

AN ASSESSMENT OF THE BIRDLIFE
OF THE PINELANDS NATIONAL RESERVE/PINELANDS AREA

Prepared for the
NEW JERSEY PINELANDS COMMISSION

by

SHARON ANN BRADY, Principal Investigator
Research Associate, New Jersey Audubon Society

January 11, 1980

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INTRODUCTION

The purpose of this report to the New Jersey Pinelands Commission is to assess the birdlife of the region of New Jersey designated as the Pinelands National Reserve/Pinelands Area (hereafter PNR/PA). In doing so we have compiled all available information on abundance and on distribution by watershed and habitat of each species occurring regularly in the area. Our research has indicated certain habitats and certain specific sites that are of particular importance within the PNR/PA ecosystem. We have determined how various human-related environmental disturbances will influence birdlife and have recommended land-use management techniques to prevent or mitigate undesirable effects.

Reliable information was not available for many species of Pinelands birds, emphasizing that field investigation is imperative if efforts to protect these species are to be planned intelligently. Likewise, the importance of certain habitats to certain bird species requires study. Furthermore, little or no documentation exists on the birdlife of much of the interior of the PNR/PA.

METHODS

In preparing this report we consulted books, periodicals, reports and publications of federal and state agencies, and banding records, and corresponded with knowledgeable observers.

We examined records of field observations for the period 1962-1979 published by the NJ Audubon Society and Christmas Count records published in American Birds for the period 1970-1978. The writings of Stone (1937) and Fables (1955) were used to provide perspective on historical changes in species' status, and to suggest possible reasons for these changes. Much valuable information on the habitat requirements of Pine-lands birds was also obtained from Stone and Fables and was supplemented by the personal knowledge of the NJ Audubon staff.

Species' designations as Endangered, Threatened, Declining, Extirpated, or Undetermined are those from the official state list published by the Nongame and Endangered Species Project of the NJ Division of Fish, Game, and Shell Fisheries. Any disagreements with these designations (as indicated in the Species Comments) are based on our interpretations of the available data and on our personal experience with the species involved. Another valuable source of information on species' status is the Blue List published annually by American Birds, a list of species which, in the opinion of active field observers reporting to this periodical, "have recently or are currently giving evidence of population declines, either regionally or continent-wide." We have included the Blue Listed designation for a species only where applicable to our region.

INVENTORY

The following species list, species comments, and habitat and watershed charts include 299 species of regular occurrence in the PNR/PA plus three widely recognized subspecies. About another 60 species of documented but accidental or casual occurrence in the PNR/PA were not included because in each case the bird does not form an important ecological component of the Pinelands avifauna.

The distribution of species by watershed and by county was based on all pertinent recent sources of information and reflects the obvious lack of data, especially regarding the commoner species. Often the rarer, more sought-after species are reported more conscientiously, resulting in a disproportionate number of records. For instance, reports of the Threatened Red-headed Woodpecker are much more frequent than are those of the much commoner Downy Woodpecker (see chart).

Although documentation is lacking, it can be safely assumed that most if not all the common species have probably occurred in all watershed and all counties where appropriate habitat exists.

Keys for Inventory Section

Abbreviations Used Throughout the Text

BNWR--Brigantine National Wildlife Refuge
F & WMA--State Fish and Wildlife Management Area
NAFEC--National Aviation Facilities Experimental Center
(Egg Harbor Twp., Atlantic County)

Abbreviations Used in Status and Habitat Chart

S--Summer Resident	C--Common
W--Winter Resident	U--Uncommon
M--Migrant (spring or fall or both)	R--Rare
PO--Pine-Oak forest	
OP--Oak-Pine forest	
PPL--Pitch-Pine Lowland	
C--Cedar Swamp	
EDW-- Hardwood Swamp	
E2O--Open water of lakes, ponds, reservoirs, rivers	
BGG--Cranberry bogs and their immediate environs	
EM--Inland marsh, including margins of lakes, ponds, reservoirs, rivers	
CM--Coastal marsh, including both saltmarsh and fresh- water marshes and impoundments near the coast, e.g., at BNWR	
AGR--Agricultural land of all types	
URB--Developed areas (cities, towns, and residential de- velopments)	
NF--Nonforested areas (including airports, garbage dumps, landfills, golf courses, etc.)	
OF--Old fields in all stages of succession	
ISL--Coastal islands, whether saltmarsh or dredge spoil	
BB--Barrier beach strips, including all habitats therein from oceanside to bayside beaches	
NPB--Non-Pine-Barrens, i.e., mesic deciduous woodlands	
*--indicates breeding species within the PNR/PA	
X--indicates primary nesting habitat	
x--indicates occurrence within habitat, in most cases as a nonbreeder	

Example: Pied-billed Grebe is a breeding species, rare in summer, uncommon in winter, and a common migrant. It nests in the PNR/PA in bogs, and inland and coastal marshes, and occurs in water and bay habitats as a migrant or winter resident.

Abbreviations Used in Watershed and County Chart

In compiling this chart we used maps and watershed designations provided by Pinelands Commission staff.

Watersheds.

RC--Rancocas Creek

N--North Branch

S--South Branch

C--Crosswicks Creek

M--Lower Maurice River and Manamuskin Creek

D--Dennis Creek

MR--Mullica River

LM--Lower Mullica

W--Wading River

B--Batsto River

MA--Mechesactauxin and Atsion Rivers

N--Nescochaque River

F--Forked River (including Cedar Creek)

GEHR--Great Egg Harbor River

L--Lower

U--Upper

T--Tuckahoe River

TM--Toms River

AD--Atlantic Drainage (including Doughty, Absecon, and Patcong Creeks)

X--indicates documented breeding within watershed

x--indicates documented occurrence within watershed

Counties

A--Atlantic

CM--Cape May

G--Gloucester

B--Burlington

CU--Cumberland

x--indicates docu-

CA--Camden

O--Ocean

mented occurrence
within county

List of Bird Species Regularly Occurring
in the Pinelands Area

Common Loon <u>Gavia immer</u>	Whistling Swan <u>Olor columbianus</u>
Red-throated Loon <u>Gavia stellata</u>	Canada Goose <u>Branta canadensis</u>
Red-necked Grebe <u>Podiceps grisegena</u>	Brant <u>Branta bernicla</u>
Horned Grebe <u>Podiceps auritus</u>	Snow Goose <u>Chen caerulescens</u>
Pied-billed Grebe <u>Podilymbus podiceps</u>	Mallard <u>Anas platyrhynchos</u>
Great Cormorant <u>Phalacrocorax carbo</u>	Black Duck <u>Anas rubripes</u>
Double-crested Cormorant <u>Phalacrocorax auritus</u>	Gadwall <u>Anas strepera</u>
Great Blue Heron <u>Ardea herodias</u>	Northern Pintail <u>Anas acuta</u>
Green Heron <u>Butorides virescens</u>	Green-winged Teal <u>Anas crecca</u>
Little Blue Heron <u>Florida caerulea</u>	Blue-winged Teal <u>Anas discors</u>
Cattle Egret <u>Bubulcus ibis</u>	European Wigeon <u>Anas penelope</u>
Great Egret <u>Casmerodius albus</u>	American Wigeon <u>Anas americana</u>
Snowy Egret <u>Egretta thula</u>	Northern Shoveler <u>Anas clypeata</u>
Louisiana Heron <u>Hydranassa tricolor</u>	Wood Duck <u>Aix sponsa</u>
Black-crowned Night Heron <u>Nycticorax nycticorax</u>	Redhead <u>Aythya americana</u>
Yellow-crowned Night Heron <u>Nyctanassa violacea</u>	Ring-necked Duck <u>Aythya collaris</u>
Least Bittern <u>Ixobrychus exilis</u>	Canvasback <u>Aythya valisineria</u>
American Bittern <u>Botaurus lentibinosus</u>	Greater Scaup <u>Aythya marila</u>
Glossy Ibis <u>Plegadis falcinellus</u>	Lesser Scaup <u>Aythya affinis</u>
White Ibis <u>Eudocimus albus</u>	Common Goldeneye <u>Bucephala clangula</u>
Mute Swan <u>Cygnus olor</u>	Bufflehead <u>Bucephala albeola</u>

Oldsquaw <u>Clangula hyemalis</u>	Merlin <u>Falco columbarius</u>
White-winged Scoter <u>Melanitta deglandi</u>	American Kestrel <u>Falco sparverius</u>
Surf Scoter <u>Melanitta perspicillata</u>	Ruffed Grouse <u>Bonasa umbellus</u>
Black Scoter <u>Melanitta nigra</u>	Common Bobwhite <u>Colinus virginianus</u>
Ruddy Duck <u>Oxyura jamaicensis</u>	Ring-necked Pheasant <u>Phasianus colchicus</u>
Hooded Merganser <u>Lophodytes cucullatus</u>	King Rail <u>Rallus elegans</u>
Common Merganser <u>Mergus merganser</u>	Clapper Rail <u>Rallus longirostris</u>
Red-breasted Merganser <u>Mergus serrator</u>	Virginia Rail <u>Rallus limicola</u>
Turkey Vulture <u>Cathartes aura</u>	Sora <u>Porzana carolina</u>
Black Vulture <u>Coragyps atratus</u>	Yellow Rail <u>Coturnicops noveboracensis</u>
Northern Goshawk <u>Accipiter gentilis</u>	Black Rail <u>Laterallus jamaicensis</u>
Sharp-shinned Hawk <u>Accipiter striatus</u>	Common Gallinule <u>Gallinula chloropus</u>
Cooper's Hawk <u>Accipiter cooperii</u>	American Coot <u>Fulica americana</u>
Red-tailed Hawk <u>Buteo jamaicensis</u>	American Oystercatcher <u>Haematopus palliatus</u>
Red-shouldered Hawk <u>Buteo lineatus</u>	Semipalmated Plover <u>Charadrius semipalmatus</u>
Broad-winged Hawk <u>Buteo platypterus</u>	Piping Plover <u>Charadrius melodus</u>
Rough-legged Hawk <u>Buteo lagopus</u>	Killdeer <u>Charadrius vociferus</u>
Golden Eagle <u>Aquila chrysaetos</u>	American Golden Plover <u>Pluvialis dominica</u>
Bald Eagle <u>Haliaeetus leucocephalus</u>	Black-bellied Plover <u>Pluvialis squatarola</u>
Northern Harrier <u>Circus cyaneus</u>	Ruddy Turnstone <u>Arenaria interpres</u>
Osprey <u>Pandion haliaetus</u>	American Woodcock <u>Philohela minor</u>
Peregrine Falcon <u>Falco peregrinus</u>	Common Snipe <u>Capella gallinago</u>

Whimbrel	Ruff
<u>Numenius phaeopus</u>	<u>Philomachus pugnax</u>
Upland Sandpiper	Sanderling
<u>Bartramia longicauda</u>	<u>Calidris alba</u>
Spotted Sandpiper	American Avocet
<u>Actitis macularia</u>	<u>Recurvirostra americana</u>
Solitary Sandpiper	Black-necked Stilt
<u>Tringa solitaria</u>	<u>Himantopus mexicanus</u>
Willet	Red Phalarope
<u>Catoptrophorus semipalmatus</u>	<u>Phalaropus fulicarius</u>
Greater Yellowlegs	Wilson's Phalarope
<u>Tringa melanoleuca</u>	<u>Steganopus tricolor</u>
Lesser Yellowlegs	Northern Phalarope
<u>Tringa flavipes</u>	<u>Lobipes lobatus</u>
Red Knot	Glaucous Gull
<u>Calidris canutus rufa</u>	<u>Larus hyperboreus</u>
Pectoral Sandpiper	Iceland Gull
<u>Calidris melanotos</u>	<u>Larus glaucoides</u>
White-rumped Sandpiper	Great Black-backed Gull
<u>Calidris fuscicollis</u>	<u>Larus marinus</u>
Baird's Sandpiper	Lesser Black-backed Gull
<u>Calidris bairdii</u>	<u>Larus fuscus</u>
Least Sandpiper	Herring Gull
<u>Calidris minutilla</u>	<u>Larus argentatus</u>
Curlew Sandpiper	Ring-billed Gull
<u>Calidris ferruginea</u>	<u>Larus delawarensis</u>
Dunlin	Black-headed Gull
<u>Calidris alpina</u>	<u>Larus ridibundus</u>
Short-billed Dowitcher	Laughing Gull
<u>Limnodromus griseus</u>	<u>Larus atricilla</u>
Long-billed Dowitcher	Bonaparte's Gull
<u>Limnodromus scolopaceus</u>	<u>Larus philadelphia</u>
Stilt Sandpiper	Little Gull
<u>Micropalama himantopus</u>	<u>Larus minutus</u>
Semipalmated Sandpiper	Gull-billed Tern
<u>Calidris pusillus</u>	<u>Gelocheidon nilotica</u>
Western Sandpiper	Forster's Tern
<u>Calidris mauri</u>	<u>Sterna forsteri</u>
Buff-breasted Sandpiper	Common Tern
<u>Tryngites subruficollis</u>	<u>Sterna hirundo</u>
Marbled Godwit	Roseate Tern
<u>Limosa fedora</u>	<u>Sterna dougallii</u>
Hudsonian Godwit	Least Tern
<u>Limosa haemastica</u>	<u>Sterna albifrons</u>

