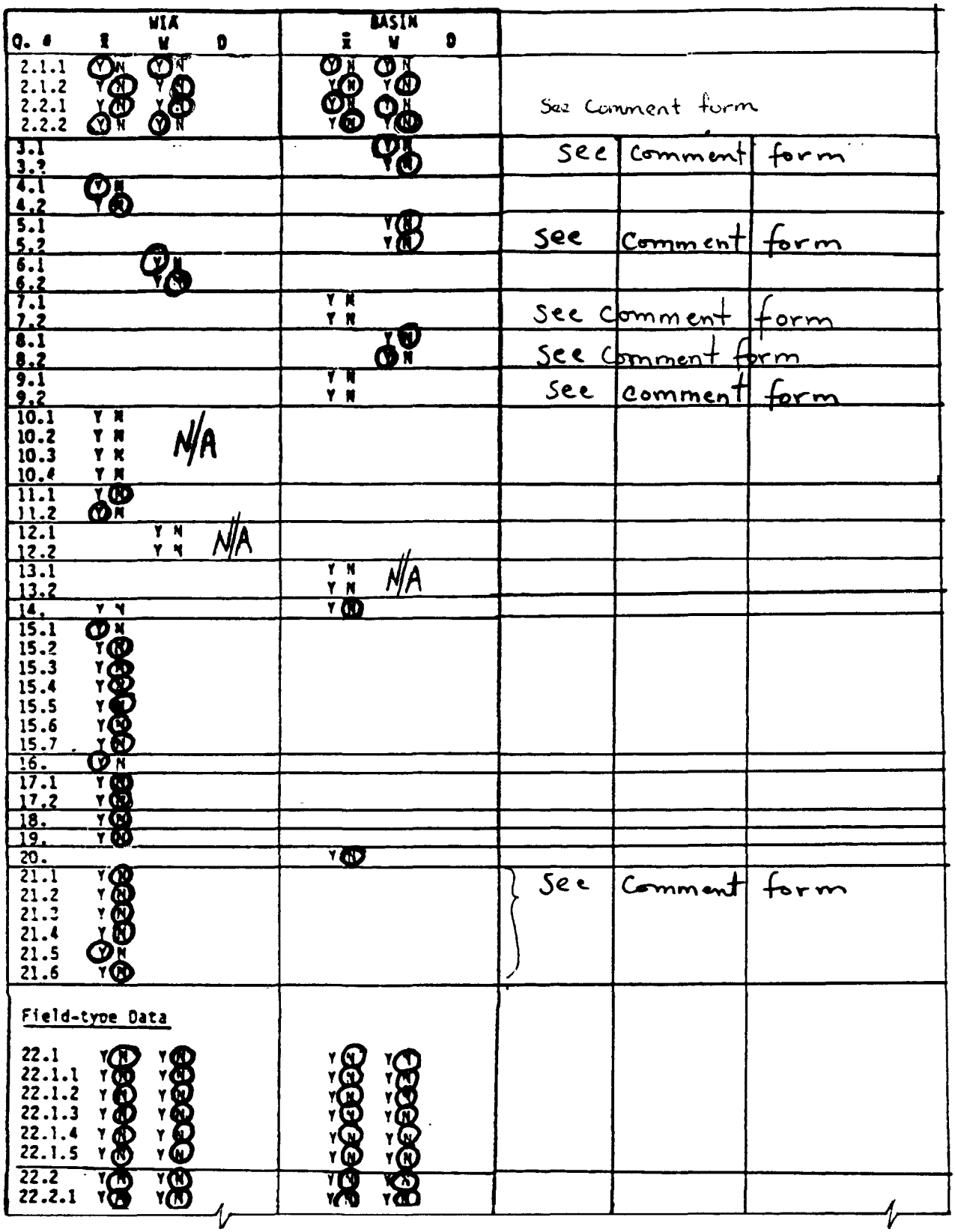
This sheet is the appropriate place for recording the responses to corresponding questions in Form A. A "yes" (Y) or "no" (N) response must be circled for all parts of each question, even when the response seems obvious. This response sheet has two major columns--"WIA" and "BASIN", and within each of these, three subcolumns entitled "$\bar{X}$", "W", and "D", which address, when relevent, the seasonal changes in some of the predictors, as follows:

> $\bar{X}$ column responses are those addressing either (a) the average annual condition, or (b) the condition intermediate between the wettest and driest annual conditions (e.g., late June in most Prairie pothole wetlands), or (c) the condition of maximum annual standing crop of wetland plants, or (d) if tidal, the average daily mid-tide condition.
>
> W column responses are those addressing what the area would look like (a) during the wettest time of an average year, or (b) if the area is tidal, what it would look like during an average daily high tide (flooded) condition.
>
> D column responses are those addressing what the area would look like during either the driest time of the year (questions pertaining to hydrology) or if the question pertains to vegetation, then during the dormant time of the year. If the area is tidal, "D" refers to its daily low tide (exposed) condition.

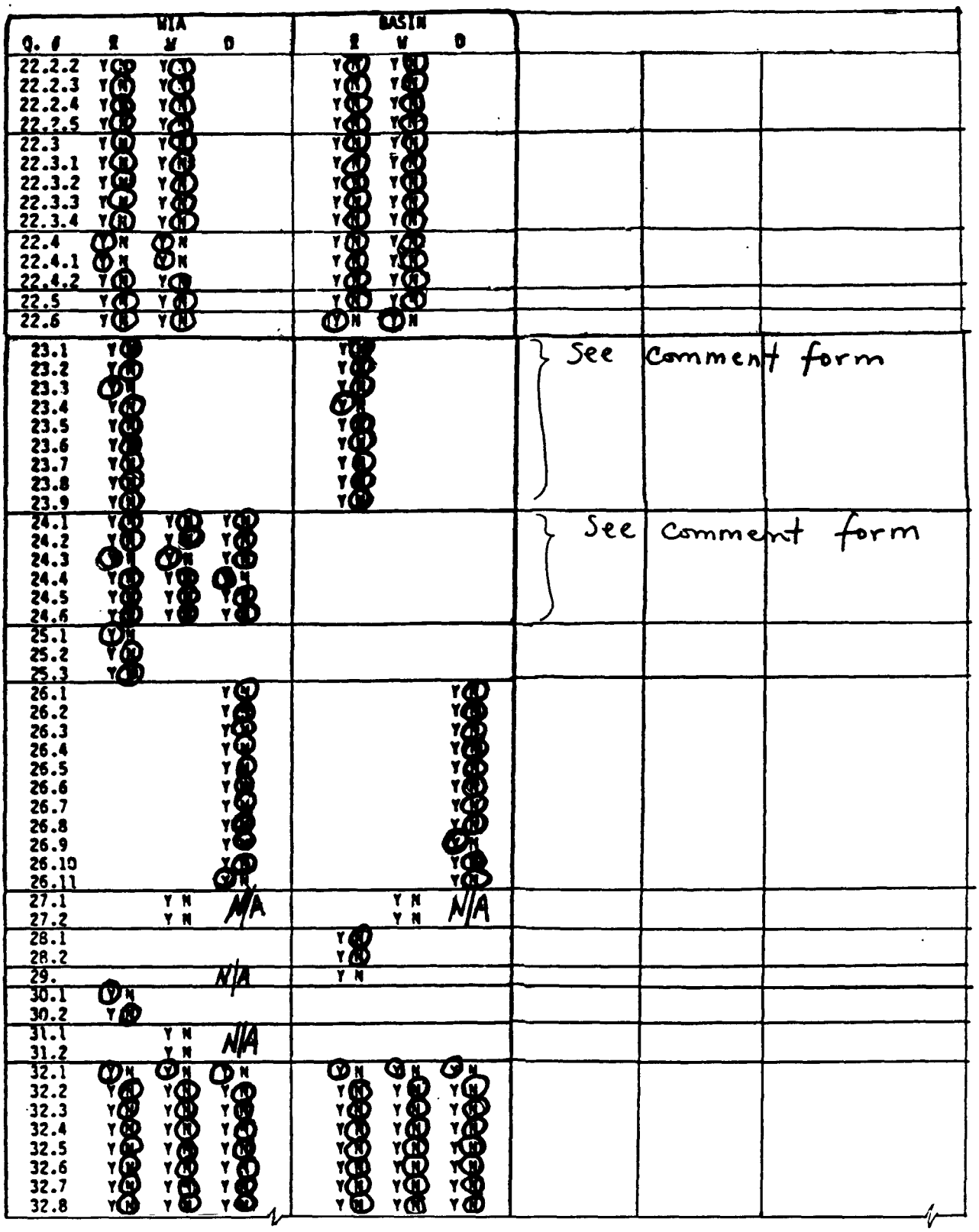
For example, question 2.1.1 should first be asked and answered in the context of the WIA's (wetland impact area's) average condition, then in terms of its wettest condition, then the basin's average condition, and finally the basin's wettest condition. This should then be repeated for question 2.1.2. Because no Y/N choice is given in either "D" column, the area's dry or dormant condition need not be evaluated for this question. Similarly, some questions will require responses only for the WIA or basin, but not both.

Q. #	WIA $\bar{X}$	WIA W	WIA D	BASIN $\bar{X}$	BASIN W	BASIN D	
Office-type Data							
1.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
1.2	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
1.3	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	
1.3.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	

Mire Pond Fill Site



Mire Pond Fill Site



Mire Pond Fill Site

O. #	WIA X	WIA W	WIA D	BASIN X	BASIN W	BASIN D	
33.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
33.2	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	
33.3	Y (N)	Y (N)	Y (N)	(Y) N	(Y) N	(Y) N	
33.4	Y (N)	Y (N)	Y (N)	(Y) N	(Y) N	(Y) N	
33.5	Y (N)	Y (N)	Y (N)	(Y) N	(Y) N	(Y) N	
33.6	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
33.7	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
33.8	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
34.1	(Y) N	(Y) N	(Y) N	Y (N)	Y (N)	Y (N)	
34.2	Y (N)	Y (N)	Y (N)	(Y) N	(Y) N	(Y) N	
34.3	Y (N)	Y (N)	Y (N)	(Y) N	(Y) N	(Y) N	
34.4	Y (N)	Y (N)	Y (N)	(Y) N	(Y) N	(Y) N	
34.5	Y (N)	Y (N)	Y (N)	(Y) N	(Y) N	(Y) N	
34.6	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
34.7	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
34.8	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
35.1	(Y) N	(Y) N					
35.2.1				Y (N)			
35.2.2				Y (N)			
35.2.3				Y (N)			
36.	(Y) N			(Y) N			see comment form
37.1		Y (N)					
37.2			Y (N)				
38.1				(Y) N	(Y) N	(Y) N	
38.2	Y N	Y N	N/A				See comment form
39.1	Y N	N/A					
39.2	Y N	N/A					
39.3	Y (N)						
39.4	Y (N)						
39.5	(Y) N						see comment form
39.6				(Y) N			see comment form
40.	Y N	Y N	N/A				
41.1				(Y) N	(Y) N	(Y) N	
41.1.1				(Y) N	(Y) N	(Y) N	
41.1.2				Y (N)	Y (N)	Y (N)	
41.1.3				Y (N)	Y (N)	Y (N)	
41.2				Y (N)	Y (N)	Y (N)	
41.2.1				Y (N)	Y (N)	Y (N)	
41.2.2				Y (N)	Y (N)	Y (N)	
41.2.3				Y (N)	Y (N)	Y (N)	
41.3				Y (N)	Y (N)	Y (N)	
41.3.1				Y (N)	Y (N)	Y (N)	
41.3.2				Y (N)	Y (N)	Y (N)	
41.3.3				Y (N)	Y (N)	Y (N)	
41.4				Y (N)	Y (N)	Y (N)	
42.1	(Y) N	(Y) N	(Y) N				
42.2	Y (N)	Y (N)	Y (N)				
42.3	Y (N)	Y (N)	Y (N)				
43.	(Y) N	(Y) N	(Y) N	Y (N)	Y (N)		
44.1				Y (N)			
44.2				(Y) N	(Y) N		
45.1	Y (N)						
45.2	(Y) N						
46.1	Y (N)						
46.2	Y N	N/A					
46.3	(Y) N						
46.4	Y (N)						
47.1	Y (N)						
47.2	Y (N)						
48.1	Y (N)	Y (N)					
48.2	Y (N)	Y (N)					

Mire Pond Fill Site

Q. #	MIA E	MIA W	MIA D	BASIN E	BASIN W	BASIN D	
49.1				Y (N)			
49.2				Y (N)			
50.	(Y) N	(Y) N	(Y) N				
51.		(Y) N					
Detailed Data							
52.1.1	Y N		N/A				See comment form
52.1.2	Y N						
52.2.1	(Y) N						
52.2.2	Y (N)						
53.1	Y N		N/A				
53.2	Y N						
54.1	Y N		N/A				
54.2	Y N						
55.	Y (N)						
56.				Y N		N/A	See comment form
57.1	(Y) N						
57.2	Y (N)						
57.3	Y (N)						
57.4	Y (N)						
58.1	Y N		N/A				See comment form
58.2	Y N						
58.3	Y N						
58.4	Y N						
59.1			N/A	Y N			See Comment form
59.2				Y N			
59.3				Y N			
60.1			N/A			Y N	See Comment form
60.2				Y N			
60.3				Y N			
61.1	Y N		N/A				See comment form
61.2	Y N						
62.	Y N		N/A				
63.1						Y N	
63.2				N/A		Y N	
64.				N/A		Y N	See Comment form
65.	(Y) N						
66.1		Y N				Y N	See comment form
66.2		Y N	N/A			Y N	
67.1		Y N				Y N	See comment form
67.2		Y N	N/A			Y N	
68.1	Y N					Y N	See Comment form
68.2	Y N		N/A			Y N	
Derived Responses							
69.1	Y N						
69.2	Y N						
70.1	Y N						
70.2	Y N						
71.1	Y N						
71.2	Y N						
72.1	Y N						
72.2	Y N						
73.1	Y N						
73.2	Y N						
74.1	Y N						
74.2	Y N						
75.1	Y N						
75.2	Y N						

After responses to all possible questions (Form A) have been recorded above, turn to Form B (page 38). You will(as an option) return to this sheet (in Section 2.1.2) to interpret the above responses.

Mire Pond Fill Site

Response Sheet B1

THRESHOLD ANALYSIS: SIGNIFICANCE

This sheet is the appropriate place for recording the responses to the corresponding questions in Form B. Circle Y (yes) or N (no), being careful to note that the order of Y and N below frequently reverses.