Royal Tern <u>Thalasseus maximus</u>	Common Flicker <u>Colaptes auratus</u>
Caspian Tern <u>Hydroprogne caspia</u>	Pileated Woodpecker <u>Dryocopus pileatus</u>
Black Tern <u>Chlidonias niger</u>	Red-bellied Woodpecker <u>Centurus carolinus</u>
Black Skimmer <u>Rynchops niger</u>	Red-headed Woodpecker <u>Melanerpes erythrocephalus</u>
Rock Dove <u>Columbia livia</u>	Yellow-bellied Sapsucker <u>Sphyrapicus varius</u>
Mourning Dove <u>Zenaida macroura</u>	Hairy Woodpecker <u>Dendrocopus villosus</u>
Yellow-billed Cuckoo <u>Coccyzus americanus</u>	Downy Woodpecker <u>Dendrocopus pubescens</u>
Black-billed Cuckoo <u>Coccyzus erythrophthalmus</u>	Eastern Kingbird <u>Tyrannus tyrannus</u>
Barn Owl <u>Tyto alba</u>	Western Kingbird <u>Tyrannus verticalis</u>
Common Screech Owl <u>Otus asio</u>	Great Crested Flycatcher <u>Myiarchus crinitus</u>
Great Horned Owl <u>Bubo virginianus</u>	Eastern Phoebe <u>Sayornis phoebe</u>
Snowy Owl <u>Nyctea scandiaca</u>	Yellow-bellied Flycatcher <u>Empidonax flaviventris</u>
Barred Owl <u>Strix varia</u>	Acadian Flycatcher <u>Empidonax virescens</u>
Long-eared Owl <u>Asio otus</u>	Willow Flycatcher <u>Empidonax trailii</u>
Short-eared Owl <u>Asio flammeus</u>	Least Flycatcher <u>Empidonax minimus</u>
Saw-whet Owl <u>Aegolius acadicus</u>	Eastern Wood Pewee <u>Contopus virens</u>
Chuck-Will's Widow <u>Caprimulgus carolinensis</u>	Olive-sided Flycatcher <u>Nuttallornis borealis</u>
Whip-Poor-Will <u>Caprimulgus vociferus</u>	Horned Lark <u>Eremophila alpestris</u>
Common Nighthawk <u>Chordeiles minor</u>	Tree Swallow <u>Iridoprocne bicolor</u>
Chimney Swift <u>Chaetura pelagica</u>	Bank Swallow <u>Riparia riparia</u>
Ruby-throated Hummingbird <u>Archilochus colubris</u>	Rough-winged Swallow <u>Stelgidopteryx ruficollis</u>
Belted Kingfisher <u>Megaceryle alcyon</u>	Barn Swallow <u>Hirundo rustica</u>

Cliff Swallow <u>Petrochelidon pyrrhonota</u>	Gray-cheeked Thrush <u>Catharus minima</u>
Blue Jay <u>Cyanocitta cristata</u>	Veery <u>Catharus fuscescens</u>
Common Crow <u>Corvus brachyrhynchos</u>	Eastern Bluebird <u>Sialia sialis</u>
Fish Crow <u>Corvus ossifragus</u>	Blue-gray Gnatcatcher <u>Polioptila caerulea</u>
Black-capped Chickadee <u>Parus atricapillus</u>	Golden-crowned Kinglet <u>Regulus satrapa</u>
Carolina Chickadee <u>Parus carolinensis</u>	Ruby-crowned Kinglet <u>Regulus calendula</u>
Tufted Titmouse <u>Parus bicolor</u>	Water Pipit <u>Anthus spinoletta</u>
White-breasted Nuthatch <u>Sitta carolinensis</u>	Cedar Waxwing <u>Bombycilla cedrorum</u>
Red-breasted Nuthatch <u>Sitta canadensis</u>	Northern Shrike <u>Lanius excubitor</u>
Brown Creeper <u>Certhia familiaris</u>	Loggerhead Shrike <u>Lanius ludovicianus</u>
House Wren <u>Troglodytes aedon</u>	Starling <u>Sturnus vulgaris</u>
Winter Wren <u>Troglodytes troglodytes</u>	White-eyed Vireo <u>Vireo griseus</u>
Carolina Wren <u>Thryothorus ludovicianus</u>	Solitary vireo <u>Vireo solitarius</u>
Long-billed Marsh Wren <u>Telmatodytes palustris</u>	Red-eyed Vireo <u>Vireo olivaceus</u>
Short-billed Marsh Wren <u>Cistothorus platensis</u>	Philadelphia Vireo <u>Vireo philadelphicus</u>
Northern Mockingbird <u>Mimus polyglottos</u>	Warbling Vireo <u>Vireo gilvus</u>
Gray Catbird <u>Dumetella carolinensis</u>	Black-and-White Warbler <u>Mniotilta varia</u>
Brown Thrasher <u>Toxostoma rufum</u>	Prothonotary Warbler <u>Protonotaria citrea</u>
American Robin <u>Turdus migratorius</u>	Swainson's Warbler <u>Limnothlypis swainsonii</u>
Wood Thrush <u>Hylocichla mustelina</u>	Worm-eating Warbler <u>Helmitheros vermivorus</u>
Hermit Thrush <u>Catherus guttata</u>	Golden-winged Warbler <u>Vermivora chrysoptera</u>
Swainson's Thrush <u>Catharus ustulata</u>	Blue-winged Warbler <u>Vermivora pinus</u>

"Brewster's" Warbler <u>Vermivora leucobronchialis</u>	Northern Waterthrush <u>Seiurus noveboracensis</u>
"Lawrence's" Warbler <u>Vermivora lawrencei</u>	Louisiana Waterthrush <u>Seiurus motacilla</u>
Tennessee Warbler <u>Vermivora peregrina</u>	Kentucky Warbler <u>Oporornis formosus</u>
Orange-crowned Warbler <u>Vermivora celata</u>	Connecticut Warbler <u>Oporornis agilis</u>
Nashville Warbler <u>Vermivora ruficapilla</u>	Mourning Warbler <u>Oporornis philadelphia</u>
Northern Parula <u>Parula americana</u>	Common Yellowthroat <u>Geothlypis trichas</u>
Yellow Warbler <u>Dendroica petechia</u>	Yellow-breasted Chat <u>Icteria virens</u>
Magnolia Warbler <u>Dendroica magnolia</u>	Hooded Warbler <u>Wilsonia citrina</u>
Cape May Warbler <u>Dendroica tigrina</u>	Wilson's Warbler <u>Wilsonia pusilla</u>
Black-throated Blue Warbler <u>Dendroica caerulescens</u>	Canada Warbler <u>Wilsonia canadensis</u>
Yellow-rumped Warbler <u>Dendroica coronata</u>	American Redstart <u>Setophaga ruticilla</u>
Black-throated Green Warbler <u>Dendroica virens</u>	House Sparrow <u>Passer domesticus</u>
Cerulean Warbler <u>Dendroica cerulea</u>	Bobolink <u>Dolichonyx oryzivorus</u>
Blackburnian Warbler <u>Dendroica fusca</u>	Eastern Meadowlark <u>Sturnella magna</u>
Yellow-throated Warbler <u>Dendroica dominica</u>	Red-winged Blackbird <u>Agelaius phoeniceus</u>
Chestnut-sided Warbler <u>Dendroica pensylvanica</u>	Orchard Oriole <u>Icterus spurius</u>
Bay-breasted Warbler <u>Dendroica castanea</u>	Northern Oriole <u>Icterus galbula</u>
Blackpoll Warbler <u>Dendroica striata</u>	Rusty Blackbird <u>Euphagus carolinus</u>
Pine Warbler <u>Dendroica pinus</u>	Boat-tailed Grackle <u>Cassidix major</u>
Prairie Warbler <u>Dendroica discolor</u>	Common Grackle <u>Quiscalus quiscula</u>
Palm Warbler <u>Dendroica palmarum</u>	Brown-headed Cowbird <u>Molothrus ater</u>
Ovenbird <u>Seiurus aurocapillus</u>	Scarlet Tanager <u>Piranga olivacea</u>

Summer Tanager <u>Piranga rubra</u>	Vesper Sparrow <u>Pooecetes gramineus</u>
Common Cardinal <u>Cardinalis cardinalis</u>	Lark Sparrow <u>Chondestes grammacus</u>
Rose-breasted Grosbeak <u>Pheucticus ludovicianus</u>	Dark-eyed Junco <u>Junco hyemalis</u>
Blue Grosbeak <u>Guiraca caerulea</u>	Tree Sparrow <u>Spizella arborea</u>
Indigo Bunting <u>Passerina cyanea</u>	Chipping Sparrow <u>Spizella passerina</u>
Dickcissel <u>Spiza americana</u>	Clay-colored Sparrow <u>Spizella pallida</u>
Evening Grosbeak <u>Hesperiphona vespertina</u>	Field Sparrow <u>Spizella pusilla</u>
Purple Finch <u>Carpodacus purpureus</u>	White-crowned Sparrow <u>Zonotrichia leucophrys</u>
House Finch <u>Carpodacus mexicanus</u>	White-throated Sparrow <u>Zonotrichia albicollis</u>
Pine Grosbeak <u>Pinicola enucleator</u>	Fox Sparrow <u>Passerella iliaca</u>
Common Redpoll <u>Acanthis flammea</u>	Lincoln's Sparrow <u>Melospiza lincolni</u>
Pine Siskin <u>Spinus pinus</u>	Swamp Sparrow <u>Melospiza georgiana</u>
American Goldfinch <u>Spinus tristis</u>	Song Sparrow <u>Melospiza melodia</u>
Red Crossbill <u>Loxia curvirostra</u>	Lapland Longspur <u>Calcarius lapponicus</u>
White-winged Crossbill <u>Loxia leucoptera</u>	Snow Bunting <u>Plectrophenax nivalis</u>
Rufous-sided Towhee <u>Pipilo erythrophthalmus</u>	
"Ipswich" Sparrow <u>Passerculus sandwichensis princeps</u>	
Savannah Sparrow <u>Passerculus sandwichensis</u>	
Grasshopper Sparrow <u>Ammodramus savannarum</u>	
Henslow's Sparrow <u>Ammodramus henslowii</u>	
Sharp-tailed Sparrow <u>Ammodramus caudacuta</u>	
Seaside Sparrow <u>Ammodramus maritima</u>	

Species Comments

Common Loon

Primarily a coastal migrant and winter resident. Uncommon during migration on the larger inland lakes and rivers.

Red-throated Loon

Occurs almost exclusively along the coast as a migrant and winter resident. Rare inland during migration.

Red-necked Grebe DECLINING

A few are reported most winters along the coast. Rare inland. Its status of declining has no bearing on New Jersey as significant numbers of this species do not utilize NJ habitat to any substantial degree at any season.

Horned Grebe

A common migrant and winter resident along the coast. Uncommon inland.

Pied-billed Grebe THREATENED

Formerly a fairly common and widespread breeder in the PNR/PA, this species has declined recently for unknown causes and now is recorded breeding only at Brigantine NWR and the flooded cranberry bogs at Whitesbog (1 or 2 pairs at each location). A secretive species, it may be less rare as a breeder than records indicate. Draining and/or filling of freshwater marshes and bogs destroys habitat used in breeding and on migration.

Great Cormorant

Uncommon and strictly coastal in its occurrence.

Double-crested Cormorant

A common summer resident and migrant of coastal areas; less common in winter. Uncommon inland from April - September. Does not currently breed in NJ, but might do so soon on coastal islands.

Great Blue Heron THREATENED

Though this species is a common summer resident, the Pomona heronry is its only currently active nesting site in the PNR/PA. It is a large and successful colony located in upland pitch pine in a rural, residential area near Pomona, Atlantic County. Human disturbance in the colony is minor but owing to this species' low tolerance threshold, such activity could prove disastrous. This site needs protection immediately. Local citizens are said to be in support of protecting the site, which is privately owned.

Green Heron

A common summer resident of fresh and salt marshes throughout the PNR/PA.

Little Blue Heron

A fairly common breeder on coastal islands. (This species and the following six species nest mainly on spoil islands vegetated with bushes and small trees).

Cattle Egret

This species has increased dramatically in NJ over the last two decades but it is as yet an uncommon breeder in the PNR/PA, but will probably increase shortly as the nesting population on Cape May County islands is high.

Great Egret

A common breeder on islands from Brigantine to Barnegat.

Snowy Egret

One of the most common nesting egrets in the PNR/PA.

Louisiana Heron

An uncommon breeder on spoil islands in the PNR/PA. Rarest of all the herons and egrets inland.

Black-crowned Night Heron Blue Listed

A common nester on coastal islands and a common visitor to inland waters.

Yellow-crowned Night Heron DECLINING

New Jersey is near the northern range limit of this species and records indicate it has never been a common breeder in the state. Local population changes of a peripheral species are frequent and so its status of Declining is questionable. Nests on coastal islands. Rare inland.

Least Bittern DECLINING

A fairly common breeder in fresh and brackish marshes. Brigantine NWR and Manahawkin F & WMA have nesting populations of this species. Scattered pairs breed in suitable habitat elsewhere in the PNR/PA. This species and the next are victims of the draining and filling of wetlands.

American Bittern DECLINING Blue Listed

Basically a freshwater marsh and bog nester, this species is less common in the PNR/PA than the Least Bittern. Noted as a breeder at Brigantine NWR (1 pair) and at the cranberry bogs at Whitesbog (3 pairs). May nest at a few other locations in the PNR/PA.

Glossy Ibis

In the process of extending its range northward, this species is now the most abundant breeding Ciconiiforme in the state and a common breeder on coastal islands in the PNR/PA. Frequent visitor to inland bogs and marshes.

White Ibis

Post-breeding dispersers of this Southeastern U.S. species have invaded NJ the past few years, and although it does not currently nest it might do so soon on coastal islands.

Mute Swan

This introduced species has increased greatly in recent years and is now a common breeder at Brigantine NWR and other coastal locations. Large wintering concentrations have been noted recently in Barnegat Bay.

Whistling Swan

This species has greatly increased as a migrant and winter resident in the PNR/PA since the early 1960's, and has expanded northward in the state. Large concentrations have been noted along the coast at Brigantine NWR (600) and inland at the West Jersey Bogs, Whitesbog, Centennial Lake, and along the Wading River. The preservation of flooded cranberry bogs is essential in supporting flocks of migrating and wintering Whistling Swans inland within the PNR/PA.