General

1.1 (Y) Y
1.2 (N) Y
1.3 (N) Y
1.4 N (Y)
1.5 (N) Y
1.6 N (Y)
2. Y (N)

} See Comment form

Recharge

3. Y (N)
4. Y (N)
5. Y (N)
6. Y (N)
7. (Y) N
8. Y (N)
9. (N) N
10. (Y) Y

See comment form

Discharge

11. Y (N)
12. (Y) N
13. (Y) N
14. (Y) N
15. (N) Y

} See Comment form

Flood Storage

16. (Y) N
17. Y (N)
18. (Y) N
19. (Y) N
20. (Y) N
21. (Y) N
22. (N) Y

See comment form
see comment form

Shoreline Anchoring

23. Y (N)
24. (Y) N
25. (Y) N
26. Y (N)
27. Y (N)
28. Y (N)
29. (N) Y

Sediment Trapping

30. Y (N)
31. Y (N)
32. (Y) N
33. (Y) N
34. (Y) N
35. (Y) N
36. (N) Y

Nutrient Retention

37. Y N
38. Y (N)
39. (Y) N
40. (Y) N
41. (Y) N
42. (N) Y

Fish Food Chain/ Habitat

43. Y (N)
44. (Y) N
45. (Y) N
46. (Y) N
47. Y (N)
48. (Y) N
49. Y (N)
50. Y (N)
51. Y (N)
52. Y (N)
53. (N) Y

} See comment form

Wildlife Habitat

54. Y (N)
55. Y (N)
56. (Y) N
57. (Y) N
58. Y (N)
59. Y (N)
60. (N) Y

Active Recreation

61. Y (N)
62. (Y) N
63. Y (N)
64. (Y) N
65. Y (N)
66. Y (N)
67. (N) Y

See comment form

Passive

68. Y (N)
69. Y (N)
70. Y (N)
71. Y (N)
72. Y (N)
73. Y (N)
74. Y (N)
75. (Y) N
76. Y (N)
77. Y (N)
78. N (Y)

See comment form

Form "A" Comments (Mire Pond Fill Site)

2.2	Basin's outlet is constricted where the Fowling Gut Pond enters the dredged portion of Fowling Gut (and overly restricted culvert at county road 2112 and 2114)
3.1-3.2	Sinuous because "basin" includes all of Fowling Gut below Mire Pond
5.2	See site map (Figure 10) and definitions for this site
7	Predictor not used
8	Sub-watershed = upland surrounding Mire Pond and Fowling Gut to Chincoteague Bay
9	Predictor not used
21	Refers strictly to the wetlands in WIA (see Methods section)
23.1-23.9	Sediments are sand with shallow layer of porous organic
24	This is an estimate because we lack salinity measurements during droughts
36	No measurements; we have estimated
38	Culvert at county road 2112 and 2114 causes flow blockage at outlet
39.5	Culverts at roads 2112 and 2114 probably restrict access by estuarine fish to some extent
39.6	Significant contribution of freshwater comes from storm water runoff from developed areas (through Fowling Gut) to our basin
52.1	No measurements
52.2	Refers to only wetland areas; <u>Spartina</u> present
56	No data

58	No data	61	No data
59	No data	64	Estimate. No data
60	No data	66	Tidal

67 No data

68 No data

Form "B" Comments (Mire Pond Fill Site, Mire Pond Scrub-Shrub-Estuarine Portion and Mire Pond Scrub-Shrub-Palustrine Portion)

1 See comments for Chincoteague Ridge/Swale and High School East Sites (there probably will be development in upland areas of the site)

2 See comments for Ridge/Swales and High School East sites.

9 Palustrine portion of Mire Pond Scrub/Shrub site is viewed as a significant recharge area

12 Groundwater discharge from Mire Pond fill and Mire Pond Scrub-Shrub sites probably influences salinity in Fowling Gut and therefore affects sport and commercial fishes in Fowling Gut

13 Discharge from Mire Pond fill and Mire Pond Scrub-Shrub sites probably dilutes septic tank outflow

19 Flooding enhances access by fishes and waterfowl

44 Mire Pond fill and estuarine portion of Mire Pond Scrub-Shrub sites contain brackish marshes with estuarine connection--a prime nursery area

45 Mire Pond fill and estuarine portion of Mire Pond Scrub-Shrub have anadromous fish--coastal mid-Atlantic

67 Mire Pond fill and estuarine portion of Mire Pond Scrub-Shrub have impacts upon Fowling Gut which affect active recreation, i.e., fishing, crabbing

21 Estuarine Portion of Mire Pond Scrub-Shrub site flooded daily, not as valuable for flood storage and desynchronization

71 In palustrine portion of Mire Pond Scrub-Shrub sites freshwater swale wetlands considered relatively rare and of scientific value

3.6 MIRE POND SCRUB/SHRUB SYSTEM STUDY SITE

3.6.1 Qualitative Site Description

Physical description. The site (Figure 11) covers 5 ha and is complex because it consists of a number of different types of wetlands and some upland areas. For this reason we have chosen to divide the site into two sections (estuarine and palustrine). The estuarine portion consists primarily of the estuarine

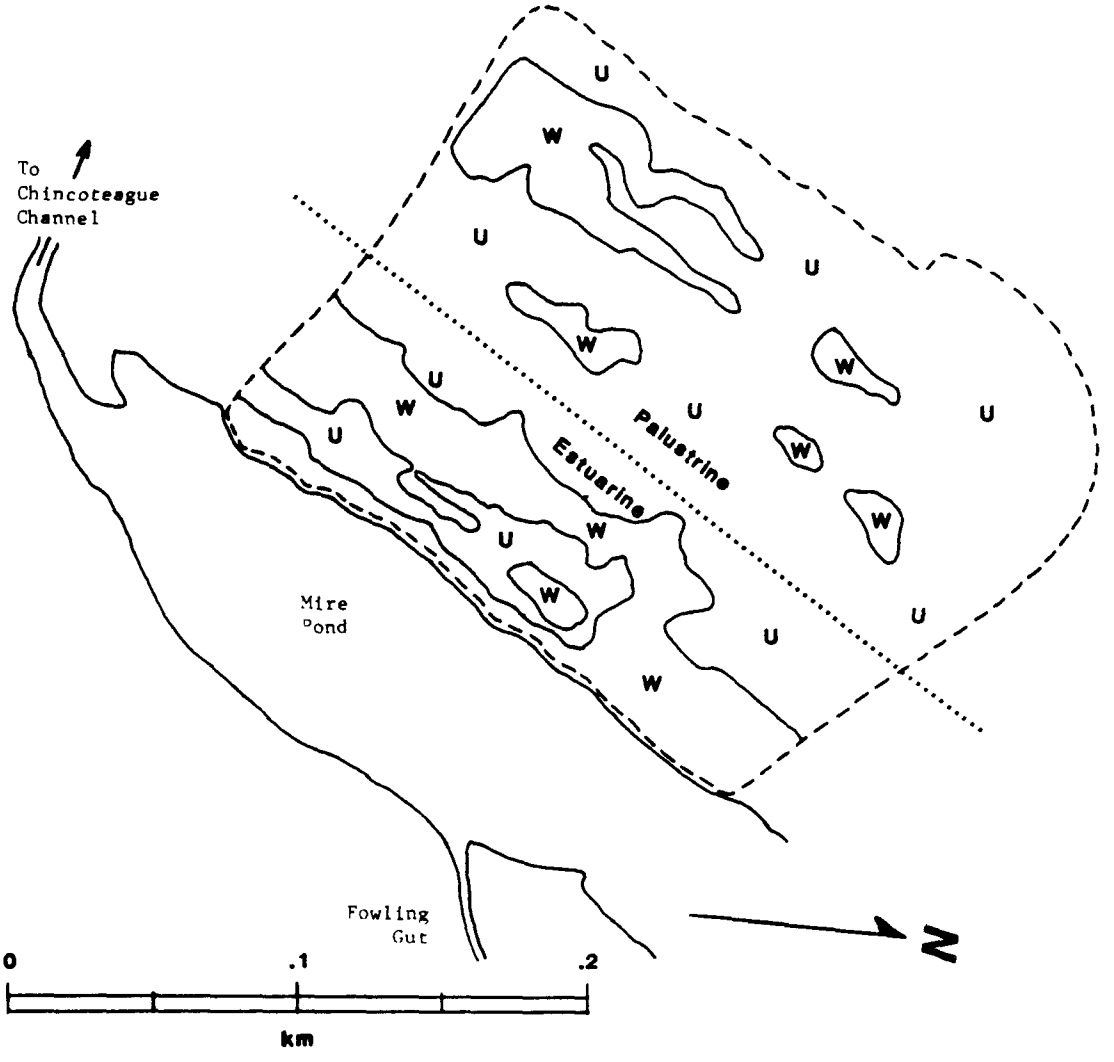


Figure 11. Map of Mire Pond Scrub/Shrub System WIA showing wetland (w) and upland (u) areas. Major outlet is indicated by arrow that depicts the direction of water movement from the site. Estuarine and palustrine portions of the WIA are separated by dotted line.

wetlands lying along Mire Pond. The palustrine portion consists of extensive, but scattered freshwater emergent wetlands and associated scrub/shrub wetlands. The two sections of this site have been divided along the line of the pine ridge which runs from the northeast to the southwest down the center of the site.

Definitions. The WIA consists of the site as outlined by EPA. The basin for the estuarine site includes Mire Pond and Fowling Gut to Chincoteague Bay. At the palustrine site the basin equals the wetlands because they drain internally under all conditions but the most extreme storms. The sub-watershed for both sites consists of the upland pine-dominated ridges within each area and for the estuarine site, a fringe of developed land surrounding Fowling Gut.

Qualitative vegetation description. Vegetation on these two sites is structurally complex. The upland areas are dominated by pine forest, small oaks, and shrubs such as Myrica. The estuarine wetlands are dominated by Spartina patens, Distichlis, Hibiscus, a small amount of S. alterniflora, and some Kosteletzkya virginica. The palustrine, emergent wetlands are dominated by Hibiscus, Rosa, Rumex, Scirpus spp., Polygonum, Typha, and Kosteletzkya. The palustrine scrub/shrub wetlands are dominated by willows, Sumac, Myrica, and Phragmites (adjacent to settled areas to the west).

Wetlands classification. The wetlands associated with the estuarine site are estuarine emergent wetlands with scattered areas of estuarine scrub/shrub. The palustrine site has both palustrine emergent and palustrine scrub/shrub wetlands.

Substrate, water salinity. Substrates in all of these areas are primarily sand overlain by a thin layer of organic material. As at other sites on Chincoteague, the ridges have more sandy loam. Salinities in the palustrine wetlands are generally less than 1 or 2 ppt, but salinities in Mire Pond range between 10 and 25 ppt seasonally.

Wildlife use. The estuarine wetland areas are utilized by the same variety of waterfowl, shorebirds, and fishes as at the estuarine portion of the adjacent Mire Pond fill site. The palustrine emergent wetlands appear to be used by waterfowl seasonally. The upland areas and palustrine scrub/shrub wetlands are used by a variety of small mammals and passerine birds. The estuarine system consisting of Mire Pond and adjacent wetlands clearly serves as an important nursery area for fishery organisms.

Hydrologic functions. Drainage from the estuarine portion of the site occurs by limited tidal exchange with Mire Pond during dry and average rainfall periods. During wet periods drainage occurs by sheet flow into the pond and through Fowling

Gut toward Chincoteague Bay. During extreme events some surface exchange of water probably occurs with the palustrine site. Otherwise drainage from the palustrine site is solely internal, either flowing vertically into the subsurface sand or collecting in the two or three lower-lying palustrine emergent wetlands which lie in the center of the site.

Because of these drainage characteristics, both portions of the site should have high potential for flood storage and nutrient retention. The palustrine portion because of its lack of an outlet should have a high ground-water recharge potential while that of the estuarine portion of the site is probably low to moderate.

3.6.2 Adamus and Stockwell Evaluations: Mire Pond Scrub-Shrub System - Estuarine Portion

Summary Sheet D

This form is the appropriate place for recording the ratings that result from use of the interpretation procedures and keys in Sections 2.1.2, and 2.2.2. As each analysis is completed, enter its rating (high,moderate, or low; or A, B, or C) in the relevant box until all boxes for functions of interest are filled.

Begin by labeling the context of the analysis (pre- or post- construction, with or without mitigation, name of basin and WIA). Then enter the data, using the numbered footnotes to help locate the associated analyses. For the evaluation of each function's Effectiveness, enter whichever rating is higher--That for the basin or that for the WIA. The evaluation of the impact vector is optional.

BASIN _____ WIA _____ PROJECT _____

EVALUATION TIME FRAME (PRE/POST) _____ MITIGATION PLAN # _____

FUNCTION	EFFECTIVENESS[1]	OPPORTUNITY[1]	FUNCTIONAL RATING[3]	SIGNIFICANCE[3]	FUNCTIONAL SIGNIFICANCE[4]
GROUND WATER RECHARGE[5]	low	moderate	low	moderate	low
GROUND WATER DISCHARGE[6]	low		low	high	low
FLOOD STORAGE[7]	high	high	high	moderate	high
SHORELINE ANCHORING[8]	moderate	low	moderate	moderate	moderate
SEDIMENT TRAPPING[9]	moderate	high	high	high	very high
NUTRIENT RETENTION					
LONG-TERM[10]	moderate	high	high	high	very high
SEASONAL[11]	moderate	high	high		very high
FOOD CHAIN SUPPORT					
DOWNSTREAM[12]	moderate		moderate	moderate	moderate
IN-BASIN[13]	moderate		moderate		moderate
FISHERY HABITAT					
WARMWATER[14]	low		low		low
COLDWATER[15]				moderate	
COLDW.RIVERINE[16]					
ANADROMOUS RIV. SPECIES[17] Bl.Fish,Hd. Cl.,Win.Fl.*	moderate		moderate		moderate
WILDLIFE HABITAT					
GENERAL DIVERSITY[18]	moderate		moderate		moderate
WATERFOWL GP.[19] 1	low summer	low winter	low		low
WATERFOWL GP.[19] 2	low summer	low winter	low	moderate	low
SPECIES[20] Black Duck		low winter			low
SPECIES[20] Common Egret	high		high		high
SPECIES[20]					
ACTIVE RECREATION[21]					
SWIMMING	low		low		low
BOAT LAUNCHING	low		low		low
POWER BOATING	low		low	moderate	low
CANOEING	moderate		moderate		moderate
SAILING	low		low		low
PASSIVE RECREATION AND HERITAGE[22]				moderate	moderate
IMPACT VECTOR RATING[23]					

FOOTNOTES

These entries will be based on analyses in the following parts of Volume II (numbers correspond to footnotes above):

[1]-Forms A, A1 (p. 6, 51); [2]-Section 2.1.2.2. (p. 97); [3]-Forms B, B1 (p. 38, 54); [4]-Section 2.1.2.2. (p. 97); [5]-Interpretation key in Section 2.1.2.1. p. 57; [6]-p. 59; [7]-p. 60; [8]-p. 62; [9]-p. 64; [10]-p. 67; [11]-p. 67; [12]-p. 69; [13]-p. 71; [14]-p. 73; [15]-p. 75; [16]-p. 79; [17]-p. 80; [18]-p. 84; [19]-p. 91; [20]-p. 92; [21]-p. 93.

* Blue Fish, Hard Clam, Winter Flounder

Response Sheet A1

THRESHOLD ANALYSIS: FUNCTIONAL OPPORTUNITY AND EFFECTIVENESS

This sheet is the appropriate place for recording the responses to corresponding questions in Form A. A "yes" (Y) or "no" (N) response must be circled for all parts of each question, even when the response seems obvious. This response sheet has two major columns--"WIA" and "BASIN", and within each of these, three subcolumns entitled "X", "W", and "D", which address, when relevent, the seasonal changes in some of the predictors, as follows:

X column responses are those addressing either (a) the average annual condition, or (b) the condition intermediate between the wettest and driest annual conditions (e.g., late June in most Prairie pothole wetlands), or (c) the condition of maximum annual standing crop of wetland plants, or (d) if tidal, the average daily mid-tide condition.

W column responses are those addressing what the area would look like (a) during the wettest time of an average year, or (b) if the area is tidal, what it would look like during an average daily high tide (flooded) condition.

D column responses are those addressing what the area would look like during either the driest time of the year (questions pertaining to hydrology) or if the question pertains to vegetation, then during the dormant time of the year. If the area is tidal, "D" refers to its daily low tide (exposed) condition.

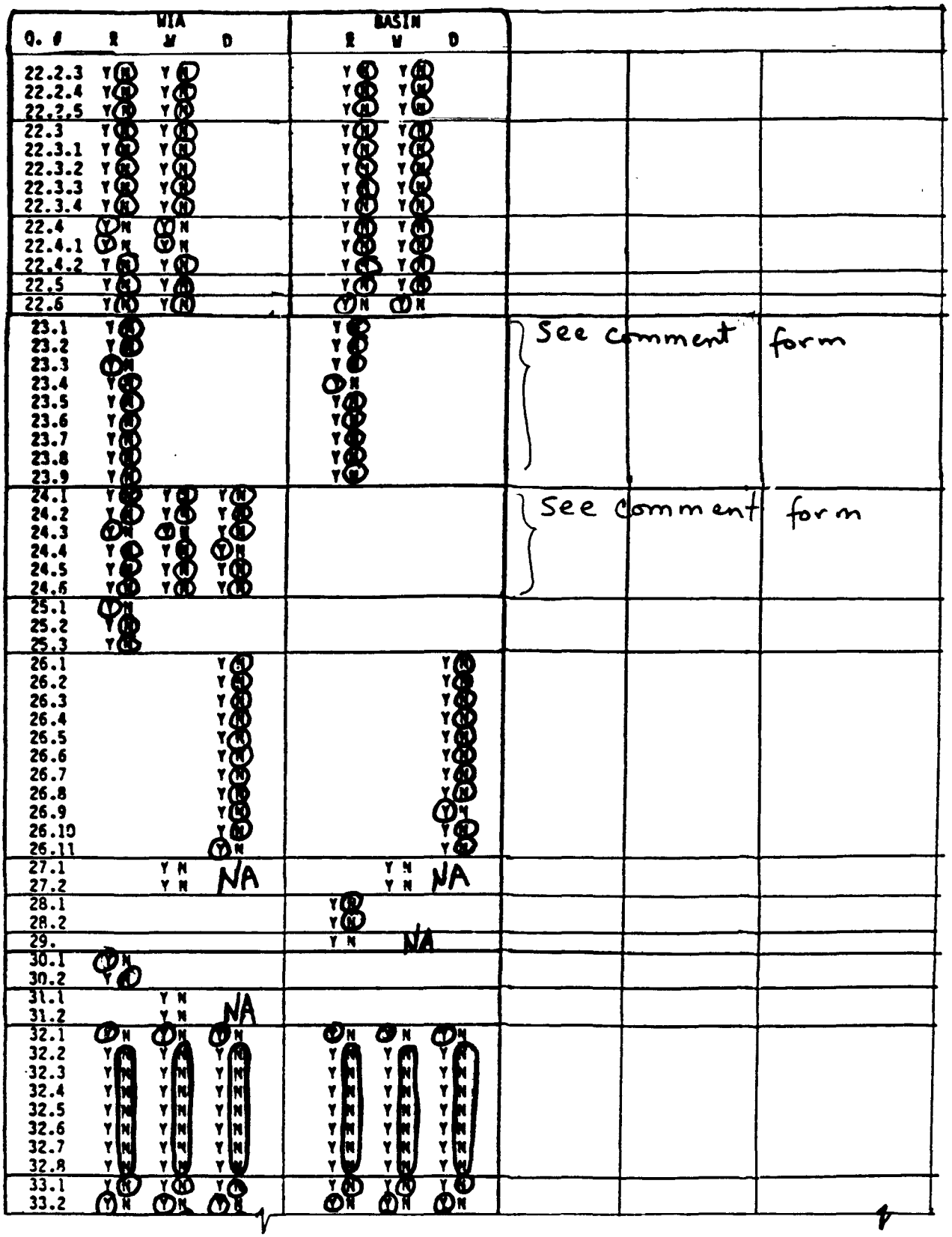
For example, question 2.1.1 should first be asked and answered in the context of the WIA's (wetland impact area's) average condition, then in terms of its wettest condition, then the basin's average condition, and finally the basin's wettest condition. This should then be repeated for question 2.1.2. Because no Y/N choice is given in either "D" column, the area's dry or dormant condition need not be evaluated for this question. Similarly, some questions will require responses only for the WIA or basin, but not both.

Q. #	WIA X	WIA W	WIA D	BASIN X	BASIN W	BASIN D
Office-type Data						
1.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)
1.2	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)
1.3	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N
1.3.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)

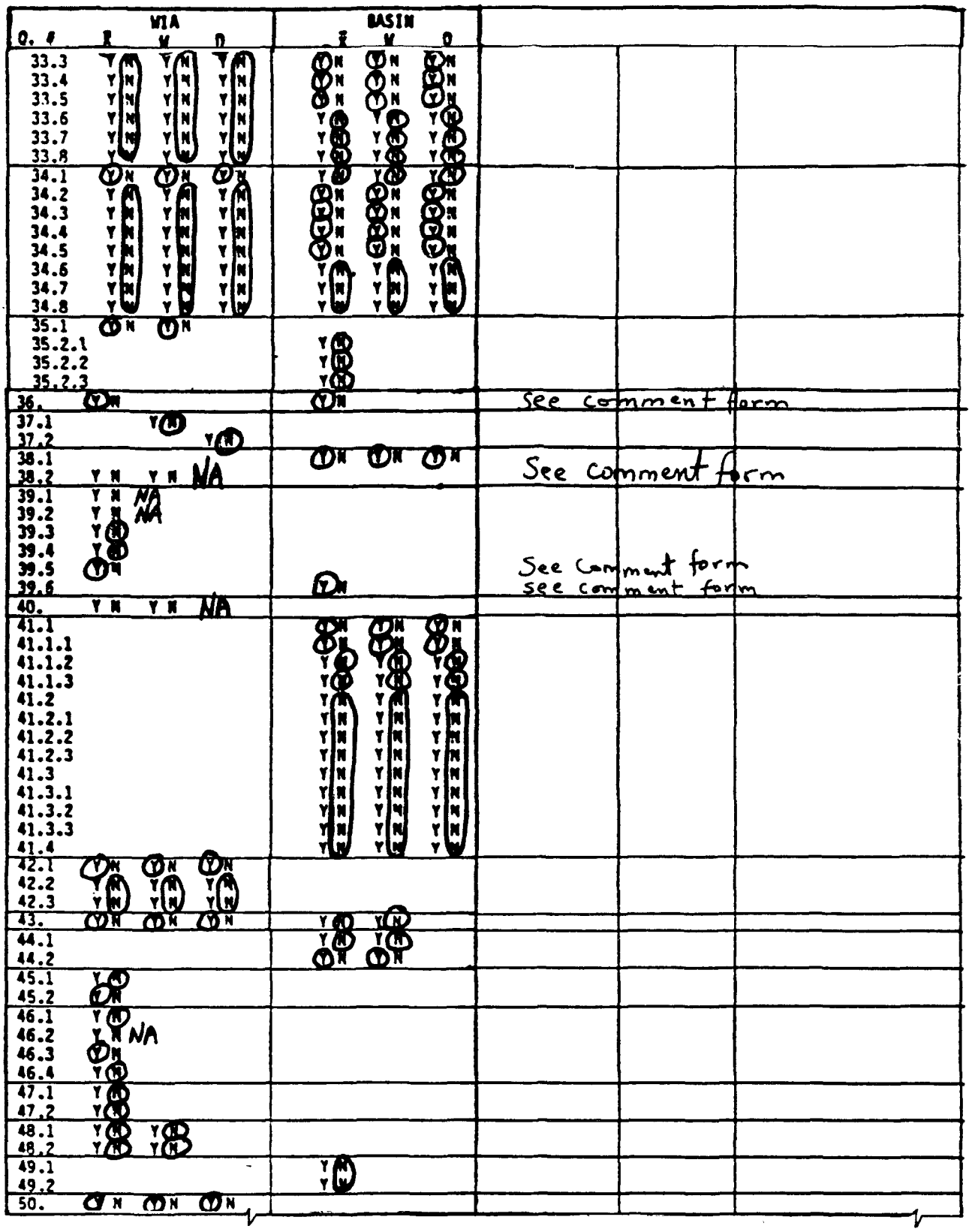
Mire Pond Scrub-Shrub System - Estuarine Portion

Q. #	MIX E	MIX W	MIX D	BASIN E	BASIN W	BASIN D	
2.1.1	N	N		N	N		
2.1.2	Y	Y		Y	Y		
2.2.1	Y	Y		N	N		
2.2.2	N	N		Y	Y		See comment form
3.1							
3.2							See comment form
4.1	N						
4.2	Y						
5.1				Y	N		
5.2				Y	N		See comment form
6.1		Y					
6.2		Y					
7.1				Y	N		
7.2				Y	N		See comment form
8.1				Y			
8.2					N		See comment form
9.1							
9.2				Y			See comment form
10.1	Y	N					
10.2	Y	N					
10.3	Y	N	NA				
10.4	Y	N					
11.1	Y						
11.2		N					
12.1		Y	N				
12.2		Y	N NA				
13.1				Y	N		
13.2				Y	N	NA	
14.	Y			Y	N		
15.1		N					
15.2	Y						
15.3	Y						
15.4	Y						
15.5	Y						
15.6	Y						
15.7	Y						
16.		N					
17.1	Y						
17.2	Y						
18.	Y						
19.	Y						
20.				Y	N		
21.1	Y						
21.2	Y						
21.3	Y						
21.4	Y						
21.5		N					
21.6	Y						See comment form
Field-type Data							
22.1	Y	Y		Y	Y		
22.1.1	Y	Y		Y	Y		
22.1.2	Y	Y		Y	Y		
22.1.3	Y	Y		Y	Y		
22.1.4	Y	Y		Y	Y		
22.1.5	Y	Y		Y	Y		
22.2	Y	Y		Y	Y		
22.2.1	Y	Y		Y	Y		
22.2.2	Y	Y		Y	Y		

Mire Pond Scrub-shrub System - Estuarine Portion



Mire Pond Scrub-Shrub System - Estuarine Portion



Mire Pond Scrub-Shrub System - Estuarine Portion

Q. #	WIA E	WIA W	WIA D	BASIN E	BASIN W	BASIN D			
51.		(Y) N							
Detailed Data									
52.1.1	Y N	NA					No Measurements		
52.1.2	Y N	NA							
52.2.1	(Y) N								
52.2.2	Y (N)								
53.1	Y N						No Measurements		
53.2	Y N	NA							
54.1	Y N						No Measurements		
54.2	Y N	NA							
55.	Y (N)								
56.				Y N	NA		No measurements		
57.1	Y N								
57.2	Y N								
57.3	Y N	NA							
57.4	Y N								
58.1	Y N						No measurements		
58.2	Y N								
58.3	Y N	NA							
58.4	Y N								
59.1				Y N			No measurements		
59.2				Y N	NA				
59.3				Y N					
60.1						Y N NA	No Measurements		
60.2				Y N					
60.3				Y N	NA				
61.1	Y N						No Measurements		
61.2	Y N	NA							
62.	Y N	NA							
63.1						Y N			
63.2				NA		Y N			
64.				NA		Y N	NO Measurements		
65.	(Y) N								
66.1		Y N		NA		Y N	No Measurements		
66.2		Y N	NA			Y N			
67.1		Y N		NA		Y N	No Measurements		
67.2		Y N	NA			Y N			
68.1	Y N					Y N	No Measurements		
68.2	Y N		NA			Y N			
Derived Responses									
69.1	Y N								
69.2	Y N								
70.1	Y N								
70.2	Y N								
71.1	Y N								
71.2	Y N								
72.1	Y N								
72.2	Y N								
73.1	Y N								
73.2	Y N								
74.1	Y N								
74.2	Y N								
75.1	Y N								
75.2	Y N								

After responses to all possible questions (Form A) have been recorded above, turn to Form B (page 38). You will(as an option) return to this sheet (in Section 2.1.2) to interpret the above responses.

Response Sheet B1

THRESHOLD ANALYSIS: SIGNIFICANCE

This sheet is the appropriate place for recording the responses to the corresponding questions in Form B. Circle Y (yes) or N (no), being careful to note that the order of Y and N below frequently reverses.

General

1.1 (N) Y
1.2 (N) Y
1.3 (N) Y — See comments for Chincoteague Ridge/Swales
1.4 (N) Y
1.5 (N) Y
1.6 (N) Y
2. Y (N) — See comments for Chincoteague Ridge/Swales

Recharge

3. Y (N)
4. Y (N)
5. Y (N)
6. Y (N)
7. (Y) N
8. Y (N)
9. Y (N)
10. (N) Y

Discharge

11. Y (N)
12. (Y) N — See comments for Mire Pond Fill
13. (Y) N — See comments for Mire Pond Fill
14. (Y) N
15. (N) Y

Flood Storage

16. (Y) N
17. Y (N)
18. (Y) N
19. (Y) N — See comments for Mire Pond Fill
20. (Y) N
21. Y (N) — See Comments for Mire Pond Fill
22. (N) Y

Shoreline Anchoring

23. Y (N)
24. Y (N)
25. Y (N)
26. Y (N)
27. Y (N)
28. Y (N)
29. (N) Y

Sediment Trapping

30. Y (N)
31. Y (N)
32. (Y) N
33. (Y) N
34. (Y) N
35. (Y) N
36. (N) Y

Nutrient Retention

37. Y N
38. Y (N)
39. (Y) N
40. (Y) N
41. (Y) N
42. (N) Y

Fish Food Chain/ Habitat

43. Y (N)
44. (Y) N — See Comments for Mire Pond Fill
45. (Y) N — See Comments for Mire Pond Fill
46. (Y) N
47. Y (N)
48. (Y) N
49. Y (N)
50. Y (N)
51. Y (N)
52. Y (N)
53. (N) Y

Wildlife Habitat

54. Y (N)
55. Y (N)
56. (Y) N
57. (Y) N
58. Y (N)
59. Y (N)
60. (N) Y

Active Recreation

61. Y (N)
62. (Y) N
63. Y (N)
64. (Y) N
65. Y (N)
66. Y (N)
67. (N) Y — See Comments for Mire Pond Fill

Passive

68. Y (N)
69. Y (N)
70. Y (N)
71. Y (N)
72. Y (N)
73. Y (N)
74. Y (N)
75. (Y) N
76. Y (N)
77. Y (N)
78. N (Y)

Form "A" Comments (Mire Pond Scrub-Shrub - Estuarine Portion)

2.2	Basin's outlet is constricted where Mire Pond joins the dredged portion of Fowling Gut (and overly restricted culvert at county roads 2112 and 2114) Refers only to wetland area; Spartina present
3.1-3.2	Sinuous because "basin" includes all of Fowling Gut
5.2	See site map (Figure 11) and definitions for this site
7	Predictor not used
8	Sub-watershed = upland adjacent to and surrounding Mire Pond and Fowling Gut to Chincoteague Bay
9	Predictor not used
21	Refers strictly to the wetlands in WIA (see Methods section)
23.1-23.9	Sediments are sand with shallow layer of porous organic
24	This is an estimate because we lack salinity measurements during droughts
36	No measurements; we have estimated
38	Culvert at county road 2112 and 2114 causes flow blockage at outlet
39.5	Culverts at roads 2112 and 2114 probably restrict access by estuarine fish to some extent
39.6	Significant contribution of freshwater comes from storm water runoff from developed areas (through Fowling Gut) to this basin
52.1	No data

53,54	No data	61	No data
56	No data	64	Guess
58	No data	66	Tidal
59	No data	67	No data
60	No data	68	No data

3.6.3 Adamus and Stockwell Evaluations: Mire Pond Scrub-Shrub System - Palustrine Portion

Summary Sheet D

This form is the appropriate place for recording the ratings that result from use of the interpretation procedures and keys in Sections 2.1.2, and 2.2.2. As each analysis is completed, enter its rating (high,moderate, or low; or A, B, or C) in the relevant box until all boxes for functions of interest are filled.

Begin by labeling the context of the analysis (pre- or post- construction, with or without mitigation, name of basin and WIA). Then enter the data, using the numbered footnotes to help locate the associated analyses. For the evaluation of each function's Effectiveness, enter whichever rating is higher--That for the basin or that for the WIA. The evaluation of the impact vector is optional.