Canada Goose

A common permanent resident throughout the PNR/PA. Breeds in freshwater marshes and impoundments especially near the coast. Brigantine NWR supports the greatest number of nesting and wintering birds in the area. Single pairs nest at scattered inland ponds, bogs, marshes, and artificial lakes. Winters primarily in bays and the larger tidal river marshes.

Brant

A common migrant and winter resident of bays and coastal marshes.

Snow Goose

From November to March great concentrations occur in coastal marshes especially at Brigantine NWR and along the Delaware Bayshore in and near the Heislerville F & WMA. Occurrences inland are sporadic and of short duration.

Mallard

Primarily a freshwater species, the Mallard is a common and widespread breeder in cranberry bogs and marshes inland, and in freshwater impoundments near the coast. Occurs during winter and migration in salt and brackish marshes.

Black Duck UNDETERMINED

The Black Duck is a common permanent resident of coastal marshes. Nests less commonly in inland marshes and bogs.

Gadwall

The NJ breeding population of this western species has increased tremendously over the last two decades. It nests primarily in freshwater impoundments near the coast, where it is often the most abundant breeding duck.

Northern Pintail

A western breeder, confirmed nesting in the PNR/PA only at Brigantine NWR.

Green-winged Teal

Primarily a western breeder, this species is a rare breeder in freshwater marshes and bogs in the PNR/PA. Recorded only from Brigantine NWR and Whitesbog.

Blue-winged Teal

Primarily a prairie-states breeder, this teal is a common NJ nester mainly in coastal freshwater marshes but also in scattered inland bogs, ponds, and marshes.

European Wigeon

A rare but regular winter visitor with one or two reported annually from various coastal locations.

American Wigeon

A western breeder which, though unconfirmed as a breeder in the PNR/PA, may rarely do so in coastal freshwater impoundments.

Northern Shoveler

A prairie nester reported breeding in the PNR/PA only at Brigantine NWR.

Wood Duck

Nests commonly along wooded pineland streams, ponds, bogs, and marshes. Also nests near the coast in freshwater impoundments.

Redhead

Usually occurs in small numbers along the coast during migration and winter, although occasionally large flocks are reported. Uncommon on inland lakes during migration.

Ring-necked Duck

Usually occurs in small numbers in hardwood swamps and wooded ponds and marshes inland and near the coast. Whitesbog, West Jersey Bogs, Centennial Lake, and the Atlantic City Reservoir at NAFEC are important wintering sites in the PNR/PA.

Canvasback Blue Listed

Declining numbers of wintering birds observed at coastal locations reflect the overall population decline evident in the Canvasback. Occurs in flocks averaging in the hundreds.

Greater Scaup

Little Egg Harbor (5700) and Dennis Creek F & WMA (44,000) are important wintering areas for this species, which also occurs in flocks of several hundred at other coastal locations. Uncommon inland.

Lesser Scaup

Uncommon migrant and winter resident along the coast and inland.

Common Goldeneye

Occurs in small flocks (10-100) throughout coastal waters.

Bufflehead

Wintering birds are well distributed throughout coastal waters in flocks of several hundred. Uncommon inland during migration.

Oldsquaw

A common winter resident in bays within the PNR/PA, occurring in flocks of several hundred. Rare inland during migration.

White-winged Scoter

May occur in flocks of several hundred in coastal bays during winter. Rare inland during migration.

Surf Scoter

Small numbers of wintering birds are found in coastal bays. Rare inland during migration.

Black Scoter

Small numbers of wintering birds are found in coastal bays. Rare inland during migration.

Ruddy Duck UNDETERMINED

An uncommon breeder at Brigantine NWR, and probably at other coastal freshwater marshes. This species winters primarily on the Delaware River and along the Delaware Bayshore, with small concentrations at Brigantine NWR, Reeds and Absecon Bays, and Dennis Creek F & WMA.

Hooded Merganser

Generally found in small numbers at coastal locations, though several hundred concentrate annually at Brigantine NWR and on the Atlantic City Reservoir at NAPEC. Well distributed in small flocks inland during migration.

Common Merganser

Uncommon in small flocks in coastal bays and estuaries during winter and migration. Common inland during migration and winter on the larger lakes and reservoirs.

Red-breasted Merganser

Migrant and wintering birds are common in coastal bays and the tidal portions of rivers. Rare inland during migration.

Turkey Vulture

Probably a common breeder in upland woods throughout the PNR/PA, however actual nesting records are few since this species nests in relatively undisturbed locations.

Black Vulture

A southern species at the northern periphery of its range in NJ; seen rarely but regularly in the PNR/PA in all seasons, though it has not been confirmed as breeding.

Northern Goshawk

A rare and sporadic migrant and winter resident most often reported from feeding stations where it preys on birds.

Sharp-shinned Hawk UNDETERMINED Blue Listed

Formerly an uncommon though local nester in pine-oak areas (last definite nesting record 1954), now apparently absent as a breeder although numbers of migrating and wintering birds have increased.

Cooper's Hawk ENDANGERED Blue Listed

This species was formerly an uncommon though well-distributed breeder in upland woods, but has declined greatly in recent years. It is now apparently absent as a breeder in the PNR/PA although migrant and wintering birds are reported frequently.

Red-tailed Hawk

A rare nester within the PNR/PA, and apparently has always been so. Nested in 1977 at Eldora, Cape May County, and may breed in northern fringe areas of the PNR/PA. Wintering birds frequent garbage dumps, landfills, and other open habitats primarily along the coast.

Red-shouldered Hawk **THREATENED** Blue Listed

This hawk nested fairly commonly in southern NJ (Salem County, outside the PNR/PA) early in the century; however, Fables (1955, p. 26) noted that records from the Pine Barrens proper were "few." No breeding records have been reported in the literature since the early 1960's, although there have been recent nestings just outside the PNR/PA. Its current breeding status in the PNR/PA needs investigation, as it has apparently declined in the state. Lowland forested areas are preferred habitat.

Broad-winged Hawk

The most common breeding hawk of the PNR/PA, nesting in mixed woods.

Rough-legged Hawk

A variously rare to common winter resident of coastal marshes and landfills; occasionally reported inland from cranberry bogs in winter and on migration.

Golden Eagle

Less common than the Bald Eagle in winter and on migration (October-May). Records are usually of single birds at coastal marshes at Tuckerton, Brigantine NWR, Barnegat, and Reeds Beach. Rarely reported inland.

Bald Eagle **ENDANGERED** Blue Listed

A few pairs formerly nested along the Atlantic coast and Delaware Bayshore until it suffered a severe population decline due to effects of pesticides on reproduction. At present there are no active nests within the PNR/PA. From late fall through early spring up to a dozen individuals frequent Brigantine NWR and the marshes of the Mullica-Wading River area, the Great Egg Harbor-Tuckahoe River area, along the lower stretch of the Maurice River, and less frequently at other coastal locations. The Wading River, above the Wading River Bridge, is a particularly important wintering area.

Northern Harrier **THREATENED** Blue Listed

This species has declined as a breeder in recent years due primarily to the draining and filling of coastal marshes. Within the PNR/PA, virtually all the current nesting sites are located in coastal marshes along the Delaware Bayshore from Reeds Beach to the Heislerville F & WMA. Recently reported also from Manahawkin and Tuckahoe F & WMAs and from Brigantine NWR.

Osprey **ENDANGERED** Blue Listed

Formerly a common coastal breeder in NJ, the Osprey has suffered the same pesticide related decline as the Bald Eagle. Since the federal ban on DDT use, populations have been slowly recovering, and now the Osprey is a fairly common nester within the PNR/PA and is no longer in danger of becoming extirpated as a breeder within the state.

Peregrine Falcon **ENDANGERED**

Formerly nested on inaccessible cliffs in northern NJ, but has never nested within the PNR/PA; however, attempts are now underway (by the Nongame & Endangered Species Project) to introduce Peregrines as breeders in coastal marsh areas, as at BNWR.

Merlin **THREATENED** **Blue Listed**

A common migrant and rare winter resident of coastal marshes. Also reported regularly but less commonly as a migrant from open areas such as cranberry bogs and the Pine Plains. Designating the Merlin as Threatened in NJ is unwarranted, for our state is ecologically unimportant to the survival of this species.

American Kestrel

A fairly common breeder in open country, inland and along the coast.

Ruffed Grouse

A fairly common breeder (though numbers fluctuate) in upland forests throughout the PNR/PA.

Common Bobwhite

A common breeder in fields and woods throughout the PNR/PA.

Ring-necked Pheasant

This introduced species is an uncommon breeder in old fields and agricultural areas throughout the PNR/PA.

King Rail **UNDETERMINED** **Blue Listed**

An uncommon breeder in coastal fresh and brackish marshes and inland marshes and bogs. This species is near the northern limit of its range in NJ, and as it is extremely elusive, population numbers are difficult to determine.

Clapper Rail

A common breeder restricted to saltmarshes.

Virginia Rail

Nests commonly in coastal fresh and brackish marshes and inland marshes and bogs.

Sora

A species whose breeding status needs further investigation. Probably breeds fairly commonly in heavily vegetated freshwater marshes.

Yellow Rail **UNDETERMINED**

An extremely secretive migrant that is only rarely reported from coastal and inland marshes and agricultural fields.

Black Rail **UNDETERMINED**

Formerly a locally common breeder in NJ saltmarshes, the Black Rail appears to have declined in recent years. The breeding sites most recently reported (early 1970's) within the PNR/PA were at Great Bay WMA, BNWR, Manahawkin WMA, and the Delaware Bayshore.

Common Gallinule

An uncommon breeder in coastal freshwater impoundments and brackish marshes.

American Coot UNDETERMINED

A common nester until quite recently in coastal freshwater impoundments and probably in inland marshes as well. Has declined suddenly and markedly over the past few years for as yet unknown reasons.

American Oystercatcher

This species has expanded its breeding range northward in recent years, and is now a fairly common breeder on coastal islands of the PNR/PA.

Semipalmated Plover

Common migrant on coastal beaches, mudflats, and marshes; frequently reported from aquatic edge habitats inland.

Piping Plover UNDETERMINED Blue Listed

An uncommon nester, strictly on undisturbed coastal beaches. Has declined severely because of habitat destruction and human disturbance at nesting areas.

Killdeer

An uncommon nester in open habitats such as agricultural fields, landfills, and lake edges, both inland and coastal.

American Golden Plover

An uncommon fall migrant on coastal marshes, and also reported inland from short-grass habitats such as airports and sod farms.

Black-bellied Plover

Common in migration on coastal beaches, marshes, and tidal mudflats, and frequently reported inland from short-grass habitats such as airports and sod farms.

Ruddy Turnstone

Common coastal migrant; rare inland.

American Woodcock

A locally common breeder in dry or moist second-growth woods bordering open fields.

Common Snipe UNDETERMINED

Common migrant occurring in moist grassy areas bordering bogs and streams. Breeding status undetermined.

Whimbrel

An uncommon migrant that frequents saltmarshes.

Upland Sandpiper THREATENED Blue Listed

An uncommon, local breeder in open, grassy country--pastureland, hayfields, airports--that may be sparsely to heavily vegetated. One to several breeding pairs are usually recorded annually at NAFEC, and at Smithville and Woodbine airports. This species breeds most abundantly in the Juliustown-Sandtown-Jobstown area near Fort Dix, just outside the PNR/PA. On migration it commonly occurs in short-grass habitats such as sod farms and airports. Development of agricultural habitats and mowing during the nesting season are detrimental to the Upland Sandpiper.

Spotted Sandpiper

An uncommon but widespread breeder near fresh or salt water.

Solitary Sandpiper

An uncommon migrant preferring freshwater habitats inland and near the coast.

Willet

A common saltmarsh nester which may be increasing in numbers.

Greater Yellowlegs

A common migrant in coastal wetlands; less common inland.

Lesser Yellowlegs

As above but confined more to freshwater.

Red Knot

A common migrant found only along the coast. Particularly common along the Delaware Bayshore in spring.

Pectoral Sandpiper

A migrant which occurs regularly in small numbers in freshwater habitats inland and along the coast.

White-rumped Sandpiper

A variously uncommon to common migrant which prefers freshwater impoundments near the coast. Rare inland.

Baird's Sandpiper DECLINING

A rare fall migrant in short-grass habitats inland and along the coast. Since the Baird's Sandpiper neither breeds or winters in NJ, and since available data indicate that it has never been numerous as a migrant here, its inclusion on the state Declining list is unwarranted.

Least Sandpiper

A common coastal migrant frequenting short-grass areas adjacent to tidal mudflats. Small flocks frequently reported inland. Bull (1964, p. 204) suggests that the cessation of salt-hay harvesting since the 1930's has greatly reduced the amount of suitable habitat for this species as well as the White-rumped and Pectoral Sandpipers.

Curlew Sandpiper

A rare but regular visitor to coastal wetlands.

Dunlin

A common migrant in coastal saltmarshes and tidal flats, and our most abundant wintering shorebird. Rare inland.

Short-billed Dowitcher

A common coastal migrant frequenting tidal mudflats. Frequently reported inland.

Long-billed Dowitcher

Uncommon coastal migrant occurring in both fresh and salt water habitats. Frequently reported inland.

Stilt Sandpiper

An uncommon migrant preferring shallow coastal pools of fresh or brackish water. Rare inland.

Semipalmated Sandpiper

Common migrant in coastal marshes and tidal mudflats; small groups frequently reported inland.

Western Sandpiper

Similar to the Semipalmated Sandpiper but usually much less common.

Buff-breasted Sandpiper

Rare autumn migrant most often observed in short-grass habitats such as airports and sodfarms.

Marbled Godwit DECLINING

Rare migrant confined to tidal mudflats. Another migrant species whose inclusion on the state list is unwarranted as it has not occurred in appreciable numbers in NJ since the heyday of commercial hunting at the turn of the century.

Hudsonian Godwit DECLINING

An uncommon migrant which prefers tidal mudflats. Rare inland. Inclusion of this species on the state list is unwarranted for reasons similar to those for Baird's Sandpiper.

Ruff

A rare but regular Eurasian visitor, most frequently reported from coastal saltmarshes and freshwater impoundments.

Sanderling

Common migrant and winter resident on the outer coastal beaches; less common on bay beaches. Rare inland.

American Avocet

Extirpated as a breeding species in NJ (Cape May County) since the early 1800's, the Avocet is now uncommon to rare in small flocks at BNWR and along the Delaware Bayshore. The Nongame & Endangered Species Project has recently attempted to reestablish the Avocet and the Black-necked Stilt (below) as breeding species in NJ.

Black-necked Stilt

Extirpated as a breeding species in NJ (Cape May County) since the early 1800's, the stilt is now a rare visitor to coastal saltmarshes and impoundments.

Red Phalarope

Primarily a pelagic species rarely reported from coastal locations within the PNR/PA.

Wilson's Phalarope

Uncommon migrant seen primarily along shores of fresh and brackish coastal ponds. Occasionally reported from inland lakes.

Northern Phalarope

Same as above.

Glaucous Gull

Rare winter visitor to coastal areas, garbage dumps, and more rarely to inland lakes and reservoirs.

Iceland Gull

Less rare than the Glaucous Gull, and occurs in the same habitats--coastal areas, garbage dumps, inland lakes.

Great Black-backed Gull

Though a common summer resident, this species is still an uncommon (but widespread) breeder on coastal islands.

Lesser Black-backed Gull

Very rare winter visitor to coastal areas, garbage dumps, and inland lakes.

Herring Gull

Common nester in large colonies on islands in coastal bays.

Ring-billed Gull

Common year-round resident, but does not breed in NJ.

Black-headed Gull

Rare winter visitor to coastal areas.

Laughing Gull

Common breeder in large colonies on saltmarsh islands, such as Great Thorofare in BNWR (5200 individuals in 1978).

Bonaparte's Gull

Common winter resident of coastal areas, occasionally appearing on inland lakes during migration.

Little Gull

Rare winter visitor to coastal areas.

Gull-billed Tern

At the northern limit of its breeding range in NJ, this species is a rare breeder on saltmarsh islands, often in association with other terns.

Forster's Tern

A fairly common, though local, breeder on saltmarsh islands. Sinkins Thorofare, BNWR, supports one of the state's largest colonies (200 individuals in 1978)

Common Tern DECLINING Blue Listed

A fairly common and widespread breeder on both saltmarsh islands and undisturbed sandy beaches. Habitat loss through human activity on and development of beaches has severely affected this and several other beach-nesting species. The creation of spoil islands has produced some new habitat, but only certain types of these islands are suitable for colonization.

Roseate Tern THREATENED Blue Listed

Probably always a rare breeder in NJ, this species may now be represented by a pair or two, but breeding has not been confirmed for several years. The breeding distribution of the Roseate Tern on the Northeast coast is extremely local, and though there are known colonies on Long Island and the Virginia coast, the species has probably always been an extremely rare and local breeder in NJ. It associates with Common Terns during the breeding season, preferring coastal

islands and beach areas with denser vegetation than tolerated by the Commons. Its designation as Threatened in NJ is unwarranted, as its rarity here is simply part of its natural distribution pattern.

Least Tern **ENDANGERED** Blue Listed

This species is endangered primarily through habitat loss, as it nests on open, unvegetated beaches. Two relatively large colonies in the PNR/PA are located on privately owned land: Cedar Bonnet (Ocean County), 140 individuals; Absecon Inlet North (Atlantic County), 96 individuals. Other, smaller colonies occur at scattered coastal locations in the PNR/PA. The Least Tern tends to be an opportunistic nester (accustomed to taking advantage of somewhat ephemeral breeding habitats) and will accept certain clean, unvegetated spoil islands as breeding habitat.

Royal Tern

Common coastal resident from late summer to late fall; does not breed in NJ.

Caspian Tern

Uncommon migrant in coastal areas, frequently reported from inland lakes.

Black Tern

Common coastal migrant, also frequently reported from inland lakes.

Black Skimmer **ENDANGERED**

Another colonial-nesting species endangered by loss of open-beach habitat to human development and activity. As with the Least Tern, colony locations may shift as the birds take advantage of various transitory sandbars, sandspits, and spoil areas for nesting, especially if the colony is washed out or otherwise disturbed early in the breeding season. The three largest colonies within the PNR/PA in 1978 were Tow Island (Ocean County), 150 birds; Brigantine Island East (Atlantic County) 40; Elder Island (Atlantic County), 30. Smaller colonies also occur within the PNR/PA.

Rock Dove

This introduced species nests commonly in developed areas.

Mourning Dove

A common breeder in a variety of lightly wooded habitats.

Yellow-billed Cuckoo

A common breeder in moist thickets and along the edges of hardwood swamps.

Black-billed Cuckoo Blue Listed

A much less common breeder in the PNR/PA than the preceding species, nesting in upland woods and thickets. This species is known to fluctuate cyclically in numbers, but some observers feel that it is now undergoing a long-term decline for unknown reasons.

Barn Owl Blue Listed

An uncommon to rare nester in barns, silos, and other structures. Most often reported from the periphery of the PNR/PA.

Common Screech Owl

A fairly common breeder in lightly wooded habitats such as orchards and second-growth woods.

Great Horned Owl

Nests commonly throughout the PNR/PA in heavily wooded habitats.

Snowy Owl

Rare to occasionally uncommon winter visitor to coastal marshes, islands, and beaches.

Barred Owl THREATENED

Uncommon breeder in lowland woods. Recorded in the PNR/PA from Bear Swamp in Southampton Township, Burlington County, Lebanon State Forest, Whitesbog, and BNWR. The decline of this species in NJ is apparently due to habitat loss, as it requires extensive tracts of swampy woods.

Long-eared Owl UNDETERMINED

An extremely secretive species which though not reported as breeding in the PNR/PA, may do so. Prefers advanced old fields and second-growth woods for breeding.

Short-eared Owl THREATENED Blue Listed

A rare breeder in coastal marshes. No recent nesting records for the PNR/PA although a few birds are seen every summer in likely nesting habitat. Formerly more common. Threatened primarily by habitat loss.

Saw-whet Owl

A rare nester in cedar swamps; recorded from the Chatsworth-Lake Oswego area, and in Lebanon State Forest.

Chuck-wills-widow

A southern species at the northern periphery of its breeding range, numbers of breeding birds have increased dramatically in the PNR/PA in the last few decades. Now an uncommon breeder in dry woods in the southern part of the PNR/PA, becoming increasingly rare northward.

Whip-poor-will DECLINING

A common nester throughout the PNR/PA in dry woods. Its designation as Declining is questionable, as it is an obvious and well-known species whose absence would easily be noticed and reported, and such reports do not appear in the literature.

Common Nighthawk

A locally common breeder in recently burned woods; also known to use flat rooftops for nesting. This species is closely tied to the fire ecology of the Pinelands, as it is a ground nester which requires bare ground for nesting. These conditions may be produced by some forms of controlled burning, which might be a useful tool in its management. It is the opinion of some observers in the Northeast

that this species has declined over the last few decades, abandoning apparently suitable nesting areas for unknown reasons. Warrants designation as DECLINING in NJ.

Chimney Swift

A common but local breeder in the PNR/PA, primarily in unused chimneys in urban areas.

Ruby-throated Hummingbird

An uncommon breeder in lowland woods. Although there are only three recent nesting records of this species in the PNR/PA (at BNWR, Bear Swamp, and Indian Mills), it is inconspicuous and therefore may be overlooked as a breeder. Nevertheless, some observers suggest that this species has declined in recent years, and it probably warrants DECLINING or at least UNDETERMINED status in NJ.

Belted Kingfisher

An apparently uncommon to rare and local breeder in the PNR/PA, probably because the sandy soil of the region does not provide suitable nesting sites (earthen banks near water). Some observers feel that this species has declined as a breeder in NJ in recent years. It probably merits either DECLINING or UNDETERMINED status.

Common Flicker

A common cavity nester in dry, open, oak dominated woods.

Fileated Woodpecker

A rare visitor at any season in the PNR/PA. A few pairs may nest in large tracts of mature NPB woodland on the periphery of the region.

Red-bellied Woodpecker

Over the last three decades this southern species has greatly extended its range northward, becoming a fairly common breeder in oak dominated woods throughout the PNR/PA.

Red-headed Woodpecker THREATENED Blue Listed

An uncommon to rare and local breeder in dry, open, oak woods. Stone (1937, pgs. 664-665) reported few breeding records for this species in southern NJ, so although it has seriously declined in the northern part of the state since the turn of the century, its status in the PNR/PA does not appear to have changed appreciably. Within the last ten years one or two pairs of this species have been regularly reported from Cedar Run Lake, Fort Dix, NAFEC, Batsto, Pomona, Pasadena, and Lebanon State Forest. It is also irregularly reported nesting at a few other locations within the PNR/PA. The largest colony in the state (3 or 4 pairs) nests at the county park in Cape May Courthouse, outside the area; and another small colony breeds regularly on the grounds of the Georgian Court College in Lakewood, also just outside the PNR/PA boundaries.

Yellow-bellied Sapsucker

A fairly common migrant in woods and orchards.

Hairy Woodpecker Blue Listed

A fairly common permanent resident of large tracts of mature oak dominated woodlands and hardwood swamps. There is concern among some observers that this species is declining. Prob-

ably merits DECLINING status.

Downy Woodpecker

A common permanent resident in oak dominated woodlots.

Eastern Kingbird

A common breeder in agricultural areas and open country near water.

Western Kingbird

A rare autumn visitor usually observed along the coast.

Great Crested Flycatcher

Common breeder in mixed woodlands, both coastal and inland.

Eastern Phoebe

Formerly a rare breeder in the PNR/PA, the Phoebe has bred with increasing frequency within the last few decades, utilizing bridges, culverts, buildings, and other structures for nesting sites.

Yellow-bellied Flycatcher

An uncommon migrant in woods and thickets, coastal and inland.

Acadian Flycatcher

This species fluctuates in abundance, possibly because NJ is at the northern periphery of its breeding range. Currently, it is a fairly common nester in mature, moist woodlands, but its status in the central PNR/PA needs investigation.

Willow Flycatcher

Within the past few decades this species has extended its range south and east to include the NJ Coastal Plain, but it is still an uncommon breeder within the PNR/PA, primarily in freshwater marshes and bogs inland and along the coast.

Least Flycatcher DECLINING

At the southern limit of its range in our area, this species is an uncommon to rare nester in dry, open, deciduous woods of the PNR/PA. There are no definite nesting records since the 1950's. This species has apparently declined north of the Coastal Plain, and its status in the PNR/PA needs investigation.

Eastern Wood Pewee

A common breeder in cedar swamps; status in other habitats needs investigation.

Olive-sided Flycatcher

Uncommon to rare autumn migrant, both inland and along the coast.

Horned Lark DECLINING

The range of this species has extended eastward in the last few decades, and it is now a fairly common and widespread breeder in either permanent or temporary short-grass habitats with bare ground such as golf courses, airports, landfills, and plowed fields. Breeds more commonly in coastal

areas than inland. Its designation as declining is puzzling as its breeding habits make population estimates difficult.

Tree Swallow

Common but local breeder near water (both coastal and inland) where dead trees or nest boxes provide suitable nest cavities.

Bank Swallow

There are no records of any Bank Swallow colonies within the PNR/PA, as the sandy soil will not support the nesting burrows which this species excavates in earthen banks.

Rough-winged Swallow

Probably a fairly common nester in a variety of sites (mostly artificial) near water. Actual status uncertain.

Barn Swallow

A common and widespread breeder coastally and inland, using barns, bridges, and other human structures for nest sites.

Cliff Swallow THREATENED

A very rare breeder (one record from Cedar Run Lake in 1964) and now probably absent from the PNR/PA. This species was probably always rare as a breeder in the region owing to the lack of suitable nest sites (rock cliffs). Its decline elsewhere in the state, where it was more common and often utilized barns and other structures for nesting, is an unexplained phenomenon that has been evident since at least the 1930's.

Purple Martin DECLINING Blue Listed

An uncommon and local colonial breeder both coastally and inland in the PNR/PA, nesting in open areas near water and almost exclusively in houses provided by humans. Formerly more abundant as a breeder on the Coastal Plain, this species has been adversely affected by competition for nest sites from the more aggressive Starling and House Sparrow.

Blue Jay

A common and widespread breeder in oak dominated woods throughout the PNR/PA.

Common Crow

A common and widespread breeder in woods, inland and near the coast.

Fish Crow

A common breeder in coastal woodlands. Also nests inland, in woods along the larger tidal rivers. May occur far inland during migration, near water.

Black-capped Chickadee

A rare breeder along the northern edge of the PNR/PA.

Carolina Chickadee

A common breeder in pine and pine-oak woods and hardwood swamps.

Tufted Titmouse

A common nester in mixed upland woods.

White-breasted Nuthatch

Apparently an uncommon breeder in oak dominated woodlands in the pinelands proper, but more common in mature oak woods on the northern and western periphery. Its exact status in the central Pinelands needs clarification.

Red-breasted Nuthatch

A probable, but as yet unconfirmed breeder in the PNR/PA which has recently been discovered nesting in coniferous woods just outside the PNR/PA boundary.

Brown Creeper

First discovered breeding in the PNR/PA in 1958, the creeper is now an uncommon but regular breeder in hardwood swamps.