BASIN _____ WIA _____ PROJECT _____

EVALUATION TIME FRAME (PRE/POST) _____ MITIGATION PLAN # _____

FUNCTION	EFFECTIVENESS[1]	OPPORTUNITY[1]	FUNCTIONAL RATING[1]	SIGNIFICANCE[2]	FUNCTIONAL SIGNIFICANCE[4]
GROUND WATER RECHARGE[3]	high	moderate	high	moderate	high
GROUND WATER DISCHARGE[5]	low		low	low	low
FLOOD STORAGE[7]	high	high	high	high	very high
SHORELINE ANCHORING[8]	high	low	moderate	moderate	moderate
SEDIMENT TRAPPING[9]	high	moderate	high	high	very high
NUTRIENT RETENTION					
LONG-TERM[10]	high	high	high	high	very high
SEASONAL[11]	high	high	high		very high
FOOD CHAIN SUPPORT					
DOWNSTREAM[12]	moderate		moderate	low	moderate
IN-BASIN[13]	moderate		moderate		moderate
FISHERY HABITAT					
WARMWATER[14]	low		low	moderate	low
COLDWATER[14]					
COLDW.RIVERINE[14]					
ANADROMOUS RIV.					
SPECIES[15] _____					
WILDLIFE HABITAT					
GENERAL DIVERSITY[16]	summer low*	winter	low		low
WATERFOWL GP.[17] 1	low	low	low		low
WATERFOWL GP.[17] 2	low	low	low	moderate	low
SPECIES[18] Black Duck	low	low	low		low
SPECIES[18] _____					
SPECIES[18] _____					
ACTIVE RECREATION[19]					
SWIMMING	low		low		low
BOAT LAUNCHING	low		low		low
POWER BOATING	low		low	moderate	low
CANOEING	low		low		low
SAILING	low		low		low
PASSIVE RECREATION AND HERITAGE[20]				moderate	moderate
IMPACT VECTOR RATING[21]					

FOOTNOTES

These entries will be based on analyses in the following parts of Volume II (numbers correspond to footnotes above):

[1]-Forms A, A1 (p. 6, 51); [2]-Section 2.1.2.2. (p. 97); [3]-Forms B, B1 (p. 38, 54); [4]-Section 2.1.2.2. (p. 97); [5]-Interpretation key in Section 2.1.2.1. p. 57; [6]-p. 59; [7]-p. 60; [8]-p. 62; [9]-p. 64; [10]-p. 67; [11]-p. 67; [12]-p. 69; [13]-p. 71; [14]-p. 73; [15]-p. 75; [16]-p. 79; [17]-p. 80; [18]-p. 84; [19]-p. 91; [20]-p. 92; [21]-p. 93. *Low sediment no open water

Response Sheet A1

THRESHOLD ANALYSIS: FUNCTIONAL OPPORTUNITY AND EFFECTIVENESS

This sheet is the appropriate place for recording the responses to corresponding questions in Form A. A "yes" (Y) or "no" (N) response must be circled for all parts of each question, even when the response seems obvious. This response sheet has two major columns--"WIA" and "BASIN", and within each of these, three subcolumns entitled "X̄", "W", and "D", which address, when relevent, the seasonal changes in some of the predictors, as follows:

X̄ column responses are those addressing either (a) the average annual condition, or (b) the condition intermediate between the wettest and driest annual conditions (e.g., late June in most Prairie pothole wetlands), or (c) the condition of maximum annual standing crop of wetland plants, or (d) if tidal, the average daily mid-tide condition.

W column responses are those addressing what the area would look like (a) during the wettest time of an average year, or (b) if the area is tidal, what it would look like during an average daily high tide (flooded) condition.

D column responses are those addressing what the area would look like during either the driest time of the year (questions pertaining to hydrology) or if the question pertains to vegetation, then during the dormant time of the year. If the area is tidal, "D" refers to its daily low tide (exposed) condition.

For example, question 2.1.1 should first be asked and answered in the context of the WIA's (wetland impact area's) average condition, then in terms of its wettest condition, then the basin's average condition, and finally the basin's wettest condition. This should then be repeated for question 2.1.2. Because no Y/N choice is given in either "D" column, the area's dry or dormant condition need not be evaluated for this question. Similarly, some questions will require responses only for the WIA or basin, but not both.

Q. #	WIA X̄	WIA W	WIA D	BASIN X̄	BASIN W	BASIN D	
Office-tyoe Data							
1.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	See Comment form
1.2	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
1.3	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
1.3.1	Y (N)	Y (N)	Y (N)	X (N)	Y (N)	Y (N)	

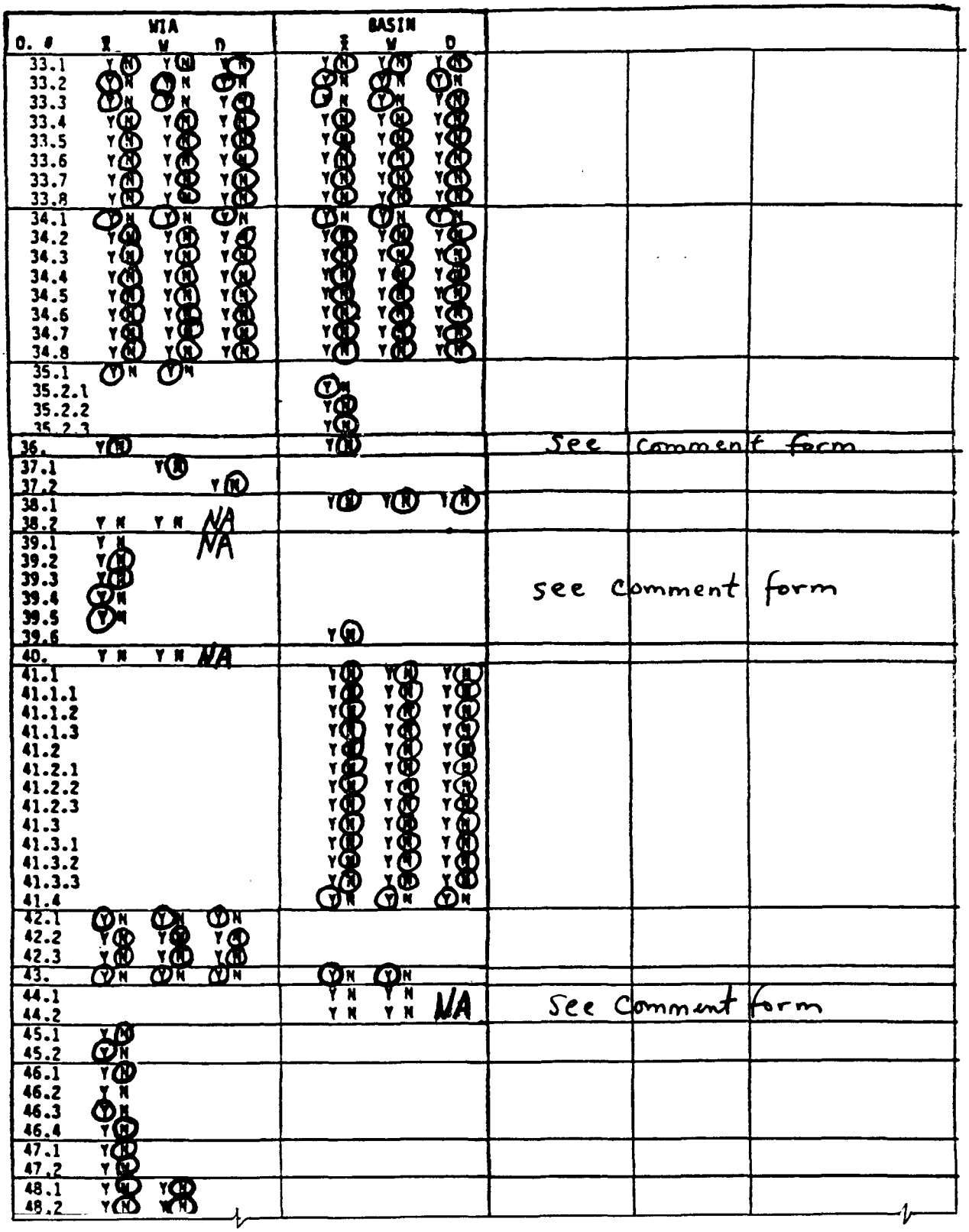
Mire Pond Scrub-Shrub System - Palustrine Portion

Q. #	WIA R	WIA W	WIA D	BASIN R	BASIN W	BASIN D			
2.1.1	Y (N)	Y (N)		Y (N)	Y (N)		See Comment form		
2.1.2	Y (N)	Y (N)		Y (N)	Y (N)				
2.2.1	Y (N)	Y (N)		Y (N)	Y (N)				
2.2.2	Y (N)	Y (N)		Y (N)	Y (N)				
3.1					Y (N)				
3.2					Y (N)				
4.1	Y (N)								
4.2	Y (N)								
5.1					Y (N)		See comment form		
5.2					Y (N)				
6.1		Y (N)					See	Comment	form
6.2		Y (N)							
7.1				Y N			see	comment	form
7.2				Y N					
8.1					Y (N)		see	Comment	form
8.2					(Y) N				
9.1				Y N			see	comment	form
9.2				Y N					
10.1	Y N								
10.2	Y N								
10.3	Y N		NA						
10.4	Y N								
11.1	Y (N)								
11.2	(Y) N		NA						
12.1		Y N							
12.2		Y N							
13.1				Y N					
13.2				Y N		NA			
14.	Y N			Y (N)					
15.1	Y (N)								
15.2	Y (N)								
15.3	Y (N)								
15.4	Y (N)								
15.5	Y (N)								
15.6	Y (N)								
15.7	Y (N)								
16.	(Y) N								
17.1	Y (N)								
17.2	Y (N)								
18.	Y (N)								
19.	Y N		NA						
20.				Y (N)					
21.1	(Y) N						See Comment form		
21.2	Y (N)								
21.3	Y (N)								
21.4	Y (N)								
21.5	Y (N)								
21.6	Y (N)								
Field-type Data									
22.1	Y (N)	Y (N)		Y (N)	Y (N)		See Comment form		
22.1.1	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.2	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.3	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.4	Y (N)	Y (N)		Y (N)	Y (N)				
22.1.5	Y (N)	Y (N)		Y (N)	Y (N)				
22.2	(Y) N	(Y) N		(Y) N	(Y) N				
22.2.1	(Y) N	(Y) N		(Y) N	(Y) N				

Mire Pond Scrub-Shrub System - Palustrine Portion

Q. #	MIA R	MIA W	MIA D	BASIN R	BASIN W	BASIN D			
22.2.2	(Y) N	(Y) N		(Y) N	(Y) N				
22.2.3	(Y) N	(Y) N		(Y) N	(Y) N				
22.2.4	(Y) N	(Y) N		(Y) N	(Y) N				
22.2.5	(Y) N	(Y) N		(Y) N	(Y) N				
22.3	(Y)	(Y)		(Y)	(Y)				
22.3.1	(Y)	(Y)		(Y)	(Y)				
22.3.2	(Y)	(Y)		(Y)	(Y)				
22.3.3	(Y)	(Y)		(Y)	(Y)				
22.3.4	(Y)	(Y)		(Y)	(Y)				
22.4	(Y)	(Y)		(Y)	(Y)				
22.4.1	(Y)	(Y)		(Y)	(Y)				
22.4.2	(Y)	(Y)		(Y)	(Y)				
22.5	(Y)	(Y)		(Y)	(Y)				
22.6	(Y) N	(Y) N		(Y) N	(Y) N				
23.1	(Y)			(Y)			See Comment form		
23.2	(Y)			(Y)					
23.3	(Y)			(Y)					
23.4	(Y)			(Y)					
23.5	(Y)			(Y)					
23.6	(Y)			(Y)					
23.7	(Y)			(Y)					
23.8	(Y)			(Y)					
23.9	(Y)			(Y)					
24.1	(Y)	(Y)	(Y) N						
24.2	(Y)	(Y)	(Y)						
24.3	(Y)	(Y)	(Y)						
24.4	(Y)	(Y)	(Y)						
24.5	(Y)	(Y)	(Y)						
24.6	(Y)	(Y)	(Y)						
25.1	(Y) N								
25.2	(Y)								
25.3	(Y)								
26.1			(Y)			(Y)	See Comment form		
26.2			(Y)			(Y)			
26.3			(Y) N			(Y) N			
26.4			(Y)			(Y)			
26.5			(Y)			(Y)			
26.6			(Y)			(Y)			
26.7			(Y)			(Y)			
26.8			(Y)			(Y)			
26.9			(Y)			(Y)			
26.10			(Y)			(Y)			
26.11			(Y)			(N)			
27.1		(Y)			(Y)				
27.2		(Y) N			(Y) N				
28.1				(Y)					
28.2				(Y)					
29.				(Y) N					
30.1	Y N								
30.2	Y N	NA							
31.1		(Y)							
31.2		(Y)							
32.1	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N			
32.2	(Y)	(Y)	(Y)	(Y)	(Y)	(Y)			
32.3	(Y)	(Y)	(Y)	(Y)	(Y)	(Y)			
32.4	(Y)	(Y)	(Y)	(Y)	(Y)	(Y)			
32.5	(Y)	(Y)	(Y)	(Y)	(Y)	(Y)			
32.6	(Y)	(Y)	(Y)	(Y)	(Y)	(Y)			
32.7	(Y)	(Y)	(Y)	(Y)	(Y)	(Y)			
32.8	(Y)	(Y)	(Y)	(Y)	(Y)	(N)			

Mire Pond Scrub-Shrub System - Palustrine Portion



Mire Pond Scrub-Shrub System -- Palustrine Portion

Q. #	WIA E	WIA W	WIA D	BASIN E	BASIN W	BASIN D	
49.1				(Y) N			
49.2				Y (N)			
50.	Y (N)	Y (N)	Y (N)				
51.		Y N	NA				NO open water
Detailed Data							
52.1.1	Y N	NA					NO measurements
52.1.2	Y N	NA					
52.2.1	Y (N)						see comment form
52.2.2	Y (N)						
53.1	Y N						NO measurements
53.2	Y N	NA					
54.1	Y N						NO measurements
54.2	Y N	NA					
55.	Y (N)						
56.		NA			Y N		
57.1	Y N						
57.2	Y N						
57.3	Y N	NA					
57.4	Y N						
58.1	Y N						NO measurements
58.2	Y N						
58.3	Y N	NA					
58.4	Y N						
59.1				Y N			
59.2	NA			Y N			NO measurements
59.3				Y N			
60.1					Y N		
60.2	NA			Y N			NO measurements
60.3				Y N			
61.1	Y N						NO measurements
61.2	Y N	NA					
62.	Y N	NA					
63.1						Y N	
63.2				NA		Y N	
64.				NA		Y N	
65.	(Y) N						
66.1		Y N				Y N	
66.2		Y N	NA	NA		Y N	NO measurements
67.1		Y N				Y N	
67.2		Y N	NA	NA		Y N	NO outlet
68.1	Y N					Y N	
68.2	Y N		NA	NA		Y N	NO outlet
Derived Responses							
69.1	Y N						
69.2	Y N						
70.1	Y N						
70.2	Y N						
71.1	Y N						
71.2	Y N						
72.1	Y N						
72.2	Y N						
73.1	Y N						
73.2	Y N						
74.1	Y N						
74.2	Y N						
75.1	Y N						
75.2	Y N						

After responses to all possible questions (Form A) have been recorded above, turn to Form B (page 38). You will(as an option) return to this sheet (in Section 2.1.2) to interpret the above responses.

Mire Pond Scrub-Shrub System — Palustrine Portion

Response Sheet B1

THRESHOLD ANALYSIS: SIGNIFICANCE

This sheet is the appropriate place for recording the responses to the corresponding questions in Form B. Circle Y (yes) or N (no), being careful to note that the order of Y and N below frequently reverses.

General

1.1 N Y
1.2 Y Y
1.3 Y Y
1.4 N Y
1.5 N Y
1.6 N Y
2. Y N

See comments for Chincoteague Ridge/Swale Site

See Comments for Chincoteague Ridge/Swale S.te.

Recharge

3. Y N
4. Y N
5. Y N
6. Y N
7. Y N
8. Y N
9. Y N
10. Y Y

See Comments for Mire Pond Fill.

Discharge

11. Y N
12. Y N
13. N N
14. Y N
15. N Y

See Comment for Mire Pond Fill.