House Wren

A common breeder, especially around human environs in both rural and suburban areas, where it utilizes both natural and artificial cavities.

Winter Wren

A common migrant in moist, dense thickets inland and along the coast.

Carolina Wren

A fairly common breeder in woods and thickets, especially near water, and often around human habitations. This species is subject to marked fluctuations due to decimations of populations by severe winters, but seems to have increased as a whole in NJ during this century and in the PNR/PA in particular during the last few decades.

Long-billed Marsh Wren

A locally common breeder in large cattail marshes and to a lesser extent in Phragmites. Chiefly coastal, although it has been known to nest inland outside the PNR/PA where suitable habitat exists.

Short-billed Marsh Wren THREATENED Blue Listed

The only recent evidence of breeding within the PNR/PA, is a pair reported from the Heislerville F & WMA in 1978, and of a few pairs at Manahawkin F & WMA in 1972. It apparently was always a rather rare breeder in the region, preferring the upland edges of saltmarshes, and has become even rarer in recent years. This species also breeds in inland marshes and bogs in the northern part of the state, but there is no record of it doing so in southern NJ. There is extreme concern for this species over most of its breeding range, but as it appears to be sensitive to habitat disturbances that are difficult to detect, the only management recommendation that can be made is protection of known, current breeding locations.

Northern Mockingbird

Found almost exclusively in association with human habitations and developed areas, where it nests in dense shrubbery.

Gray Catbird

Possibly the most abundant breeding bird of the PNR/PA, nesting in dense thickets near water.

Brown Thrasher

A common breeder in dry second-growth and mature woodlands. The thrasher is one of the few common breeding species of the Pine Plains.

American Robin

A common and apparently increasing breeding species, frequenting road margins, agricultural areas, open woods, and especially human habitations.

Wood Thrush

Apparently almost entirely restricted to cedar swamps as a breeding habitat where it has increased in recent years.

Hermit Thrush

A probable, but as yet unconfirmed breeder in dry mixed woods in the PNR/PA. Has bred in the "Pine Barrens" of Long Island.

Swainson's Thrush

A common migrant in woods throughout the PNR/PA, and especially abundant as a migrant along the coast.

Gray-cheeked Thrush

As above but generally much less common.

Veery

An unconfirmed but probable breeder in lowland woods, as singing birds have been heard at various locations in the PNR/PA during summer.

Eastern Bluebird UNDETERMINED Blue Listed

This cavity nesting species, has suffered severe nest-site competition from Starlings and House Sparrows over much of its breeding range. The bluebird is also adversely affected by severe winters. Current strongholds in the PNR/PA include the Cedar Run Lake - West Jersey Bogs area (Medford Township), where nest boxes erected for them have been used by up to nine pairs, and Colliers Mills F & WMA, where thanks to a recent nest-box program, 47 young fledged in 1979, the second highest production in the entire state. A few pairs nest in other scattered localities, and there is some evidence that burned woodlands may provide nesting habitat for this species. Generally, the bluebird prefers natural or artificial cavities in open woods, clearings, and woodland edges, and would benefit greatly from a widespread nest-box program in such habitats.

Blue-gray Gnatcatcher

Probably a fairly common breeder in second-growth woods near water and possibly other habitats. The status of this species needs investigation.

Golden-crowned Kinglet

A common migrant in woods and thickets inland and coastal.

Ruby-crowned Kinglet

A common migrant in woods and thickets inland and coastal.

Water Pipit

A variously uncommon to common migrant frequenting open areas inland and along the coast.

Cedar Waxwing

An uncommon and irregular breeder in a variety of lightly wooded terrestrial habitats, often near water.

Northern Shrike

A rare winter visitor to open country, primarily along the coast.

Loggerhead Shrike UNDETERMINED

An uncommon to rare migrant along the outer coast in fall.

Sterling

An introduced species, locally common in developed and agricultural areas and garbage dumps. An aggressive species which often outcompetes native hole-nesting species for nest sites.

White-eyed Vireo DECLINING

A fairly common breeder in dense thickets near water. There is no evidence to indicate a decline and in fact this species might be increasing.

Yellow-throated Vireo

A rare breeder within the PNR/PA in swampy deciduous woodlands. Noted breeding from the Vincentown area and the Delaware Bayshore.

Solitary Vireo

A fairly common migrant in woodland habitats.

Red-eyed Vireo

Until the 1960's a very common breeder in second-growth deciduous woodlands, this species appears to have declined since then; its current status in the PNR/PA needs investigation. May merit designation as Declining in the state.

Philadelphia Vireo

An uncommon fall migrant of woods and thickets, observed more frequently along the coast than inland.

Warbling Vireo DECLINING Blue Listed

No breeding records for the PNR/PA, although the species does nest just to the north and west.

Black-and-White Warbler

A common breeder in oak dominated woodlands; somewhat less common in southern parts of the PNR/PA.

Prothonotary Warbler

A fairly common breeder along streams in hardwood swamps. Apparently has increased as a breeder in our area during this century as a result of a northward range extension.

Swainson's Warbler

A very rare migrant in the PNR/PA. A few unconfirmed reports of singing birds in large cedar swamps indicate possible breeding by this species.

Worm-eating Warbler

A rare to uncommon migrant which has been confirmed as breeding in swampy deciduous woods along the Delaware Bayshore just outside the PNR/PA.

Golden-winged Warbler

Not yet confirmed as a breeder in the PNR/PA, although in 1978 a small colony of singing males was discovered at Bear Swamp, Vincentown, on the very boundary of the region.

Blue-winged Warbler

An uncommon and local breeder both in lowlands and in dry, open, mixed woods with scrub oak understory.

"Brewster's" Warbler (Blue-winged X Golden-winged hybrid)
A very rare migrant and unconfirmed breeder.

"Lawrence's" Warbler (Blue-winged X Golden-winged hybrid)
A very rare migrant and unconfirmed breeder.

Tennessee Warbler

Generally a common fall coastal migrant although *Nest-fluc.* yearly; less common inland.

Orange-crowned Warbler

An uncommon fall migrant along the coast; rare inland.

Nashville Warbler

Generally a common fall coastal migrant, although numbers fluctuate yearly; less common inland.

Northern Parula EXTIRPATED

Formerly a locally common nester in coastal swampy woods with growths of Usnea lichen used for nesting material; Much less common in similar habitats inland. When the Usnea disappeared (for unexplained reasons) shortly after the turn of the century, the Northern Parula went unreported as a breeder for several decades. However, the species may be reestablishing itself on the Coastal Plain, for it nested at Batsto in 1958, and since that time singing males have been reported with increasing frequency.

Yellow Warbler

An uncommon and local breeder in dense thickets along water-courses in the Pinelands proper. Common along the Delaware Bayshore.

Magnolia Warbler

A common migrant in wooded habitats.

Cape May Warbler

A common fall migrant along the coast; less common inland.

Black-throated Blue Warbler

A common migrant throughout the PNR/PA.

Yellow-rumped Warbler

One of the most abundant migrants in the PNR/PA, especially near the coast; also the only warbler which winters in large numbers, chiefly in bayberry thickets along the coast.

Black-throated Green Warbler

Nests in cedar swamps and possibly in hardwood swamps, however the breeding distribution throughout the PNR/PA in such habitats is not well known and needs further study.

Cerulean Warbler

This species has extended its breeding range northward and eastward recently to include the Coastal Plain. It has been found breeding, though rarely, in a few PNR/PA localities in mature woods along streams.

Blackburnian Warbler

A rather uncommon migrant throughout the PNR/PA.

Yellow-throated Warbler

A very rare and local breeder in the southern sections of the PNR/PA in mixed woods near water.

Chestnut-sided Warbler

A rare breeder within the PNR/PA, the only record being two pairs at Manahawkin F & WMA for the past several years.

Bay-breasted Warbler

An uncommon migrant throughout the PNR/PA.

Blackpoll Warbler

One of the more abundant migrant warblers in the PNR/PA.

Pine Warbler

A common and widespread breeder in extensive tracts of mature pine woods. Less common in mixed pine-oak woods.

Prairie Warbler

A common and widespread breeder which utilizes the pine and scrub oak sprout growth that follow fires.

Palm Warbler

A common migrant, especially in fall along the coast.

Ovenbird

A common nester in deciduous and mixed woodlands throughout the PNR/PA.

Northern Waterthrush

A fairly common coastal migrant, perhaps less common inland. Recently reported nesting south to coastal Monmouth County, but not yet reported from the PNR/PA.

Louisiana Waterthrush

An uncommon breeder in cedar and hardwood swamps. Reported from the Delaware Bayshore and from Bear Swamp, Medford Twp.

Kentucky Warbler

A fairly common and widespread breeder in low wet woods throughout the PNR/PA.

Connecticut Warbler

A common fall coastal migrant; less common inland in moist thickets.

Mourning Warbler

An uncommon migrant in swampy thickets.

Common Yellowthroat

A common and widespread breeder in moist thickets throughout the PNR/PA.

Yellow-breasted Chat DECLINING Blue Listed

A fairly common but local breeding species, occupying dense thickets in either moist or dry areas. There is no evidence to support this species' designation as declining.

Hooded Warbler DECLINING

An uncommon and local breeder in cedar and mixed hardwood-cedar swamps. Breeding distribution and current population size in the PNR/PA needs investigation.

Wilson's Warbler

A fairly common coastal migrant; less common inland in low, wet thickets.

Canada Warbler

A common migrant throughout the PNR/PA in moist woodlands and thickets.

American Redstart

A locally common breeder in moist woodlands along streams.

House Sparrow

This introduced species is a common resident in developed areas.

Bobolink THREATENED

No breeding records for the PNR/PA; however, it has been reported as breeding just north of the area at Assunpink F & WMA and at Mt. Holly. This species is threatened due to loss of habitat and early mowing of the grain fields in which it nests. Since central and southern NJ are at the very southern edge of the Bobolink's breeding range, management efforts to assist it in the PNR/PA would probably not be fruitful.

Eastern Meadowlark DECLINING

An uncommon and local breeder in grain and weed fields and meadows. Has been adversely affected by loss of such habitats to development. Current population size and distribution need study.

Red-winged Blackbird

A common breeder in coastal and inland marshes.

Orchard Oriole

An uncommon and local breeder within the PNR/PA; more common in fringe areas, where it nests in shade trees and hedgerows near water and often near human dwellings in agricultural areas.

Northern Oriole

A rare and local nester in developed areas and along streams within the PNR/PA; less rare toward the northern and western boundaries.

Rusty Blackbird

A fairly common migrant found primarily in wooded swamps.

Boat-tailed Grackle

Has extended its range northward within the past few decades, and is now an uncommon breeder in shrubs and small trees bordering saltmarshes.

Common Grackle

Common breeder singly or in small colonies in dense thickets and especially in conifers associated with developed areas.

Brown-headed Cowbird

Common breeder in virtually every terrestrial habitat in the PNR/PA. Has apparently increased as a result of development in the region.

Scarlet Tanager

An uncommon breeder within the PNR/PA in dry deciduous woods; more common in deciduous woods (especially NPB) along the fringes of the area.

Summer Tanager

An unconfirmed but probable breeder in the southern portions of the PNR/PA, particularly in dry mixed woods along the Delaware Bayshore.

Common Cardinal

A fairly common breeder in moist thickets and dense shrubbery, especially in and around developed areas.

Rose-breasted Grosbeak

Not known to nest in the PNR/PA; however, it is a common nester just to the north in NPB habitats.

Blue Grosbeak

A southern species now extending its range northward, the Blue Grosbeak is increasing in numbers, frequenting hedgerows in agricultural or NF areas.

Indigo Bunting

An uncommon breeder in the PNR/PA in second-growth oaks bordering open areas.

Dickcissel

This mid-western species is a very rare and sporadic breeder in the East. Has been recently reported as nesting in the grassy fields at NAFEC. Uncommon fall coastal migrant.

Evening Grosbeak

A common but somewhat erratically occurring winter visitor to woodlands and feeding stations.

Purple Finch

An uncommon winter visitor to woodlands and feeding stations.

House Finch

Introduced from the West, this species is uncommon but increasing as a breeder in developed areas.

Pine Grosbeak

A very rare and sporadic winter visitor to woodlands and orchards.

Common Redpoll

A rare winter visitor frequenting weedy fields, open woods, and feeding stations.

Pine Siskin

A variously rare to very common winter visitor to coniferous woods and feeding stations.

American Goldfinch

A common breeder in old fields and hedgerows throughout the PNR/PA.

Red Crossbill

An apparently rare but little-known breeder in the PNR/PA, nesting in coniferous woodlands, possibly in association with recent burns. The status and ecology of this species in the area needs investigation.

White-winged Crossbill

The one confirmed breeding record for this species in NJ was just outside the PNR/PA boundary, at Pine Lake Park, Ocean County. Rarer than the Red Crossbill at all seasons.

Rufous-sided Towhee

An extremely common breeder in second-growth woodlands, thickets, scrub areas - one of the PNR/PA's most abundant breeding species.

"Ipswich" Sparrow THREATENED

This subspecies of the Savannah Sparrow is an uncommon migrant and winter resident, confined to beach and dune areas. Formerly considered a full species, it has been recently reclassified as a subspecies and therefore does not belong on the NJ threatened list.

Savannah Sparrow THREATENED

A rare and local breeder in grassy filled areas and dunes along the coast. Breeding records from fringe areas only. Its population size needs study.

Grasshopper Sparrow THREATENED Blue Listed

Formerly a common and well distributed breeder in weedy fields, grassy meadows, and back dune areas, now much reduced in numbers and is uncommon and very local. The largest remaining colony (about 20 pairs) is at NAFEC, and other smaller colonies are reported regularly from BNWR, and Woodbine Airport. Its status in the central PNR/PA needs investigation.

Henslow's Sparrow THREATENED Blue Listed

Formerly a locally common breeder in both wet and dry

shrubby meadows and fills near the coast and more rarely in bogs, marshes, and old fields inland. Currently not known to breed in the PNR/PA. However, within the past decade it has nested at Dividing Creek, just outside the area, and areas such as BNWR and Manahawkin F & WMA have very recently had singing birds in summer. The only recommendation that can be made is the preservation of known breeding sites. Although this species has suffered considerable habitat loss to development, the reasons for such a severe decline must be considered largely unknown, for much apparently suitable habitat still remains unused.

Sharp-tailed Sparrow

Still a common breeder in the drier areas of saltmarshes, but reduced from its former abundance by draining, ditching, and development of the marshes.

Seaside Sparrow

This species shares the habitat of the Sharp-tailed Sparrow, but nests in the wetter portions of the saltmarsh, and has shared a similar decline from abundant to common owing to marsh alteration and development.

Vesper Sparrow THREATENED Blue Listed

Now a rare and local breeder in the PNR/PA, this species was apparently formerly more common, especially in farming areas. The Vesper Sparrow nests on the ground in dry, open, thinly vegetated areas. Recorded within the PNR/PA as breeding only at NAFEC (2 pairs since 1976).

Lark Sparrow

A rare but regular coastal migrant.

Dark-eyed Junco

A common migrant and winter resident in fields and woodland edges inland and coastal.

Tree Sparrow

A common but somewhat sporadic winter visitor to weedy fields and landfills.

Chipping Sparrow

A common breeder throughout the PNR/PA in open, grassy, woods and clearings, and also in residential areas with lawns.

Clay-colored Sparrow

A rare but regular fall coastal migrant.

Field Sparrow

A common and widespread breeder in overgrown fields, and in the Pine Plains.

White-crowned Sparrow

Uncommon migrant along the coast in fall; less common inland. Frequents hedgerows, lawns, and thickets.

White-throated Sparrow

A common migrant and winter resident in woods, swamps, and thickets.

Fox Sparrow

A fairly common migrant and winter resident frequenting moist woods and thickets.

Lincoln's Sparrow

An uncommon coastal migrant in the fall; less common inland. A secretive and inconspicuous species likely to be overlooked. Prefers brushy areas near water.

Swamp Sparrow

A common breeding species of grassy bogs, and freshwater marshes; chiefly inland.

Song Sparrow

A common breeder throughout the PNR/PA in moist thickets and woodland edges.

Lapland Longspur

A rare and irregular winter visitor to open areas chiefly along the coast and occasionally inland.

Snow Bunting

An uncommon and irregular winter visitor to open areas along the coast. Much less common in similar habitats inland.

TABLE 1. Status and Habitats of Birds of the Pinelands.

Species	Status			Habitats																
	S	W	M	PO	OP	PPL	C	HDW	H2O	BOG	IM	CM	AGR	URB	NF	OF	ISL	BB	BAY	NPB
Loon, Common	U	C							x											x
Red-throated	U	C							x											x
Grebe, Red-necked	R	R							x											x
Horned	C	C							x											x
Pied-billed*	R	U	C						x	X	X	X								x
Cormorant, Great	U	U							x											x
Double-crested	C	U	C						x											x
Heron, Great Bl.*	C	C	C				X	x	x	x	x									x
Green*	C	R	C				X	x	X	X	X					x				x
Little Blue*	C	R	C					x	x	x	x					X				x
Egret, Cattle*	U	C								x	x		x			X				x
Great*	C	U	C					x	x	x	x					X				x
Snowy*	C	R	C					x	x	x	x					X				x
Heron, La.*	U	R	U								x					X				x
Blk.-cr. Night*	C	U	C					x	x	x	x					X				x
Yel.-cr. Night*	U							x	x	x	x					X				x
Bittern, Least*	U		U							X	X	X								x
American*	U	R	U							X	X	X								x
Ibis, Glossy*	C	R	U					x	x	x	x					X				x
White			R							x	x	x								x
Swan, Mute*	O	C							x	x		X								x
Whistling	C	C							x	x		x								x
Canada Goose*	C	C	C						x	x	x	X	x		x					x
Brant	R	C	C									x			x					x
Snow Goose	R	C	C						x	x	x	x	x							x
Mallard*	C	C	C						x	X	X	X								x
Black Duck*	C	C	C						x	x	x	X								x
Gadwall*	C	C	C						x	x	x	X								x
N. Pintail*	R	U	C						x	x	x	X								x
Grn:-winged Teal*	R	C	C						x	x	x	X								x

Table 1, continued

Species	Status			Habitats																	
	S	W	M	PO	OP	PPL	C	HDW	H2O	BOG	IM	CM	AGR	URB	NF	OF	ISL	BB	BAY	NPB	
Bl.-winged Teal*	C	R	C						x	x	x	X								x	
Wigeon, Eur.		R																		x	
American	R	U	C						x	x	x	x								x	
N. Shoveler*	R	U	C						x	x	x	X								x	
Wood Duck*	C	R	C					X	x	X	X	X									
Redhead		U	U						x	x										x	
Ring-necked Duck		U	U					x	x	x											
Canvasback		C	C						x	x										x	
Scaup, Greater		C	C						x	x										x	
Lesser		U	U						x	x										x	
Common Goldeneye		C	C						x	x										x	
Bufflehead		C	C						x	x										x	
Oldsquaw		C	C																	x	
Scoter, Wht.-w.		U	U																	x	
Surf		U	U																	x	
Black		U	U																	x	
Ruddy Duck*	U	C	C						x	x	x	X								x	
Merganser, Hooded		C	C					x	x	x		x									
Common		U	C						x	x										x	
Red-breasted	R	C	C																	x	
Vulture, Turkey*	C	C	C	X	X									x							X
Black	R	R	R											x							
N. Goshawk		R	R	x	x	x	x	x		x										x	x
Hawk, Sharp-shin.		U	C	x	x	x	x	x		x				x						x	x
Cooper's		U	U	x	x	x	x	x		x				x						x	x
Red-tailed*	R	C	C	x	x							x	X		x	x				X	
Red-shouldered*	U	U	U	x	x	X	x	X		x										X	
Broad-winged*	C	:	C	X	X															X	
Rough-legged		U	U							x	x	x	x		x						
Eagle, Golden		R	R							x	x	x									
Bald	R	U	U					x	x	x	x									x	
Northern Harrier*	U	C	C							x	x	X	x		x	x	x	x			

Table 1, continued

Species	Status			Habitats																
	S	W	M	PO	OP	PPL	C	HDW	H2O	BOG	IM	CM	AGR	URB	NP	OF	ISL	BB	BAY	NPB
Tern, Gull-bill.*	R											x					X	x	x	
Forster's*	C	R	C									x					X	x	x	
Common*	C		C									x					X	X	x	
Roseate	R		R									x					x	x	x	
Least*	U		C									x					X	X	x	
Royal	U	R	C									x					x	x	x	
Caspian		R	U						x	x		x							x	
Black			C						x	x	x	x							x	
Black Skimmer*	U											x					X	X	x	
Dove, Rock*	C		C										x	X	x					
Mourning*	C	C	C	x	x	x							x	X	X	X				x
Cuckoo, Y.-b.*	C		C	x	x	x		X												X
Blk.-billed*	U		C	x	x															X
Owl, Barn*	R	R	R										X	X						
Common Screech*	C		C	X	X															X
Great Horned*	C		C	X	X	x	x	X												X
Snowy			R									x						x		
Barred*	U	U		x	x	x	x	X												x
Long-eared	R	R	R	x	x	x		x												x
Short-eared*	R	U	U							x	X				x	x	x	x		
Saw-whet*	R	U	U				X											x		
Chuck-will.-wid.*	R			X	X															
Whip-poor-will*	C		C	X	X															x
Com. Nighthawk*	C		C	X	X									x						
Chimney Swift*	C		C											X						
R.-t. Hummingb.*	U		U	x	x	X		X										x		X
B. Kingfisher*	U	U	C						X	X		X								
Common Flicker*	C	U	C	X	X			x												X
Woodpecker, Pil.	R	R	R		x															X
Red-bellied*	C	U	R	X	X	X		X												X
Red-headed*	R	R	U	x	X													x		x

Table 1, continued

Species	Status			Habitats																
	S	W	M	PO	OP	PPL	C	HDW	H2O	BOG	IM	CM	AGR	URB	NP	OF	ISL	BB	BAY	NPB
Y.-b. Sapsucker	R	C		x	x	x		x										x		x
Wdpkr., Hairy*	C	C	C	x	X			X												X
Downy*	C	C	C	x	X			X							x					X
Kingbird, E. *	C		C							X			X					x		
Western			R									x						x		
Or.-cr. Flycatch.*	C		C	X	X	x		X										x		X
Eastern Phoebe*	C	R	C	x	x	x		x		x				X				x		x
Flycatcher, Y.-b.			U	x	x	x		x		x								x		x
Acadian*			U	x	x	x		X												x
Willow*			U							X		X								
Least*			R	x	x								x							X
E. Wood Pewee*			C	x	x	x	X	x										x		X
O.-s. Flycatcher			U	x	x	x		x		x								x		x
Horned Lark*			U	C	C								X		X			x		
Swallow, Tree*			C	R	C			X	x	X	X	X	x					x		x
Bank					C				x	x	x	x						x		x
Rough-winged*			C		C				x	x	x	x		X				x		x
Barn*			C		C				x	x	x	x	X	X				x		x
Cliff					R				x	x	x	x	x					x		x
Blue Jay*			C	C	C									X				x		X
Crow, Common*			C	C	C								X	x	x	X				X
Fish*			C		U	C				x	x	X			x		X	x		
Chickadee, B.-c.*			R	U	U									x		x		x		X
Carolina*			C	C	C									x		X		x		X
Tufted Titmouse*			C	C										x		x				X
Nuthatch, W.-b.*			U	U	C									x						X
Red-breasted*			R	U	C													x		x
Brown Creeper*			U	U	C													x		X
Wren, House*			C	R	C								X	X		X		x		X
Winter					U	C										x		x		x

Table 1, continued

Species	Status			Habitats																
	S	W	M	PO	OP	PPL	C	HDW	H2O	BOG	IM	CM	AGR	URB	NF	OF	ISL	BB	BAY	NPB
Wren, Carolina*	C	U		X	X	x		x					X	X		X		x		X
L.-b. Marsh*	C	R	C								x	X					x			
S.-b. Marsh*	R	R	R							x	x	X								
N. Mockingbird*	C	C											X	X		X		X		
Gray Catbird*	C	R	C	x	x	X		X		X			X	X		X		X		X
Brown Thrasher*	C	R	C	X	X								X			X		X		X
Am. Robin*	C	C	C	X	X	x		x					X	X	x	X		x		X
Thrush, Wood*	C		C	x	x	x	X	x										x		X
Hermit*	R	U	C	X	x	x		x										x		x
Swainson's			C	x	x	x		x										x		x
Gray-cheeked			C	x	x	x		x										x		x
Veery*	U		C	x	x	x		X										x		X
E. Bluebird*	U	R	U	X	X	x		X		X			X	X		X				
B.-g. Gnatcatcher*	C		C	X	X	X		X		X								x		X
Kinglet, G.-c.	U		C	x	x	x	x	x								x		x		x
Ruby-crowned	R		C	x	x	x	x	x								x		x		x
Water Pipit			C										x		x			x		
Cedar Waxwing*	U	U	C	X	X	x	x	X		X			X			X		x		X
Shrike, Northern	R		R								x					x		x		
Loggerhead	R		U													x		x		
Starling*	C	C	C										X	X	x					
Vireo, White-eyed*	C		C			X	X	X		X						X		X		
Yellow-throated*	R		U					X										x		X
Solitary			U	x	x	x	x	x										x		x
Red-eyed*	C		C	X	X													x		X
Philadelphia			U	x	x	x		x										x		x
Warbling			U	x	x	x		x		x		x						x		x
Warbler, B.&w.*	C		C	x	X	x		x										x		X
Prothonotary*	U		U					X	X											
Swainson's			R															x		
Worm-eating*	R		U	x	x			X										x		X

Table 1, continued

Species	Status			Habitats																
	S	W	M	PO	OP	PPL	C	HDW	H2O	BOG	IM	CM	AGR	URB	NF	OF	ISL	BB	BAY	NPB
Warbler, G.-w.*	R	U		x	x											X		x		x
Blue-winged*	U	U		X	X											X		x		x
"Brewster's"*	R	R		X	X											X		x		x
"Lawrence's"	R	R		x	x											x		x		x
Tennessee		C		x	x	x		x										x		x
Orange-crowned	R	U				x		x		x						x		x		x
Nashville		C		x	x	x		x								x		x		x
Northern Parula*	R	C		x	x	x	X	X		x								x		x
Warbler, Yellow*	U	C				X		X		X	X	X				X		x		x
Magnolia		C		x	x	x	x	x		x								x		x
Cape May		C		x	x	x	x	x		x								x		x
Blk.-thr. Blue		C		x	x	x		x										x		x
Yellow-rumped	R	C	C	x	x	x	x	x		x			x		x			x		x
Blk.-thr. Green*U		C		x	x	x	X	x										x		x
Cerulean*	R	R		x	x	x		X										x		X
Blackburnian		U		x	x	x	x	x										x		x
Yellow-throated*R		R		x	x	x		X										x		x
Chestnut-sided*R		U		x	x	x		x							X			x		x
Bay-breasted		U		x	x	x	x	x										x		x
Blackpoll		C		x	x	x	x	x										x		x
Pine*	C	R	C	X	x	x												x		
Prairie*	C	C		X	X	x										X		x		
Palm		R	C	x	x	x		x		x				x	x			x		x
Ovenbird*	C	C		x	X	x		x										x		X
Waterthrush, N.		C				x	x	x		x								x		x
Louisiana*	U	R					X	X		X								x		x
Warbler, Kentucky*U		R						X												X
Connecticut		C					x	x		x								x		x
Mourning		U					x	x		x					x			x		x
Com. Yellowthroat*U	C	R	C			X	X	X		X	X	X		X				X		x
Yell.-br. Chat*	U	R	C												X			X		x
Hooded Warbler*	U	U				x	X	X										x		x