See Comments for Mire Pond Fill.

Flood Storage

16. Y N
17. Y N
18. Y N
19. Y N
20. Y N
21. Y N
22. N Y

Shoreline Anchoring

23. Y N
24. Y N
25. Y N
26. Y N
27. Y N
28. Y N
29. N Y

Sediment Trapping

30. Y N
31. Y N
32. Y N
33. Y N
34. Y N
35. Y N
36. N Y

Nutrient Retention

37. Y N
38. Y N
39. Y N
40. Y N
41. Y N
42. N Y

Fish Food Chain/ Habitat

43. Y N
44. Y N
45. Y N
46. Y N
47. Y N
48. Y N
49. Y N
50. Y N
51. Y N
52. Y N
53. N Y

Wildlife Habitat

54. Y N
55. Y N
56. Y N
57. Y N
58. Y N
59. Y N
60. N Y

Active Recreation

61. Y N
62. Y N
63. Y Y
64. Y N
65. Y N
66. Y N
67. N Y

Passive

68. Y N
69. Y N
70. Y N
71. Y N
72. Y N
73. Y N
74. Y N
75. Y N
76. Y N
77. Y N
78. N Y

See comments for Mire Pond Fill.

Form "A" Comments (Mire Pond Scrub-Shrub: Palustrine)

1	We are assuming that there is no inlet or outlet due to isolation by road without culvert (drainage was formerly to the south)
2.2	Basin = WIA
5.2	See site map (Figure 11) and definitions for this site
6.1-6.2	Wetland area includes scrub/shrub area west of basin
7	Predictor not used
8	Sub-watershed = narrow fringe of upland surrounding WIA
9	Predictor not used
21	Refers strictly to the wetlands in WIA
22	Scrub/shrub area (west of ponds) exceeds (but only slightly) the emergent wetland areas within the ponds
23.1-23.9	Sediments are sand with shallow layer of porous organic
26	May be a small area near road (dike) which is permanently flooded. Also may be scrub/shrub areas which are temporarily flooded
36	Although we have no estimates, the amount of accumulated organic matter suggests that the D.O. levels are probably low in the summer
39.4	Road/dike construction has impounded wetlands at this site
44	There is no wetland-water edge
51	No open water
52.1	No measurements
52	Refers only to wetland area
53	No measurements
54	No measurements

58	No measurements
59	No measurements
60	No measurements
61	No measurements
64	Guess
66	No measurements available
67	No outlet
68	No outlet

3.7 OCEAN BREEZES SOUTH STUDY SITE

3.7.1 Qualitative Site Description

Physical description. This site (Figure 12) covers approximately 17 ha and lies at the southwest corner of Chincoteague Island, just southwest of a recently constructed trailer court.

The southeast corner of Chincoteague was formerly a large estuarine marsh (as shown in a 1943 U.S.G.S. topograph map). The Ocean Breezes South Study Site has been extensively altered in the last few years in an attempt to develop the site for commercial purposes. Much of the former estuarine marsh land has been filled and bulldozed. A dead-end canal resulted from fill placed during the early years of disturbance. This triangular site is currently bounded on two sides by roads and on the third side by the trailer court, so there is very little way for tidal salt water to flow into and out of the site. The only tidal outlets are (1) a small tidal creek which flows under the road almost due south into the nearby Andrews Landing Gut and (2) a culvert connecting Chincoteague Channel to Fowling Gut at the northwest end of the study area. The first creek is blocked by a

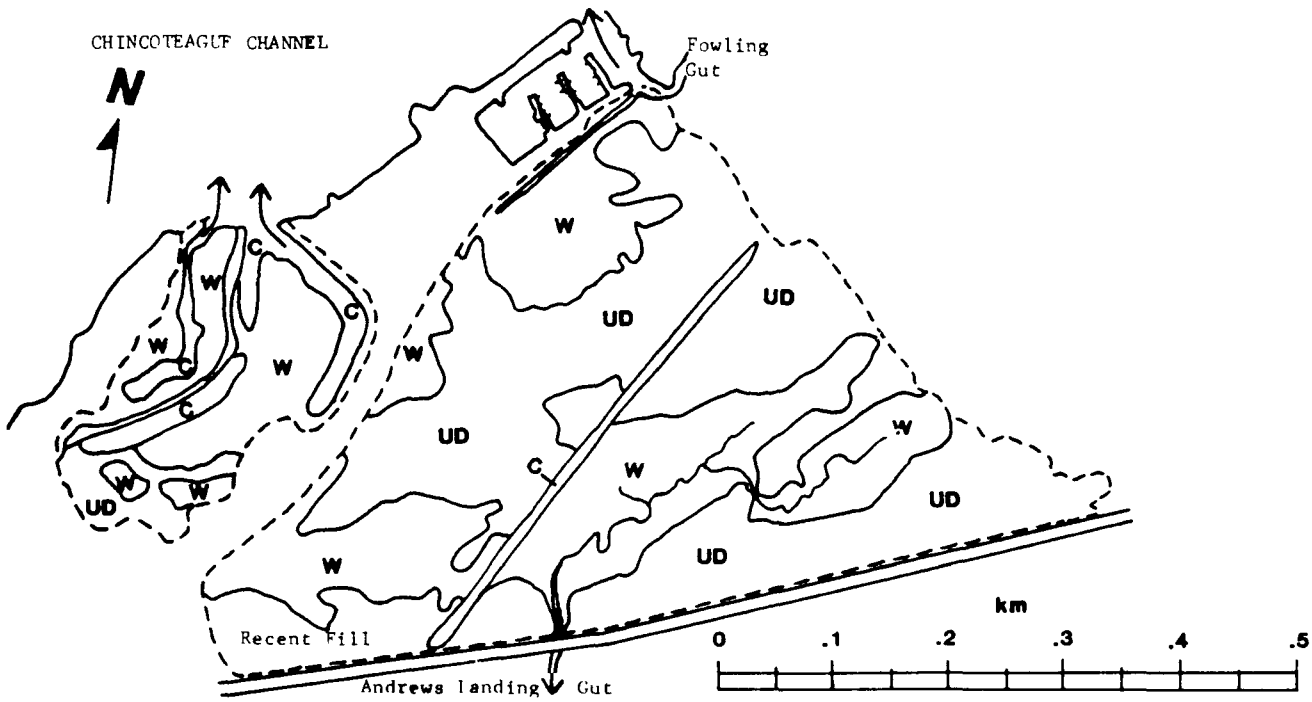


Figure 12. Map of Ocean Breezes South (right) and Chincoteague Channel Marsh (left) WIA's showing wetland (w) and undifferentiated (ud) areas. Channels (c) are shown and major outlets are indicated by arrows that depict the direction of water movement from the sites.

"flap gate" which allows water to drain the site freely but impedes flow into the site. This one-way "flap gate" is highly detrimental in that it impedes tidal flow and access by fishes to the wetland portion of the site while allowing outgoing tidal waters to drain out.

Definitions. The WIA consists of the site as outlined by the EPA. The basin for the site includes marsh and tidal creeks which flow southward into Andrews Landing Gut and northwestward into Chincoteague Channel. The sub-watershed consists of the higher, artificially filled areas within the site and several low-lying pine ridges that have persisted since disturbance.

Qualitative vegetation description. The remaining areas of estuarine wetlands within the interior of the site are covered with a combination of Spartina patens, S. alterniflora, Distichlis, and a few other salt marsh plants. The filled and altered upland areas are bare in some areas and have a thin cover of shrubs such as Myrica, Iva, and Baccharis. A few small pines are also scattered over this area.

Wetland classification. The wetlands at this site are largely estuarine emergent wetlands.

Substrate, water salinity. The substrate of this site is almost entirely sand. Under the remaining estuarine wetlands there is a layer of organic material (5-50 cm) overlying the sand. The water entering and leaving the site through the two remaining tidal outlets is typical estuarine water with a salinity of 15-30 ppt. There are a few cut-off, temporary pools of water which fluctuate according to rainfall conditions.

Wildlife use. The areas which remain as estuarine marsh continue to serve a nursery function for fishes and estuarine invertebrates. These wetlands are also utilized by waterfowl and shorebirds. The filled areas have passerine birds and occasional shorebirds. Evidence of small mammals (e.g. raccoons) can be found throughout the site.

Hydrologic functions. Water drains from the site through two outlets -- one to Fowling Gut to the northwest and one to Andrews Landing Gut to the south. The latter is severely impaired by the aforementioned "flap gate" which if removed would allow normal tidal flow to the estuarine wetlands within the site. Much of the precipitation which falls upon the site probably infiltrates through the sand fill into the surface brackish aquifer and then moves laterally into the estuarine wetlands and creeks. Therefore, this site should have a moderate to high ground-water recharge and discharge potential along with a high nutrient retention potential. Flood storage, because of filling, is probably only of moderate potential.

3.7.2 Adamus and Stockwell Evaluations: Ocean Breezes South

Summary Sheet D

This form is the appropriate place for recording the ratings that result from use of the interpretation procedures and keys in Sections 2.1.2, and 2.2.2. As each analysis is completed, enter its rating (high,moderate, or low; or A, B, or C) in the relevant box until all boxes for functions of interest are filled.

Begin by labeling the context of the analysis (pre- or post- construction, with or without mitigation, name of basin and WIA). Then enter the data, using the numbered footnotes to help locate the associated analyses. For the evaluation of each function's Effectiveness, enter whichever rating is higher--That for the basin or that for the WIA. The evaluation of the impact vector is optional.

BASIN _____ WIA _____ PROJECT _____

EVALUATION TIME FRAME (PRE/POST) _____ MITIGATION PLAN # _____

FUNCTION	EFFECTIVENESS[1]	OPPORTUNITY[1]	FUNCTIONAL RATING[1]	SIGNIFICANCE[3]	FUNCTIONAL SIGNIFICANCE[4]
GROUND WATER RECHARGE[5]	low	moderate	low	moderate	low
GROUND WATER DISCHARGE[6]	low		low	high	low
FLOOD STORAGE[7]	high	high	high	moderate	high
SHORELINE ANCHORING[8]	high	moderate	high	high	very high
SEDIMENT TRAPPING[9]	moderate	high	high	high	very high
NUTRIENT RETENTION					
LONG-TERM[10]	moderate	high	high	high	very high
SEASONAL[11]	moderate	high	high		very high
FOOD CHAIN SUPPORT					
DOWNSTREAM[12]	moderate		moderate	moderate	moderate
IN-BASIN[13]	moderate		moderate		moderate
FISHERY HABITAT					
WARMWATER[14]	low		low		low
COLDWATER[14]				moderate	
COLDW.RIVERINE[14]					
ANADROMOUS RIV.					
SPECIES[15] Bl.Fish,Hd. Cl. Win.Fl.*	moderate		moderate		moderate
WILDLIFE HABITAT	summer	winter			
GENERAL DIVERSITY[16]	moderate **		moderate		moderate
WATERFOWL GP.[17] 1	low	low	low		low
WATERFOWL GP.[17] 2	low	low	low	moderate	low
SPECIES[18] Common Egret	high		high		high
SPECIES[18] _____					
SPECIES[18] _____					
ACTIVE RECREATION[19]					
SWIMMING	low		low		low
BOAT LAUNCHING	low		low		low
POWER BOATING	low		low	moderate	low
CANOEING	low		low		low
SAILING	low		low		low
PASSIVE RECREATION AND HERITAGE[20]				moderate	moderate
IMPACT VECTOR RATING[21]					

FOOTNOTES

These entries will be based on analyses in the following parts of Volume II (numbers correspond to footnotes above):

[1]Forms A, A1 (p. 6, 51); [2]Section 2.1.2.2. (p. 97); [3]Forms B, B1 (p. 38, 54); [4]Section 2.1.2.2. (p. 97); [5]Interpretation key in Section 2.1.2.1. p. 57; [6]p. 59; [7]p. 60; [8]p. 62; [9]p. 64; [10]p. 67; [11]p. 67; [12]p. 69; [13]p. 71; [14]p. 73; [15]p. 75; [16]p. 79; [17]p. 80; [18]p. 84; [19]p. 91; [20]p. 92; [21]p. 93.

* Blue Fish, Hard Clam, Winter Flounder **Artificial Water Fluctuation

Response Sheet A1

THRESHOLD ANALYSIS: FUNCTIONAL OPPORTUNITY AND EFFECTIVENESS

This sheet is the appropriate place for recording the responses to corresponding questions in Form A. A "yes" (Y) or "no" (N) response must be circled for all parts of each question, even when the response seems obvious. This response sheet has two major columns--"WIA" and "BASIN", and within each of these, three subcolumns entitled "$\bar{X}$", "W", and "D", which address, when relevent, the seasonal changes in some of the predictors, as follows:

> $\bar{X}$ column responses are those addressing either (a) the average annual condition, or (b) the condition intermediate between the wettest and driest annual conditions (e.g., late June in most Prairie pothole wetlands), or (c) the condition of maximum annual standing crop of wetland plants, or (d) if tidal, the average daily mid-tide condition.
>
> W column responses are those addressing what the area would look like (a) during the wettest time of an average year, or (b) if the area is tidal, what it would look like during an average daily high tide (flooded) condition.
>
> D column responses are those addressing what the area would look like during either the driest time of the year (questions pertaining to hydrology) or if the question pertains to vegetation, then during the dormant time of the year. If the area is tidal, "D" refers to its daily low tide (exposed) condition.

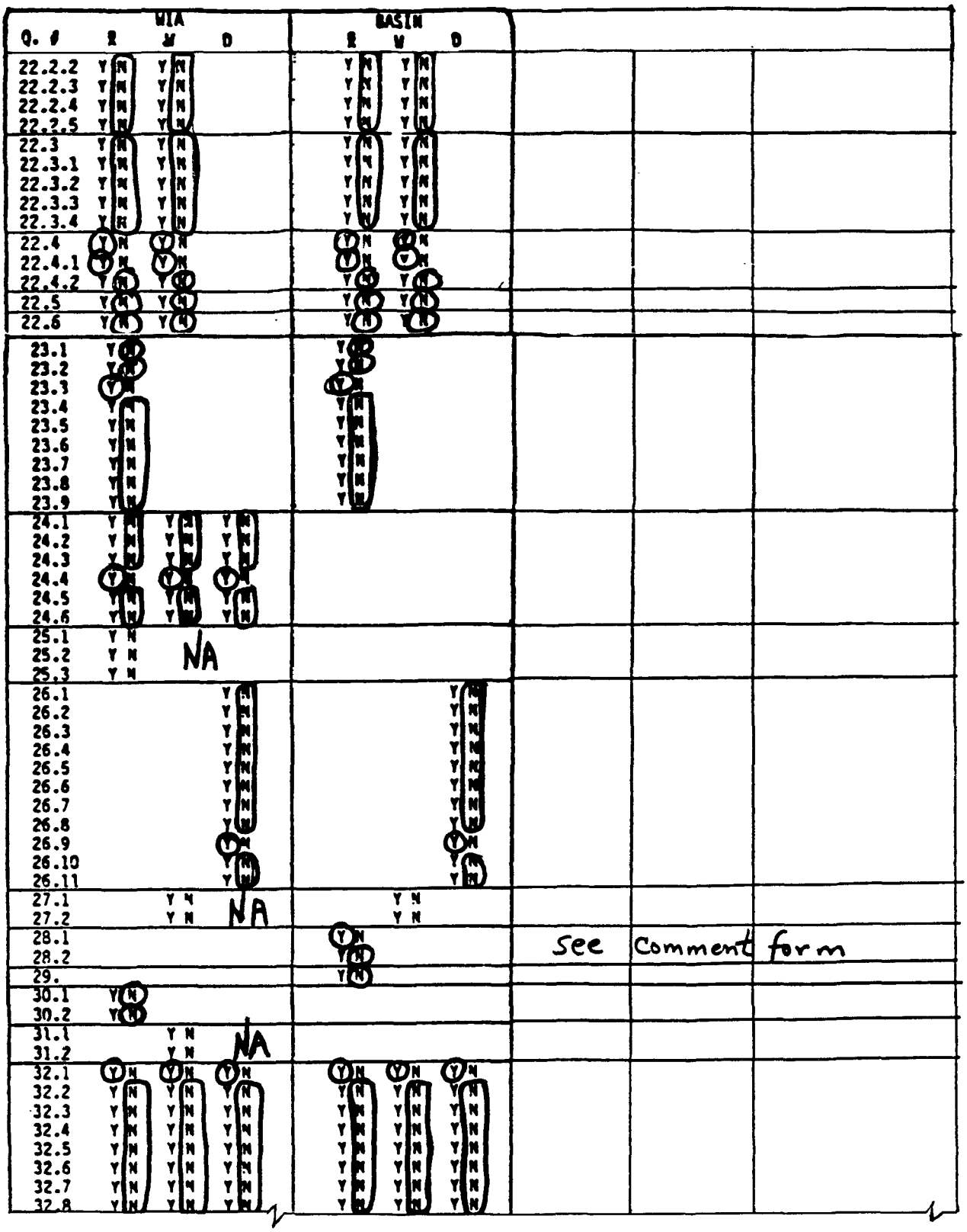
For example, question 2.1.1 should first be asked and answered in the context of the WIA's (wetland impact area's) average condition, then in terms of its wettest condition, then the basin's average condition, and finally the basin's wettest condition. This should then be repeated for question 2.1.2. Because no Y/N choice is given in either "D" column, the area's dry or dormant condition need not be evaluated for this question. Similarly, some questions will require responses only for the WIA or basin, but not both.