Table 1, continued

Species	Status			Habitats																
	S	W	M	PO	OP	PPL	C	HDW	H2O	BOG	IM	CM	AGR	URB	NF	OF	ISL	BB	BAY	NPB
Warbler, Wilson's		C				x	x	x		x						x		x		x
Canada		C				x	x	x		x						x		x		x
Am. Redstart*	C	C		X	X	X	x	X								x		x		X
House Sparrow*	C	C	C										X	X						
Bobolink	R		C								x	x	x		x					
E. Meadowlark*	U	U	U								x	x	X		X	x				
R.-w. Blackbird*	C	C	C					x		X	X	X	x	x	x			X		
Oriole, Orchard*	U		U							X			X	X						x
Northern*	R		C							X				X				x		x
Rusty Blackbird		U	C					x		x										x
Grackle, B.-t.*	U	U										X					X	X	x	
Common*	C	C	C							x	x	x	X	X	x	X		x	x	x
Brn.-hd. Cowbird*	C	U	C	X	X	X	X	X		X	X	X	X	X	x	X		X		X
Tanager, Scarlet*	U		C	x	X			X										x		X
Summer*	R		R	X	X													x		x
Common Cardinal*	C	C	C			X		X		X			X	X		X		X		X
Grosbeak, R.-b.			C					x		x				x		x		x		
Blue*	U		R									X				X				
Indigo Bunting*	U		U	X	X	x		x		x			X			X		x		
Dickcissel*	H	R	U									X			X	X		x		
Evening Grosbeak		C	C	x	x	x		x						x		x		x		x
Finch, Purple		U	U	x	x	x		x						x		x		x		x
House*	U	U	U											X						
Pine Grosbeak		R						x				x				x				x
Common Redpoll		R	R									x	x		x			x		
Pine Siskin		C	C	x		x	x	x						x				x		x
Am. Goldfinch*	C	C	C									X	x		X			x		
Crossbill, Red*	R	R	R	X		X														
White-winged*	R	R	R	X		X														
R.-s. Towhee*	C	U	C	X	X	x		x								X		X		X

Table 1, continued

Species	Status			Habitats																	
	S	W	M	PO	OP	PPL	C	HDW	H2O	BOG	TM	CM	AGR	URB	NF	OF	ISL	BB'	BAY	NPB	
Sparrow, "Ipswich"	U																				x
Savannah	U	C									x	x	x		x	x					x
Grasshopper*	U	R										X	X		X	X					x
Henslow's*	R	R								X	X	X				X					
Sharp-tailed*	C	U	C									X									
Seaside*	C	U	C									X									
Vesper*	R	R	U										X		X	X					
Lark			R																		x
Dark-eyed Junco	C	C		x	x	x		x		x			x	x	x	x					x
Sparrow, Tree	C	C									x	x	x		x	x					x
Chipping*	C	R	C	x	x									X	X	x					x
Clay-colored			R																		x
Field*	C	C	C	x	x										x	X					x
White-crowned	U	U											x	x	x	x					x
White-throated	C	C		x	x	x		x		x		x	x		x						x
Fox	U	C				x		x		x					x						x
Lincoln's			U							x											
Swamp*	C	U	C							X	X	X				x					x
Song*	C	C	C							x			X	X		X					x
Lapland Longspur	R	R											x		x						x
Snow Bunting	U	U											x		x						x

Table 2. Distribution by Watershed and County of Birds of the Pinelands.

	RC		C	M	D	MR					P	GMIR			TM	AD	County					
	N	S				LM	W	B	MA	N		L	U	T			A	B	CA	CM	CU	O
Loon, Common		x					x				x	x			x	x	x		x			
Red-throated								x							x	x	x					
Grebe, Red-necked												x			x	x						
Horned	x	x													x	x	x		x			
Pied-billed	X										X				X	x	x		x			x
Cormorant, Great															x	x	x					x
Double-crested	x	x													x	x	x					x
Heron, Great Blue	x					X									x	x	x					x
Green	X	X													X	x	x					x
Little Blue	x	x										x			X	x	x					x
Egret, Cattle															x	x						x
Great	x											X			X	x	x					x
Snowy	x	x													X	x	x					x
Heron, Louisiana														x	X	x	x		x			
Blk.-cr. Night															X	x						x
Yel.-cr. Night								x							X	x	x					x
Bittern, Least									X		X				X	x	x					x
American	X										X				X	x	x					x
Ibis, Glossy		x							x		X				X	x	x					x
White															x	x						
Swan, Mute		x													X	x	x					
Whistling	x	x				x	x	x			x			x	x	x	x		x			x
Goose, Snow	x	x		x	x										x	x	x		x			x
Canada	X	x				x			x						X	x	x		x			x
Brant					x										x	x			x			x
Mallard	X			x	x	x					X		x	x	X	x	x	x	x	x	x	x
Black Duck	X			x	x	x	x				x		x	x	X	x	x	x	x	x	x	x
Gadwall	x	x		x	x										X	x	x				x	
N. Pintail	x			x	x	x			x						X	x	x		x	x		
Teal, Gr.-winged	X	x		x	x	x	x				x			x	X	x	x		x	x		x
Blue-winged	x	x			x	x					x			x	X	x			x			x

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Table 2, continued

Species	RC		C	M	D	MR				F	GEHR			TM	AD	County							
	N	S				IM	W	B	MA		N	L	U			T	A	B	CA	CM	CU	O	G
Wigeon, Eur.										X						X	X						
American	X	X		X	X				X					X		X	X		X				X
N. Shoveler	X				X									X		X	X		X				X
Wood Duck	X	X			X		X	X				X	X	X	X	X	X	X	X			X	X
Redhead	X													X		X	X						X
Ring-necked Duck	X	X				X		X	X		X			X		X	X						X
Canvasback	X								X					X		X	X						X
Scaup, Greater				X										X		X			X		X		X
Lesser	X	X		X										X		X	X		X				X
Com. Goldeneye	X	X			X			X	X	X				X		X	X		X				X
Bufflehead	X	X							X	X				X		X	X		X				X
Oldsquaw		X							X					X		X	X						X
Scoter, W.-w.		X												X		X	X						X
Surf		X												X		X	X						X
Black		X												X		X	X						X
Ruddy Duck									X					X		X	X						X
Merganser, Hooded	X	X			X						X			X		X	X		X				X
Common	X	X												X		X	X						X
Red-breasted		X								X				X		X	X		X		X		X
Vulture, Turkey					X									X		X			X		X		X
Black													X						X				X
N. Goshawk		X						X	X		X			X		X	X						X
Hawk, Sharp-shin.	X													X		X	X						
Cooper's	X	X						X	X				X		X	X	X		X				
Red-tailed	X				X									X		X	X		X				
Red-shouldered	X									X	X			X		X							X
Broad-winged	X	X									X			X		X	X						
Rough-legged		X			X	X	X	X	X	X				X		X	X		X		X	X	X
Eagle, Golden	X				X	X				X				X		X	X		X		X	X	X
Bald	X	X			X	X	X			X	X		X		X	X	X		X		X	X	X

Table 2, continued

Species	RC		C	M	D	MR					F	GERR			TM	AD	County					
	N	S				IM	W	B	MA	N		L	U	T			A	B	CA	CM	CU	O
N. Harrier				X	X						X				X	x			x	x	x	
Osprey	x	x						x			x				X	x	x		x		x	
Peregrine Falcon	x														x	x					x	
Merlin	x							x			x				x	x	x				x	
American Kestrel		X					X					X			X	x	x				x	
Ruffed Grouse	X				X	x	X				X				x	x	x		x	x	x	
Common Bobwhite	X														X	x	x				x	
R.-n. Pheasant	X														X	x	x				x	
Rail, King	X														x	x	x					
Clapper											X	X	X		X	x			x		x	
Virginia	X										x				X	x	x		x		x	
Sora					x						x				X	x				x	x	
Rail, Yellow															x	x						
Black					X						X				x	x			x	x	x	
Com. Gallinule				X											X	x				x		
American Coot											x				X	x			x		x	
Am. Oystercatcher											x				X	x					x	
Plover, Semipalm.		x													x	x	x			x	x	
Piping											x				X	x					x	
Killdeer	X	x													X	x	x				x	
Plover, Blk.-bel.				x											x	x				x	x	
Am. Golden											x	x			x	x					x	
Ruddy Turnstone															x	x			x			
Am. Woodcock	x	X													X	x	x				x	
Common Snipe	x	x							x						x	x	x				x	
Whimbrel															x	x					x	
Sandpiper, Upland	x	x										X	X		x	x	x		x			
Spotted	X	x													x	x	x				x	
Solitary		x					x								x	x	x				x	
Willet											x				X	x			x		x	
Yellowlegs, Gr.	x	x			x						x				x	x	x		x	x	x	
Lesser	x	x							x						x	x	x		x	x	x	
Red Knot											x				x	x			x		x	

Table 2, continued

Species	RC		C	M	D	MR					F	GEHR		T	TM	AD	County						
	N	S				LM	W	B	MA	N		L	U				A	B	CA	CM	CU	O	G
Sandpiper, Pect.	x	x										x			x	x	x					x	
White-rumped															x	x							x
Baird's															x	x							
Least	x	x													x	x	x						x
Curlew											x				x	x							x
Dunlin															x	x							x
Dowitcher, S.-b.	x	x													x	x	x		x				x
Long-billed												x			x	x							
Sandpiper, Stilt	x														x	x	x						x
Semipalmated	x	x													x	x	x						x
Western															x	x							x
Buff-breasted															x	x							
Godwit, Marbled															x	x							
Hudsonian															x	x							
Ruff	x										x				x	x	x						x
Sanderling															x	x							x
Am. Avocet											x				x	x							x
Blk.-necked Stilt											x				x	x							x
Phalarope, Red											x				x	x							
Wilson's											x				x	x							x
Northern											x				x	x							x
Gull, Glaucous					x										x	x						x	
iceland															x	x							
Gr. Blk.-backed															x	x		x					x
Lesser Blk.-bk.															x	x							
Herring															x	x		x					x
Ring-billed															x	x		x					x
Black-headed															x	x							
Laughing		x		x	x										x	x	x		x	x			x
Bonaparte's		x													x	x	x		x				x
Little															x	x							

Table 2, continued

Species	RC		C	M	D	MR					F	GEMR		T	TM	AD	County					
	N	S				IM	W	B	MA	N		L	U				A	B	CA	CM	CU	O
Tern, Gull-billed					x						x					x	x			x	x	
Forster's																x	x			x	x	
Common	x															x	x	x		x	x	
Roseate																x	x				x	
Least		x														x	x	x			x	
Royal																x	x				x	
Caspian																x	x			x		
Black																x	x				x	
Black Skimmer											x					x	x			x	x	
Dove, Rock																x	x				x	
Mourning																x	x				x	
Cuckoo, Y.-b.	x	x							x							x	x	x			x	
Black-billed	x	x				x					x					x	x	x			x	
Owl, Barn	x	x				x					x			x		x	x	x		x	x	
Common Screech	x	x					x	x				x				x	x	x			x	
Great Horned	x	x							x			x				x	x	x			x	
Snowy									x							x	x	x			x	
Barred	x	x							x		x					x	x	x			x	
Long-eared		x														x	x	x			x	
Short-eared				x	x						x	x				x	x			x	x	
Saw-whet	x	x					x									x	x	x			x	
Chuck-will's-wid.		x														x	x	x		x	x	
Whip-poor-will		x					x									x	x	x			x	
Common Nighthawk	x	x						x			x					x	x	x			x	
Chimney Swift																x	x					
R.-t. Hummingbird		x							x			x				x	x	x			x	
Bltd. Kingfisher		x														x	x	x			x	
Common Flicker																x	x				x	
Woodpecker, Pil.		x										x		x			x	x		x		
Red-bellied	x	x		x							x	x	x	x		x	x	x	x	x	x	

Table 2, continued

Species	RC		C	M	D	MR					F	GEMR		T	TM	AD	County						
	N	S				LM	W	B	MA	N		L	U				A	B	CA	CM	CU	O	G
Red-headed Wpkr.	X	X			x		x	X			X	X	x			X	x	x	x	x		x	
Y.-b. Sapsucker	x															x	x	x					x
Wdpkr., Hairy		X														x	x	x					x
Downy																x	x				x		x
Kingbird, E.		X			x		X									x	x	x			x		x
Western										x						x	x						x
Gr.-cr. Flycatch.		X			x											X	x	x			x		x
Eastern Phoebe	X	x				x										X	x	x					x
Flycatcher, Y.-b.		x										x				x	x	x					x
Acadian					X					X			x								x		x
Willow										X						X	x						x
Least								X										x					x
E. Wood Pewee					x											X	x				x		x
O.-s. Flycatcher						x					x							x					x
Horned Lark		x														X	x	x					x
Swallow, Tree		x			x	x										X	x	x			x		x
Bank																x	x						x
Rough-winged																x	x						x
Barn					x						x					X	x				x		x
Cliff		X									x					x	x	x					x
Purple Martin											x	x				X	x						x
Blue Jay		x														X	x	x					x
Crow, Common																X	x						
Fish							x									X	x	x					x
Chickadee, B.-c.		x														x	x	x					x
Carolina																X	x						x
Tufted Titmouse		X														X	x	x					x
W.-b. Nuthatch		X														X	x	x					x
Red-breasted	X	x					X									x	x	x					x
Brown Creeper	X	X					X	X	X	X				X		x	x	x					x x