Q. #	WIA $\bar{X}$	WIA W	WIA D	BASIN $\bar{X}$	BASIN W	BASIN D	
Office-type Data							
1.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
1.2	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
1.3	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	
1.3.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	

Ocean Breezes South

Q. #	WIA E	WIA W	WIA D	BASIN E	BASIN W	BASIN D			
2.1.1	Y N	Y N		N	Y N				
2.1.2	Y N	Y N		Y N	Y N				
2.2.1	Y N	Y N		N	Y N				
2.2.2	Y N	Y N		Y N	Y N				
3.1					Y N				
3.2					Y N				
4.1	Y N								
4.2	Y N								
5.1					Y N				
5.2					Y N				
6.1		Y N							
6.2		Y N							
7.1				Y N					
7.2				Y N			See	comment	form
8.1					Y N		See	comment	form
8.2					Y N				
9.1				Y N					
9.2				Y N					
10.1	Y N								
10.2	Y N		NA						
10.3	Y N								
10.4	Y N								
11.1	Y N								
11.2	Y N								
12.1		Y N							
12.2		Y N	NA						
13.1				Y N		NA			
13.2				Y N					
14.	Y N			Y N					
15.1	Y N								
15.2	Y N								
15.3	Y N								
15.4	Y N								
15.5	Y N								
15.6	Y N								
15.7	Y N								
16.	Y N								
17.1	Y N								
17.2	Y N								
18.	Y N								
19.	Y N								
20.				Y N					
21.1	Y N								
21.2	Y N								
21.3	Y N								
21.4	Y N								
21.5	Y N								
21.6	Y N								
Field-type Data							See	Comment	form
22.1	Y N	Y N		Y N	Y N				
22.1.1	Y N	Y N		Y N	Y N				
22.1.2	Y N	Y N		Y N	Y N				
22.1.3	Y N	Y N		Y N	Y N				
22.1.4	Y N	Y N		Y N	Y N				
22.1.5	Y N	Y N		Y N	Y N				
22.2	Y N	Y N		Y N	Y N				
22.2.1	Y N	Y N		Y N	Y N				

Ocean Breezes South



Ocean Breezes South

O. #	MIA R	MIA W	MIA D	BASIN E	BASIN W	BASIN D			
33.1	Y N	Y N	Y N	Y N	Y N	Y N			
33.2	Y N	Y N	Y N	Y N	Y N	Y N			
33.3	Y N	Y N	Y N	Y N	Y N	Y N			
33.4	Y N	Y N	Y N	Y N	Y N	Y N			
33.5	Y N	Y N	Y N	Y N	Y N	Y N			
33.6	Y N	Y N	Y N	Y N	Y N	Y N			
33.7	Y N	Y N	Y N	Y N	Y N	Y N			
33.8	Y N	Y N	Y N	Y N	Y N	Y N			
34.1	Y N	Y N	Y N	Y N	Y N	Y N			
34.2	Y N	Y N	Y N	Y N	Y N	Y N			
34.3	Y N	Y N	Y N	Y N	Y N	Y N			
34.4	Y N	Y N	Y N	Y N	Y N	Y N			
34.5	Y N	Y N	Y N	Y N	Y N	Y N			
34.6	Y N	Y N	Y N	Y N	Y N	Y N			
34.7	Y N	Y N	Y N	Y N	Y N	Y N			
34.8	Y N	Y N	Y N	Y N	Y N	Y N			
35.1	Y N	Y N							
35.2.1				Y N					
35.2.2				Y N					
35.2.3				Y N					
36.	Y N			Y N					
37.1		Y N							
37.2			Y N						
38.1				Y N	Y N	Y N			
38.2	Y N	Y N	NA						
39.1	Y N	NA							
39.2	Y N	NA							
39.3	Y N								
39.4	Y N								
39.5	Y N								
39.6				Y N			see comment form		
40.	Y N	Y N	NA						
41.1				Y N	Y N	Y N	See comment form		
41.1.1				Y N	Y N	Y N			
41.1.2				Y N	Y N	Y N			
41.1.3				Y N	Y N	Y N			
41.2				Y N	Y N	Y N			
41.2.1				Y N	Y N	Y N			
41.2.2				Y N	Y N	Y N			
41.2.3				Y N	Y N	Y N			
41.3				Y N	Y N	Y N			
41.3.1				Y N	Y N	Y N			
41.3.2				Y N	Y N	Y N			
41.3.3				Y N	Y N	Y N			
41.4				Y N	Y N	Y N			
42.1	Y N	Y N	Y N				See	Comment form	
42.2	Y N	Y N	Y N						
42.3	Y N	Y N	Y N						
43.	Y N	Y N	Y N	Y N	Y N				
44.1				Y N	Y N				
44.2				Y N	Y N				
45.1	Y N								
45.2	Y N								
46.1	Y N								
46.2	Y N								
46.3	Y N								
46.4	Y N								
47.1	Y N								
47.2	Y N								
48.1	Y N	Y N							
48.2	Y N	Y N							

Ocean Breezes South

Q. #	MIA E	MIA W	MIA D	BASIN E	BASIN W	BASIN D			
49.1				(Y) N					
49.2				Y (N)					
50.	(Y) N	(Y) N	(Y) N						
51.		(Y) N							
Detailed Data									
52.1.1	Y N	NA					See comment form		
52.1.2	Y N	NA							
52.2.1	(Y) N								
52.2.2	(Y) N								
53.1	Y N								
53.2	Y N	NA							
54.1	Y N								
54.2	Y N	NA							
55.	Y N	NA							
56.					Y N	NA			
57.1	Y N								
57.2	Y N								
57.3	Y N	NA							
57.4	Y N								
58.1	Y N								
58.2	Y N								
58.3	Y N	NA							
58.4	Y N								
59.1				Y N					
59.2		NA		Y N					
59.3				Y N					
60.1					Y N				
60.2		NA		Y N					
60.3				Y N					
61.1	Y N								
61.2	Y N	NA							
62.	Y N	NA							
63.1				NA		Y N			
63.2						Y N			
64.				NA		Y N			
65.	(Y) N								
66.1		Y N				Y N			
66.2		Y N	NA			Y N			
67.1		Y N				Y N			
67.2		Y N	NA			Y N			
68.1	Y N					Y N			
68.2	Y N		NA			Y N			
Derived Responses									
69.1	Y N								
69.2	Y N								
70.1	Y N								
70.2	Y N								
71.1	Y N								
71.2	Y N								
72.1	Y N								
72.2	Y N								
73.1	Y N								
73.2	Y N								
74.1	Y N								
74.2	Y N								
75.1	Y N								
75.2	Y N								

After responses to all possible questions (Form A) have been recorded above, turn to Form B (page 38). You will(as an option) return to this sheet (in Section 2.1.2) to interpret the above responses.

Ocean Breezes South

Response Sheet B1

THRESHOLD ANALYSIS: SIGNIFICANCE

This sheet is the appropriate place for recording the responses to the corresponding questions in Form B. Circle Y (yes) or N (no), being careful to note that the order of Y and N below frequently reverses.

General
1.1 N Y
1.2 N Y
1.3 N Y
1.4 N Y
1.5 N Y
1.6 N Y
2. Y N

Recharge
3. Y N
4. Y N
5. Y N
6. Y N
7. Y N
8. Y N
9. Y N
10. N Y

Discharge
11. Y N
12. Y N
13. Y N
14. Y N
15. N Y

Flood Storage
16. Y N
17. Y N
18. Y N
19. Y N
20. Y N
21. Y N see comment form
22. N Y

Shoreline Anchoring
23. Y N
24. Y N
25. Y N
26. Y N
27. Y N
28. Y N
29. N Y

Sediment Trapping
30. Y N
31. Y N
32. Y N
33. Y N see comment form
34. Y N
35. Y N
36. N Y

Nutrient Retention
37. Y N
38. Y N
39. Y N See comment form
40. Y N
41. Y N
42. N Y

Fish Food Chain/ Habitat
43. Y N
44. Y N
45. Y N
46. Y N
47. Y N
48. Y N
49. Y N
50. Y N
51. Y N
52. Y N
53. N Y

Wildlife Habitat
54. Y N
55. Y N
56. Y N
57. Y N
58. Y N
59. Y N
60. N Y

Active Recreation
61. Y N
62. Y N
63. Y N
64. Y N
65. Y N
66. Y N
67. N Y

Passive
68. Y N
69. Y N
70. Y N
71. Y N
72. Y N
73. Y N
74. Y N
75. Y N
76. Y N
77. Y N
78. N Y

Form "A" Comments (Ocean Breeze South Study Site)

7,8	Basin = WIA + area 1.5 times as large toward Assateague Channel Sub-watershed = 1/2 area of trailer park to north Watershed = sub-watershed + pine stand to north
22	Answered to describe emergent, estuarine wetland. Scrub/shrub pine land within WIA not considered
28	Flap gates restrict exchange with Assateague Channel
39.5	Flap gates (see above)
42	See comment 22 above
52.2	See comment 22 above
41	Basin for Ocean Breezes South includes a large area of salt marsh adjacent to Assateague Channel

Form "B" Comments (Ocean Breezes South and Chincoteague Channel Marsh Study Sites)

21	Flooded daily, not as valuable for flood storage and desynchronization
39,33	Chincoteague Channel Marsh Study Site is too small for turbid water, high nutrient water disposal

3.8 CHINCOTEAGUE CHANNEL MARSH STUDY SITE

3.8.1 Qualitative Description

Physical description. This small site (Figure 12) is approximately 5 ha and is located immediately next to Chincoteague Channel on the southwest corner of Chincoteague Island adjacent to the Ocean Breezes South Study Site.

Several large spoil banks and dredged channels dissect the site and have destroyed perhaps 10% to 15% of the estuarine marsh which existed formerly. However, much of the original hydrologic circulation and expanses of estuarine vegetation remain.

Definitions. The WIA includes the site as outlined by the EPA. The basin consists of the tidal creek which flows into Chincoteague Bay. The sub-watershed includes the filled areas which run down the middle of the site and around the edges of the site.

Qualitative vegetation description. The wetland areas of the site are dominated by Spartina alterniflora, S. patens, and Distichlis spicata. The higher areas of the wetlands and the filled dikes are covered with Iva and Baccharis and other shrubs.

Wetland classification. The wetlands on this site are largely estuarine emergent with small patches and strips of estuarine scrub/shrub.

Substrate, water salinity. Most of the substrates underneath this site are basically sand, but are overlain by a layer of estuarine organic soils which may be up to 20-50 cm thick. Water enters and exits the site through a fairly open inlet so that salinities within the site range from 15 to 30 ppt depending on local rainfall and tidal conditions.

Wildlife use. As with most small estuarine marshes this area is heavily utilized by estuarine fishes. In addition, a variety of shorebirds and waterfowl also are present at times.

Hydrologic functions. While drainage is restricted to certain areas of the site by construction of dikes and filled areas, most of the site is still flushed through an inlet/outlet which flows into Chincoteague Bay. Drainage within the site would be improved easily by breaching the artificial dikes at several points. Like most estuarine sites the ground-water recharge potential is low. Flood storage and nutrient retention, however, are probably high.

3.8.2 Adamus and Stockwell Evaluations: Chincoteague Channel Marsh

Summary Sheet D

This form is the appropriate place for recording the ratings that result from use of the interpretation procedures and keys in Sections 2.1.2. and 2.2.2. As each analysis is completed, enter its rating (high,moderate, or low; or A, B, or C) in the relevant box until all boxes for functions of interest are filled.

Begin by labeling the context of the analysis (pre- or post- construction, with or without mitigation, name of basin and WIA). Then enter the data, using the numbered footnotes to help locate the associated analyses. For the evaluation of each function's Effectiveness, enter whichever rating is higher--That for the basin or that for the WIA. The evaluation of the impact vector is optional.

BASIN _____ WIA _____ PROJECT _____

EVALUATION TIME FRAME (PRE/POST) _____ MITIGATION PLAN # _____

FUNCTION	EFFECTIVENESS[1]	OPPORTUNITY[1]	FUNCTIONAL RATING[2]	SIGNIFICANCE[2]	FUNCTIONAL SIGNIFICANCE[2]
GROUND WATER RECHARGE[3]	low	moderate	low	moderate	low
GROUND WATER DISCHARGE[4]	moderate		moderate	high	high
FLOOD STORAGE[7]	high	high	high	moderate	high
SHORELINE ANCHORING[8]	moderate	moderate	moderate	high	high
SEDIMENT TRAPPING[9]	moderate	high	high	moderate	high
NUTRIENT RETENTION					
LONG-TERM[10]	moderate	high	high	moderate	high
SEASONAL[11]	moderate	high	high		high
FOOD CHAIN SUPPORT					
DOWNSTREAM[12]	moderate		moderate	moderate	moderate
IN-BASIN[13]	moderate		moderate		moderate
FISHERY HABITAT					
WARMWATER[14]	low		low	moderate	low
COLDWATER[15]					
COLDW.RIVERINE[16]					
ANADROMOUS FISH SPECIES[17] Bl.Fish,Hd.Cl.,Win.Fl.*	moderate		moderate		moderate
WILDLIFE HABITAT	summer	winter			
GENERAL DIVERSITY[18]	moderate	**	moderate	moderate	moderate
WATERFOWL GP.[19] 1	low	low	low		low
WATERFOWL GP.[19] 2	low	low	low		low
SPECIES[20] common egret	high		high		high
SPECIES[20] _____					
SPECIES[20] _____					
ACTIVE RECREATION[21]					
SWIMMING	low		low	moderate	low
BOAT LAUNCHING	low		low		low
POWER BOATING	low		low		low
CANOEING	low		low		low
SAILING	low		low		low
PASSIVE RECREATION AND HERITAGE[21]				moderate	moderate
IMPACT VECTOR RATING[21]					

FOOTNOTES

These entries will be based on analyses in the following parts of Volume II (numbers correspond to footnotes above):

[1]-Forms A, A1 (p. 6, 51); [2]-Section 2.1.2.2. (p. 97); [3]-Forms B, B1 (p. 38, 54); [4]-Section 2.1.2.2. (p. 97); [5]-Interpretation key in Section 2.1.2.1. p. 57; [6]-p. 59; [7]-p. 60; [8]-p. 62; [9]-p. 64; [10]-p. 67; [11]-p. 67; [12]-p. 69; [13]-p. 71; [14]-p. 73; [15]-p. 75; [16]-p. 79; [17]-p. 80; [18]-p. 84; [19]-p. 91; [20]-p. 92; [21]-p. 93.

* Blue Fish, Hard Clam, Winter Flounder **Too small to score high

Response Sheet A1

THRESHOLD ANALYSIS: FUNCTIONAL OPPORTUNITY AND EFFECTIVENESS

This sheet is the appropriate place for recording the responses to corresponding questions in Form A. A "yes" (Y) or "no" (N) response must be circled for all parts of each question, even when the response seems obvious. This response sheet has two major columns--"WIA" and "BASIN", and within each of these, three subcolumns entitled "$\bar{X}$", "W", and "D", which address, when relevent, the seasonal changes in some of the predictors, as follows:

$\bar{X}$ column responses are those addressing either (a) the average annual condition, or (b) the condition intermediate between the wettest and driest annual conditions (e.g., late June in most Prairie pothole wetlands), or (c) the condition of maximum annual standing crop of wetland plants, or (d) if tidal, the average daily mid-tide condition.

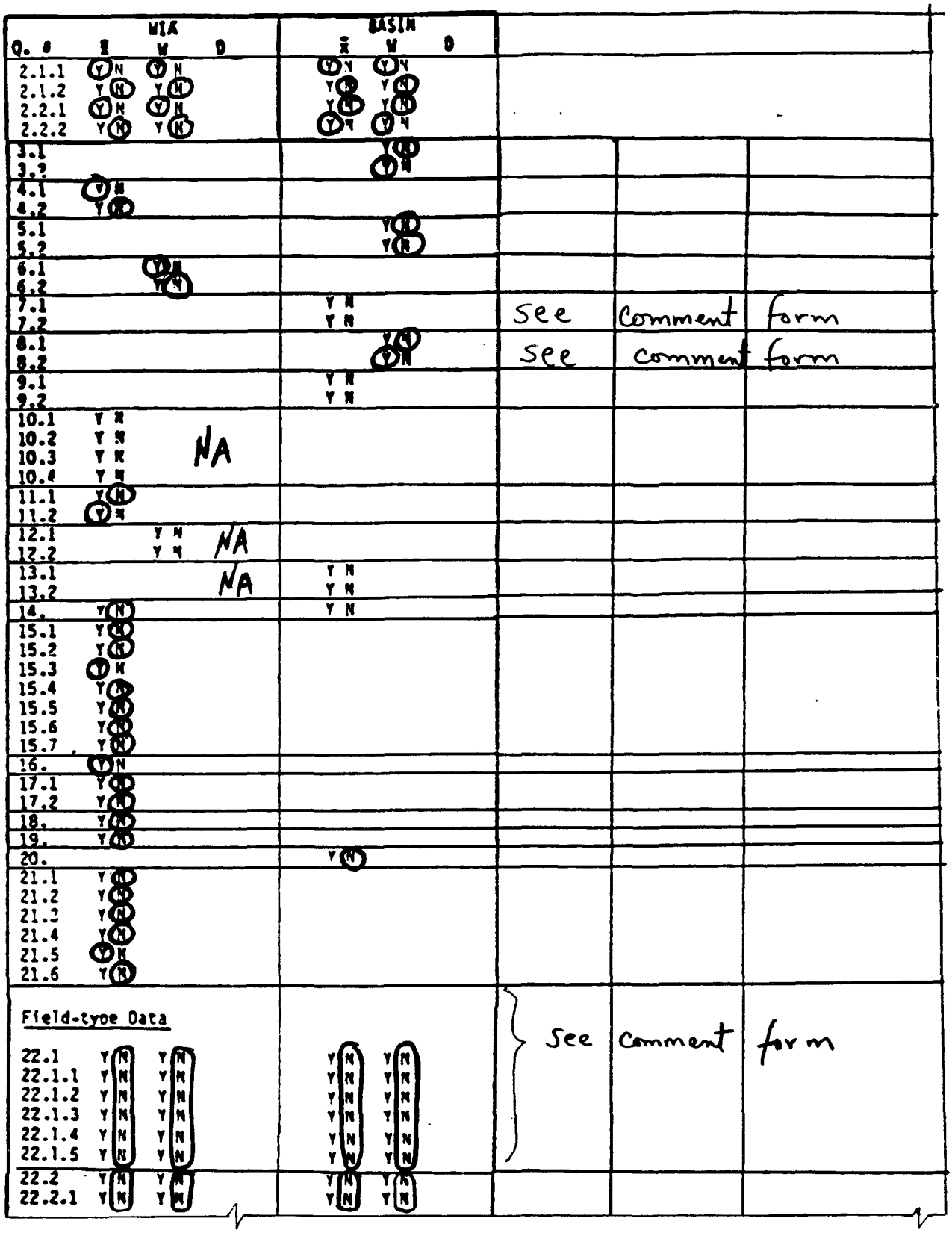
W column responses are those addressing what the area would look like (a) during the wettest time of an average year, or (b) if the area is tidal, what it would look like during an average daily high tide (flooded) condition.

D column responses are those addressing what the area would look like during either the driest time of the year (questions pertaining to hydrology) or if the question pertains to vegetation, then during the dormant time of the year. If the area is tidal, "D" refers to its daily low tide (exposed) condition.

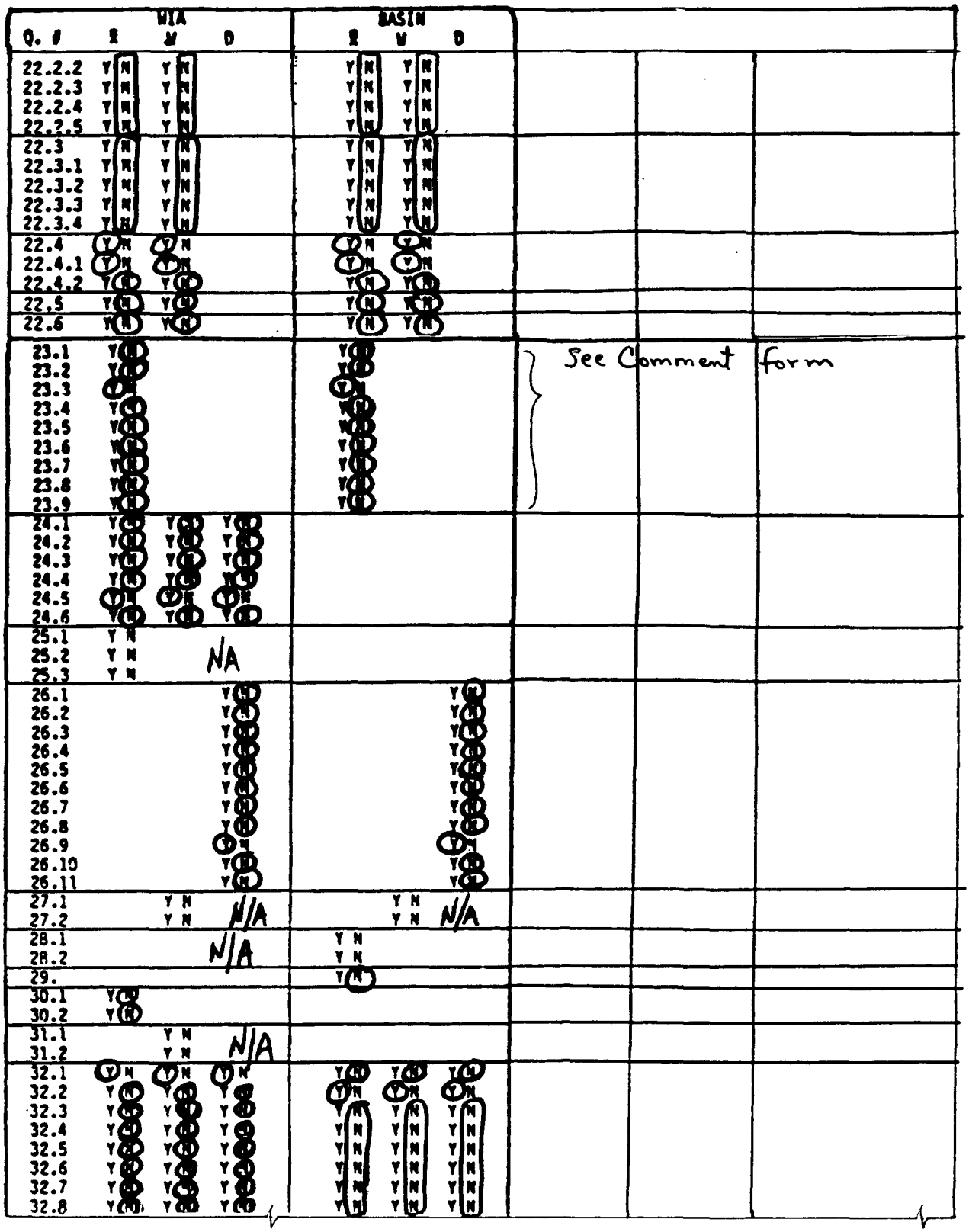
For example, question 2.1.1 should first be asked and answered in the context of the WIA's (wetland impact area's) average condition, then in terms of its wettest condition, then the basin's average condition, and finally the basin's wettest condition. This should then be repeated for question 2.1.2. Because no Y/N choice is given in either "D" column, the area's dry or dormant condition need not be evaluated for this question. Similarly, some questions will require responses only for the WIA or basin, but not both.

Q. #	WIA $\bar{X}$	WIA W	WIA D	BASIN $\bar{X}$	BASIN W	BASIN D	
Office-type Data							
1.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
1.2	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	
1.3	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	
1.3.1	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	Y (N)	

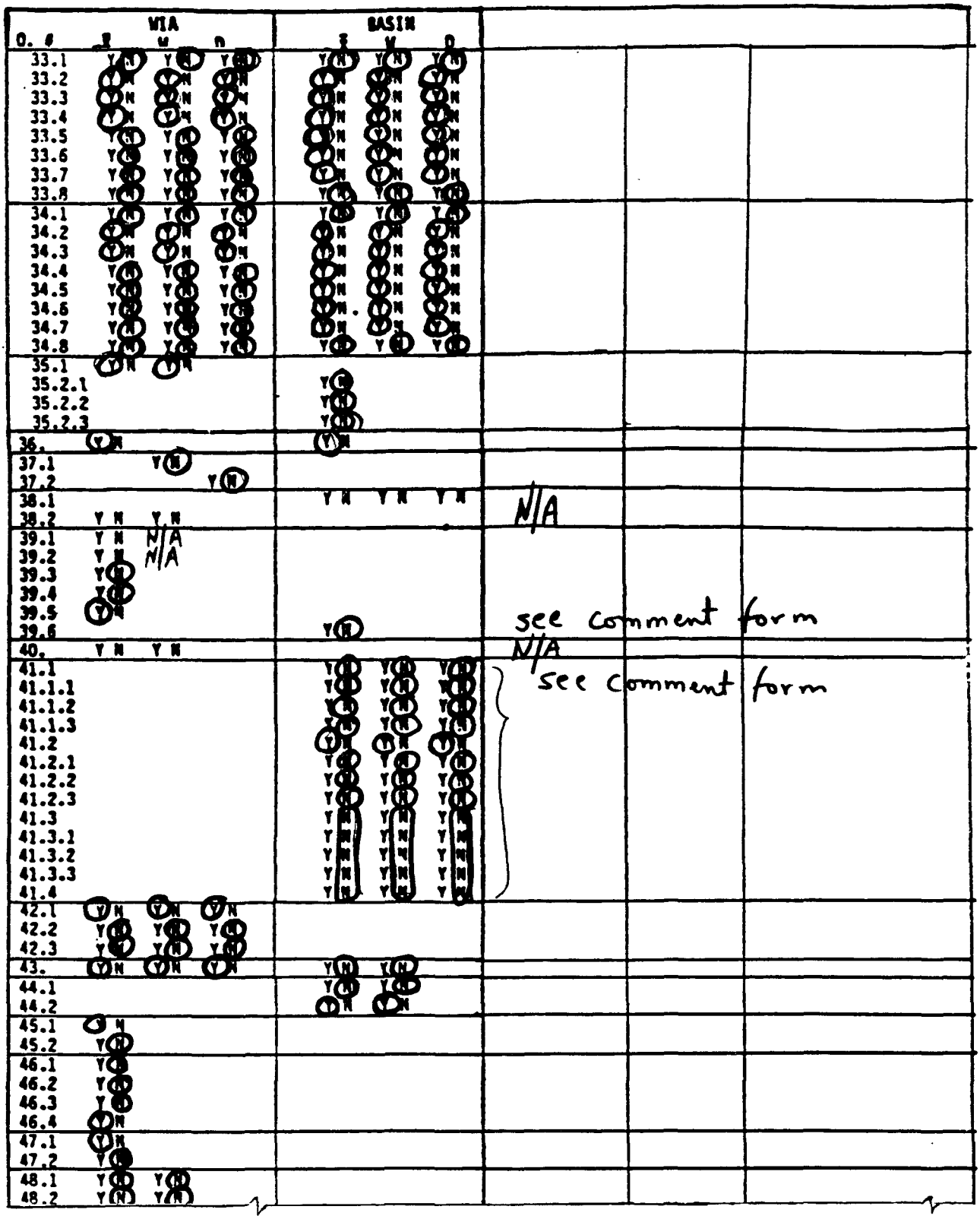
Chincoteague Channel Marsh



Chincoteague Channel Marsh



Chincoteague Channel Marsh



Chincoteague Channel Marsh

Q. #	AREA E	AREA W	AREA D	BASIN E	BASIN W	BASIN D
49.1				(Y) N		
49.2				Y (N)		
50.	(Y) N	(Y) N	(Y) N			
51.		(Y) N				
Detailed Data						
52.1.1	Y N	NA				
52.1.2	Y N	NA				
52.2.1	(Y) N					
52.2.2	Y (N)					
53.1	Y N					
53.2	Y N	NA				
54.1	Y N					
54.2	Y N	NA				
55.	Y N	NA				
56.		NA		Y N		
57.1	Y N					
57.2	Y N	NA				
57.3	Y N					
57.4	Y N					
58.1	Y N					
58.2	Y N					
58.3	Y N	NA				
58.4	Y N					
59.1				Y N		
59.2		NA		Y N		
59.3				Y N		
60.1					Y N	
60.2		NA		Y N		
60.3				Y N		
61.1	Y N	NA				
61.2	Y N					
62.	Y N	NA				
63.1					Y N	
63.2				NA	Y N	
64.				NA	Y N	
65.	(Y) N					
66.1		Y N			Y N	
66.2		Y N	NA		Y N	
67.1		Y N			Y N	
67.2		Y N	NA		Y N	
68.1	Y N				Y N	
68.2	Y N		NA		Y N	
Derived Responses						
69.1	Y N					
69.2	Y N					
70.1	Y N					
70.2	Y N					
71.1	Y N					
71.2	Y N					
72.1	Y N					
72.2	Y N					
73.1	Y N					
73.2	Y N					
74.1	Y N					
74.2	Y N					
75.1	Y N					
75.2	Y N					

After responses to all possible questions (Form A) have been recorded above, turn to Form B (page 38). You will(as an option) return to this sheet (in Section 2.1.2) to interpret the above responses.

Chincoteague Channel Marsh

Response Sheet B1

THRESHOLD ANALYSIS: SIGNIFICANCE

This sheet is the appropriate place for recording the responses to the corresponding questions in Form B. Circle Y (yes) or N (no), being careful to note that the order of Y and N below frequently reverses.