Table 2, continued

Species	RC		C	M	D	MR					F	GEHR		T	TM	AD	County					
	N	S				LM	W	B	MA	N		L	U				A	B	CA	CM	CU	O
Wren, House	X								X							X	x	x				x
Winter		x														x	x	x				x
Carolina		x														x	x	x				x
Long-bill. M.																x	x					x
Short-bill. M.		x		X		x					X					x	x	x			x	x
N. Mockingbird															X	x						x
Gray Catbird					X										X	x			x			x
Brown Thrasher	x	x													X	x	x					x
American Robin		x							x						X	x	x					x
Thrush, Wood					x										X	x			x			x
Hermit	X				x						x				x	x	x		x			x
Swainson's					x										x	x			x			x
Gray-cheeked	x				x						x				x	x	x		x			x
Veery	X	X			x										x	x	x		x			x
E. Bluebird	X	X	X			X	x	x	X			X		X	x	x	x					x
B.-g. Gnatcatcher		x											x		x	x	x		x			x
Kinglet, G.-c.		x													x	x	x					x
Ruby-crowned		x			x										x	x	x		x			x
Water Pipit	x	x								x					x	x	x					x
Cedar Waxwing							X				x				x	x	x					x
Shrike, Northern															x	x						x
Loggerhead	x	x									x				x	x	x					x
Starling		X													X	x	x					x
Vireo, White-eyed															X	x						x
Yellow-throated		X		X						x		x		x	x	x	x		x		x	x
Solitary		x								x		x		x	x	x		x				x
Red-eyed					x										X	x			x			x
Philadelphia	x	x													x	x	x					x
Warbling										x	x					x						x

Table 2, continued

Species	RC		C	M	D	MR					F	GEHR		T	TM	AD	County					
	N	S				LM	W	B	MA	N		L	U				A	B	CA	CM	CU	O
Warbler, Bl. & wt.	x														X	x	x					x
Prothonotary	x				X						X			X	x	x	x			x		x
Swainson's					x														x			x
Worm-eating	x	x		X								x			x	x	x					x
Golden-winged		X										x			x	x	x					x
Blue-winged	X														x	x	x					x
"Brewster's"		X										x		x			x			x		x
"Lawrence's"																						x
Tennessee	x	x													x	x	x					x
Orange-crowned	x					x											x					x
Nashville	x	x													x	x	x					x
Northern Parula	x	x							X						x	x	x					x
Warbler, Yellow	X	x		X	X										X	x	x			x	x	x
Magnolia		x													x	x	x					x
Cape May	x														x	x	x					x
Black-thr. Blue					x							x			x	x	x			x		x
Yellow-rumped		x													x	x	x					x
Blk.-thr. Green		x				X	X				X				x	x	x					x
Cerulean	X											x				x	x					x
Blackburnian		x										x			x	x	x					x
Yellow-throated	x											x				x	x					x
Chestnut-sided		x									X	x			x	x	x					x
Bay-breasted	x				x										x	x	x			x		x
Blackpoll		x													x	x	x					x
Pine	X	x							x						X	x	x					x
Prairie	X														X	x	x					x
Palm	x	x							x						x	x	x					x
Ovenbird	x				x										X	x	x			x		x
Waterthrush, N.	x				x										x	x	x			x		x
Louisiana	x	X			X												x			x		x
Warbler, Kentucky													x							x		x
Connecticut									x						x	x	x					x

AREAS OF ACTUAL AND POTENTIAL CRITICAL CONCERN

Relative Importance of Each Habitat

Pine-Oak

Breeding-bird species diversity is fairly high in this habitat at approximately 34 species.

Pine-oak forests may formerly have provided breeding habitat for Cooper's Hawk (E) and Sharp-shinned Hawk (U); however, these species apparently no longer nest in the PNR/PA. They do still use this habitat in winter and on migration.

The one known Great Blue Heron (T) colony in the PNR/PA is in upland pine woods at Pomona; however, this species may use any forest habitat near suitable feeding areas.

Whip-poor-will (D) nests on the ground in upland wooded habitats.

Eastern Bluebird (U) nests in open pine-oak forests as well as in other habitats.

The Pine Warbler, though common, is noteworthy for being virtually restricted to this habitat in NJ.

The pine-oak forests of the PNR/PA are the only known breeding location in NJ for Red Crossbill.

Concentrations of migratory birds in Coastal Plain forested habitats are rather low; most migrants pass either along the outer coastal strip or to the west.

Oak-Pine

Oak-pine forests attract a relatively high diversity of about 40 breeding-bird species.

Oak-pine forests may formerly have provided breeding habitat for Cooper's Hawk (E) and Sharp-shinned Hawk (U); however these species apparently no longer nest in the PNR/PA. They do still use this habitat in winter and on migration.

Colonies of Red-headed Woodpecker (T) are generally located in oak-dominated woodlands with little understory. Known localities are at Batsto, Pomona, and Cedar Run Lake.

Whip-poor-will (D) nests on the ground in upland wooded habitats.

Least Flycatcher (D) is a rare nester in the PNR/PA which utilizes oak-dominated forests where it does occur.

Eastern Bluebird (U) nests in open oak-pine woodlands as well as in other habitats.

Broad-winged Hawk, White-breasted Nuthatch, Red-eyed Vireo, and Scarlet Tanager, as well as woodpeckers, flycatchers, and ground-nesting warblers, are all generally more common in oak-pine than in pine-oak forests.

No particular areas of concentration or important breeding sites (other than for Red-headed Woodpecker) are known to be located in this habitat.

Pitch-Pine Lowland

Although it is estimated to have a fairly low diversity of breeding-bird species (about 15), this habitat is not well documented and further investigation may disclose more breeders.

Pitch-pine lowland may formerly have provided breeding habitat for Cooper's Hawk (E) and Sharp-shinned Hawk (U); however these species apparently no longer nest in the PNR/PA. They do still use this habitat in winter and on migration.

Red-shouldered Hawk (T) may breed in this habitat.

White-eyed Vireo breeds in moist thickets in this habitat.

Common breeding species include Gray Catbird and Common Yellowthroat.

No important concentrations or breeding sites are known.

Cedar Swamp

Cedar Swamps are specialized habitats with a comparatively low diversity of 11 breeding-bird species; further investigation might possibly reveal some others.

Barred Owl (T) and Hooded Warbler (D) are known to breed in cedar swamps.

The Northern Parula, designated Extirpated, may be re-establishing itself as a breeder in the PNR/PA in cedar swamps, and should be searched for in any field studies.

The following species are either restricted to cedar swamps or most field observations of them occur in cedar swamps: Saw-whet Owl, Eastern Wood Pewee, Wood Thrush, Prothonotary Warbler, Black-throated Green Warbler, Louisiana Waterthrush.

Hardwood Swamp

A highly diverse breeding-bird community of about 41 species is characteristic of this habitat.

Hardwood swamps provide breeding habitat for Red-shouldered Hawk (T), Barred Owl (T), Hooded Warbler (D), and Eastern Bluebird (U).

Largely restricted to this habitat are Prothonotary Warbler, Louisiana Waterthrush, and Kentucky Warbler.

The only well-reported hardwood swamp in the PNR/PA is Bear Swamp, Southampton Township, notable mainly for its great diversity of breeders.

Water

Water is not considered as a breeding habitat in this treatment, but may be considered highly diverse in the number of species which breed near it, feed in, on, over, and around it, and concentrate on it in winter and on migration.

Noteworthy species found on or near water during migration include Red-necked Grebe (D), Bald Eagle (E), Osprey (E), Great Blue Heron (T), and American Coot (U).

Breeding of Belted Kingfisher is restricted to earthen banks near suitable fishing waters.

Atlantic City Reservoir and Centennial Lake hold important winter concentrations of Ring-necked Duck.

Bog

Cranberry bogs and their environs support a moderately diverse breeding-bird community of about 29 species, including several noteworthy species, and are exceptionally important as wintering areas for certain waterfowl and as migration habitat for waterbirds, raptors, and shorebirds.

Bald Eagles (E) and Ospreys (E) are frequent visitors to large cranberry bogs, as are Peregrine Falcon (E), Merlin (T), Cooper's Hawk (E), Northern Harrier (T), and Great Blue Heron (T).

American Bittern (D), Least Bittern (D), King Rail (U), and Pied-billed Grebe (T) have been recorded breeding at cranberry bogs and utilizing them on migration.

Bogs are important migration habitat for American Coot (U) and Common Snipe (U).

Bogs would be excellent areas in which to erect houses for Purple Martin (D) and Eastern Bluebird (U).

Large winter concentrations of Whistling Swan and Ring-necked Duck are known to occur at Whitesbog and West Jersey Bogs, and probably may be found at other large bogs as well.

Thickets and woods surrounding bog areas are heavily utilized by migrant passerines in preference to more upland habitats.

All breeding records for bogs noted in this report are from either Whitesbog or West Jersey Bogs.

Inland Marsh

The diversity of breeding species in this habitat is rather low at about 18 species. Although interior marshes do not support any species that coastal marshes do not, the relative scarceness of this habitat inland makes it important; without it such species as Sora and Swamp Sparrow would breed only rarely within the central PNR/PA.

Inland marshes offer potential breeding habitat for Pied-billed Grebe (T), American Bittern (D), Least Bittern (D), King Rail (U), Common Snipe (U), and Henslow's Sparrow (T).

Bobolinks (T) use inland marshes on migration.

Larger marshes may harbor numbers of migrant waterfowl, and those near the coast may also be utilized as seasonal blackbird roosts.

Coastal Marsh

This habitat (defined to include coastal freshwater marsh, essentially that impounded at BNWR, as well as saltmarsh) supports a very high diversity of breeding species (about 43) and is also immensely important as migratory and wintering habitat for great numbers of species. It is undoubtedly the most important habitat complex in the PNR/PA for entire groups of birds: waterfowl, raptors, wading birds, and shorebirds.

Among the Endangered species, coastal marsh provides migration, wintering, and potential breeding habitat for Bald Eagle; breeding habitat for Osprey; and feeding areas for Black Skimmer. It is also the site of the attempted reintroduction of the Peregrine Falcon, though it was not this species' natural breeding habitat in NJ.

Many Threatened species also inhabit coastal marsh. Pied-billed Grebe breeds at BNWR. Northern Harrier is now virtually restricted to saltmarsh as a breeder in NJ and uses all coastal marsh in winter. It is migratory habitat for Merlin. For Great Blue Heron it is probably the most-used habitat on a year-round basis, though not used for breeding. It is the most important breeding and wintering habitat in the PNR/PA for Short-eared Owl. Short-billed Marsh Wren may breed at the saltmarsh-upland ecotone, and has been recorded from Heislerville WMA. Coastal marshes are significant wintering habitat for Savannah Sparrow, and Henslow's Sparrow may formerly have bred on the upper reaches of saltmarshes.

Coastal marsh is important to many Declining species as well. It is nesting habitat for American and Least Bitterns and an important feeding area for Yellow-crowned Night Heron. Marbled and Hudsonian Godwits use marshes and associated tidal flats on migration. Some Common Tern colonies are located on mainland saltmarsh, others on marsh islands; the terns also feed in creeks and channels. Coastal marshes are wintering and migration habitat for Eastern Meadowlark.

Among the state's Undetermined species, coastal marsh is the most important year-round habitat for Black Duck; concentrations breed, winter, and stop on migration at BNWR. This refuge is also the only breeding habitat for Ruddy Duck in the state. Most of the King Rails and all Black Rails in the PNR/PA breed in such areas. American Coot is now virtually restricted as a breeder to coastal freshwater marshes.

In addition, certain species are restricted to coastal saltmarshes: Clapper Rail, Long-billed Marsh Wren, Boat-tailed Grackle, Sharp-tailed and Seaside Sparrows.

Important coastal marsh breeding areas include BNWR; the Manahawkin, Great Bay, and Tuckahoe-Corbin City WMAs; and the entire Delaware Bayshore of the PNR/PA (Reed's Beach to the Maurice River).

The entire intertidal marsh complex from BNWR up the Mullica and Wading River drainages is important both as breeding habitat for saltmarsh species and as a raptor wintering area.

Agriculture

This habitat provides open country with various kinds of vegetation (sod, orchards, hedgerows, field crops) attractive to a rather high diversity of breeding birds--about 33 species. However, only a relatively small proportion of agricultural land suitable for species such as Upland Sandpiper (T), Bobolink (T), Eastern Meadowlark (D), and Grasshopper, Vesper, and Savannah Sparrows (all D) actually occurs within the PNR/PA, and that near the northern and western periphery. There are no reports of these species from agricultural habitats within the PNR/PA, but it is possible that such habitats do support breeding populations; the absence of data may simply reflect lack of fieldwork owing to the inaccessibility of large areas of private agricultural land.

Sod farms in the area would attract concentrations of migrants, and plowed fields are used by migrating flocks of Water Pipit, Horned Lark (D), American Robin, and Killdeer.

Upland Sandpiper (T) breeds just outside the PNR/PA boundaries near Juliustown, Sandtown, and Jobstown, in Burlington County.

Urban

Urban areas have a moderately high diversity of breeding species (about 24), many of which do not occur "naturally" in undisturbed Pinelands habitats.

Purple Martin (D) formerly nested in good numbers in houses erected in lightly developed areas. Eastern Bluebirds (U) may also accept nest boxes in developed areas with considerable open space.

Restricted to urban areas are Chimney Swift (flocks of which may roost in large chimneys on migration), Eastern Phoebe, Mockingbird, and House Finch.

Birds whose populations increase in developed areas include Mourning Dove, House and Carolina Wrens, Common

Grackle, Cardinal, and Chipping Sparrow.

Urban and agricultural areas are the strongholds of Starling, House Sparrow, Rock Dove, and House Finch, introduced species which often compete with native birds for food and nest sites.

Nonforested