General
1.1 N Y
1.2 N Y
1.3 N Y
1.4 N Y
1.5 Y Y
1.6 N Y
2. Y N

Recharge
3. Y N
4. Y N
5. Y N
6. Y N
7. Y N
8. Y N
9. Y N
10. N Y

Discharge
11. Y N
12. Y N
13. Y N
14. Y N
15. N Y

Flood Storage
16. Y N
17. Y N
18. Y N
19. Y N
20. Y N
21. Y N
22. N Y

Shoreline Anchoring
23. Y N
24. Y N
25. Y N
26. Y N
27. Y N
28. Y N
29. N Y

Sediment Trapping
30. Y N
31. Y N
32. Y N
33. Y N
34. Y N
35. Y N
36. N Y

Nutrient Retention
37. Y N
38. Y N
39. Y N
40. Y N
41. Y N
42. N Y

Fish Food Chain/ Habitat
43. Y N
44. Y N
45. Y N
46. Y N
47. Y N
48. Y N
49. Y N
50. Y N
51. Y N
52. Y N
53. N Y

Wildlife Habitat
54. Y N
55. Y N
56. Y N
57. Y N
58. Y N
59. Y N
60. N Y

Active Recreation
61. Y N
62. Y N
63. Y N
64. Y N
65. Y N
66. Y N
67. N Y

Passive
68. Y N
69. Y N
70. Y N
71. Y N
72. Y N
73. Y N
74. Y N
75. Y N
76. Y N
77. Y N
78. N Y

Form "A" Comments (Chincoteague Channel Marsh Study Site)

WIA	= area inside dashed line (Figure 12)
Basin	= WIA + equivalent area (extending width of wetland into Chincoteague Bay)
7,8	Sub-watershed = cleared parking area around WIA
22	Basin (as well as WIA) considered emergent
23	< 50 cm porous organic
39.5	Two vegetated dams across creek. Origin unknown
41	Basin includes WIA

4. SUMMARY OF THE EIGHT CHINCOTEAGUE STUDY SITES

4.1 OVERALL IMPRESSIONS FROM FIELD VISITS

Most of the interior palustrine and estuarine wetlands (in contrast to fringing estuarine marshes) are the result of the basic ridge and swale topography. On a regional scale (nearby mainland and barrier islands), these wetlands are relatively unusual features and worthy of both scientific study and preservation efforts. Chincoteague palustrine wetlands, including emergent scrub/shrub and forested, are particularly unusual in this region. For example, on Assateague, most ridge and swale topography is either saline or has been altered for waterfowl management.

Clearly, these ridge and swale wetlands generally function for ground-water recharge and discharge with the surface (water table) aquifer. Since this aquifer is largely brackish, except for a thin surface layer of freshwater input from the palustrine wetlands, the palustrine wetlands are probably instrumental in preventing the aquifer from becoming more saline. Since most of Chincoteague's ridge and swale wetlands are probably connected by this surface aquifer, this means that filling or destruction of one wetland may adversely affect other wetlands, particularly the palustrine wetlands, on Assateague. This suggests that the destruction of more than one palustrine wetland may have a cumulative effect on other untouched, undeveloped wetlands by increasing the salinity of the surface aquifer. Furthermore, these cumulative effects may include reduced freshwater inflow to adjacent estuarine marshes which may alter their estuarine nature (i.e., intermediate salinity regime, nursery value, and protection for juvenile fishes).

At this point, these suggestions of hydrologic connectivity through the surface aquifer and cumulative impacts of palustrine wetland alteration remain hypothetical. The next step is a detailed topographic and ground-water hydrologic study (see Section 6.).

4.2 SUMMARY OF ADAMUS/STOCKWELL RATINGS

Summaries of the functional significance ratings for the eight sites (and two sub-sites) are given in Table 1. In section

Table 1. Functional significance ratings for each WIA and WIA subdivision evaluated in the study. Possible scores for each function are VH=very high, H=high, M=moderate, L=low, and VL=very low.

	Functional Significance Ratings																					
Site Name	Groundwater Recharge	Groundwater Discharge	Flood Storage	Shoreline Anchoring	Sediment Trapping	Nutrient Retention	Long Term	Seasonal	Flood Chain Support	Downstream	In Basin	Fishery Habitat	Warm water	Species*	Wildlife Habitat	General Diversity	Waterfowl Group 1	Waterfowl Group 2	Species**	Active Recreation	Swimming	Boat Launching	Power Boating	Canoeing	Sailing	Passive Recreation and Heritage
Chincoteague Ridge/Swales	M	M	H	M	H		VH	VH		M	M		L			H	M	M	M[d]		L	L	L	L	L	M
High School East	M	H	H	M	H		VH	VH		M	M		L	M[b]		H	M	M	M[d]		L	M	L	L	L	M
Fowling Gut - Estuarine Portion	L	L	H	M	VH		VH	VH		M	M		L	M[a,b,c]		M	L	L	H[e]		L	L	L	L	L	M
Fowling Gut - Palustrine Portion	H	H	VH	H	VH		H	H		M	M		L			M	L	L	L[f]		L	L	L	L	L	H
Mixed Hardwoods Swamp	H	L	VH	M	H		VH	VH		M	M		VL			L	L	M	M[d,g,L[f]]		VL	VL	VL	VL	VL	M
Mire Pond Fill Site	L	L	H	M	VH		VH	VH		M	M		L	M[a,b,c]		M	L	L	H[e],L[f]		L	L	L	M	L	M
Mire Pond Scrub-Shrub-Estuarine Portion	L	L	H	M	VH		VH	VH		M	M		L	M[a,b,c]		M	L	L	H[e],L[f]		L	L	L	M	L	M
Mire Pond Scrub-Shrub-Palustrine Portion	H	L	VH	M	VH		VH	VH		M	M		L			L	L	L	L[f]		L	L	L	L	L	M
Ocean Breezes South	L	L	H	VH	VH		VH	VH		M	M		L	M[a,b,c]		M	L	L	H[e]		L	L	L	L	L	M
Chincoteague Channel Marsh	L	H	H	H	H		H	H		M	M		L	M[a,b,c]		M	L	L	H[e]		L	L	L	L	L	M

*a=bluefish, b=winter flounder, c=hard clam **d=wood duck, e=common egret, f=black duck, g=black-crowned night-heron

5. we discuss the Adamus/Stockwell technique and compare the ratings from our own subjective impressions formed while field-surveying the sites.

5. COMMENTS ON THE ADAMUS/STOCKWELL TECHNIQUE AS RELATED TO CHINCOTEAGUE WETLANDS

5.1 GENERAL COMMENTS

The Adamus and Stockwell method is designed to objectively assess potential wetland functional values based on simple physical, chemical, and biological indicators along with socioeconomic trends. Simple yes-no responses to 153 questions are categorized and evaluated to derive final summary ratings (very low, low, moderate, high, very high) for each of eleven functional values. Though widely regarded as an improvement over earlier attempts to develop wetland rating systems, the method remains relatively new and untested.

Upon receiving the Adamus/Stockwell document, we were impressed with the interdisciplinary breadth of the literature review. Almost any wetland scientist will find new references and ideas contained in this portion of the document.

After using the method on eight different sites on Chincoteague Island, Virginia, we have concluded that for this area the Adamus/Stockwell technique works relatively well in its current form and has even more promise if revised, regionalized, and "fine-tuned" in the future. We have identified six problem areas with the technique in its present form. Though these problems interfere somewhat with assessments, we feel that the outcomes of the Chincoteague study were not seriously affected. (See the next section for examples of possible minor problems with specific ratings.)

We have identified six problem areas with the Adamus/Stockwell technique in its present form. These are presented below in no particular order of importance.

(1) <u>The method is best suited for the assessment of small homogenous areas.</u> Heterogenous sites create problems for users of the Adamus technique. When answering the numerous questions that require the observer to take an average over a widespread and diverse wetland, in effect one loses the ability to describe any part of the wetland accurately. In two cases (Fowling Gut and Mire Pond Scrub/Shrub sites) we found such basic differences in wetland vegetation, hydroperiod, and flow characteristics

within the same WIA that it became necessary to divide the WIA into two sections. Of course, this criticism applies to almost all wetland assessment techniques.

(2) The method can be applied much more reliably where detailed, site-specific data are available. Detailed data, rather than gross physical features lend the strongest support to hypotheses concerning wetland functions in this assessment system. In addition, without detailed data the final rating of a wetland for a particular function may be artificially moderate. A moderate rating may mean that a wetland has a truly moderate value, or it may only mean that the assessment has been inconclusive due to a lack of detailed data. The system guards against assigning high or low values without sufficient data. This may have affected, for example, fishery and wildlife ratings at many of the Chincoteague sites.

(3) Answers to Form B depend entirely upon the perspective of the user. A reliable, functional rating method should have a high degree of accuracy and reproducibility. The questions in Form B give essentially free-reign to the user to interpret local socioeconomic trends. There also exists a high degree of latitude in assigning the final ratings. The Form B evaluation has undergone significant modification in a revision of the Adamus and Stockwell method due out in late 1986. Since these modifications were not available when this evaluation was conducted, the results for this section may be inaccurate.

(4) The method may contain a high degree of subjectivity. In the complex structure of the Form A interpretation key there may be junctures in which the outcome becomes extremely sensitive to certain questions. In fact, we found in several instances that the differences between a high and a moderate (or even a high and a low) rating could hinge upon the answer to a single question. Identification of these pivotal questions is essential. Pivotal questions could be identified through some sort of computer generated sensitivity analyses as is often done in systems analysis and operations research. The results of the analyses could then be checked for consistency and potential uneven outcomes.

(5) The method requires that experienced wetland scientists perform the assessment if results are to be accurate and reproducible. We believe that in the long run the accuracy of the ratings derived from this method will be inseparable from the skills and training of the observer (knowledge of hydrology, field botany, etc.) in all but the simplest wetlands. The method is an excellent aid that can broaden the perspective of a research scientist, but given the inherent problems described above, there remains no substitute for extensive training and experience in wetland science.

(6) The method has potential problems dealing with wetlands in different regions. While this problem did not appear to seriously affect the Chincoteague study, it is clear that the technique needs to be modified for certain regions (e.g., tropics, Pacific coast, far north). The only real problems in this area for the Chincoteague study involved the estuarine fish species supposedly important to this region (see the next section).

5.2 SPECIFIC COMMENTS CONCERNING THE CHINCOTEAGUE ANALYSES

In general, the Adamus/Stockwell Technique appears to have functioned well for this set of eight wetlands. This opinion is based on a comparison of calculated values versus estimated values (the latter are expert opinions based on our own field and academic experience with similar wetlands).

One of the most confusing aspects of wetlands assessments involves "effectiveness" and "opportunity." For example, at the present time a specific wetland may be potentially very effective at sediment trapping, but there may be no sediment to trap. Twenty years later after a construction activity, there may be plenty of opportunity to trap sediment. One of our biggest problems, particularly in our personal assessments of a particular site, is reconciling "effectiveness" and "opportunity." The Adamus/Stockwell technique handles this problem relatively well. Therefore, in most cases, we agree closely with the values reported in Table 1.

Several values in Table 1, however, appear to be too low or too high. For example, the ground-water discharge values for Chincoteague Channel Marsh, which has a small drainage area, seem too high (probably should be a 3 instead of a 2). On the other hand, the value for Ocean Breezes south, which has a relatively large area for infiltration and two outlets, seems too low (probably should be at least a 3 instead of a 4).

In certain cases (e.g., food chain support, wildlife habitat), the ratings are almost uniformly the same at all sites. This can be traced to the problem of insufficient field data (seasonal counts of waterfowl, fish surveys, etc.) which we discussed in 5.1.

The moderate values (3) for "fishery habitat by species" are probably too low (should be 2). These underestimates were generated by the non-inclusion of species such as spot and croaker in the Adamus listing of important estuarine dependent fishes for this region (see Table 8, page 78 in Adamus/Stockwell, 1983).

In summary, the majority of the rankings in Table 1 seem fair and consistent with our opinions based on field observations.

6. RESEARCH NEEDS

The functional role of the interior wetlands of barrier islands of the coastal United States has not been as intensively studied as that of riverine or tidal wetlands. In the extensive review of wetland functional values by Adamus and Stockwell (1983), few citations apply directly to hydrologic and nutrient retention values of coastal wetlands other than salt marshes. Less attention in research has been given to swales, dune slacks and other varieties of interior, coastal wetlands. On Chincoteague Island, basic research would sharpen understanding and strengthen conclusions concerning the functional role of the swale wetlands in the hydrology and ecology of the island. Basic research is time consuming and expensive. Yet if planned correctly, such work could provide an invaluable environmental management tool.

Research that could improve understanding of the hydrology and nutrient retention capacity of Chincoteague's wetlands is described briefly below.

1. Microtopographic survey. Stereo-photogrammetric aerial photography could be used to map 1' elevation contours, to identify and categorize wetlands, channels, borrow pits, drainage ditches, culverts and other drainage modifications. Large scale photography (1" = 500') would be essential. This mapping would represent a substantial improvement over existing photography and contour mapping of the island. It would be invaluable in conducting a baseline inventory and classification of wetlands and surface water bodies (e.g., probable degree of isolation) on the island. Field ground truthing would be an essential component of this work.

2. Surface water drainage. Channel cross section data, water level gauging and current velocity measurements could be made to establish stage-discharge relationships in the Jeep Trail Ditch, Fowling Gut, and Andrews Landing Gut. These data are necessary to calculate surface discharge from the island under various conditions of water stage.

3. Groundwater. On selected transects wells could be installed, soil borings examined and described qualitatively, grain size analyzed vs. depth, and possible confining layers identified for the water table aquifer. Within the wells, pump

tests would allow determination of transmissivity within the water table aquifer. Daily or weekly monitoring of water levels within wells for a minimum of one year in addition to rainfall measurements, evaporation estimates, and surface water drainage estimates would provide the basic data needed to construct wetland water budgets.

4. Simulation of water table aquifer dynamics. Ground-water models have been used successfully for aquifer simulation in other coastal environments. An existing model could be modified and validated against field data from Chincoteague and then used to quantitatively assess the effects of simplified model scenarios such as culvert removal, complete blockage of major surface drainways, and other wetland manipulations.

5. Water quality. Salinity, coliforms, total dissolved solids, dissolved N and P, metals (Pb), pH, and suspended solids (of surface water) could be monitored in major surface drainways and within wells on selected transects. This would indicate both the amount of lateral movement of pollutants from highways, septic fields, and the like and the effect of selected wetlands on interception and retention of these pollutants.

In addition to the hydrologic studies, seasonal studies of waterfowl and fishes at specific wetland sites are desirable. The results might alter the Adamus/Stockwell values for fishery and wildlife habitat functions.

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50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. NWRC Open File Report 86-7	2.	3. Recipient's Accession No.

4. Title and Subtitle
The Functional Assessment of Selected Wetlands of Chincoteague Island, Virginia

5. Report Date
May 1986

6.

7. Author(s)
W. E. Odum, J. Harvey, L. Rozas, R. Chambers*

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U.S. Fish and Wildlife Service
National Wetlands Research Center
1010 Gause Blvd.
Slidell, LA 70458

U.S. Environmental Protection Agency
Wetlands and Marine Policy Section
Region 3
Philadelphia, PA 19107

13. Type of Report & Period Covered

14.

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16. Abstract (Limit: 200 words)

At the request of the U.S. Environmental Protection Agency, a study was conducted to assess the potential hydrologic and ecologic functions of eight wetlands sites on Chincoteague Island, Virginia. These sites ranged from 4 to 21 ha and included estuarine emergent and scrub/shrub wetlands as well as palustrine emergent, scrub/shrub, and forested wetlands.

The author was asked to use the 1983 Adamus/Stockwell technique as the assessment method and to provide general descriptions of the sites and the suitability of the technique for assessing the wetlands.

This report discusses the results of the assessment and the problems with some of the ratings.

17. Document Analysis a. Descriptors
Fresh and estuarine wetlands, hydrologic functions, ecological functions, recreational values

b. Identifiers/Open-Ended Terms
Adamus/Stockwell technique
Chincoteague Island, VA

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited release	Unclassified	127
	20. Security Class (This Page) Unclassified	22. Price

(See ANSI-Z39.18)

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce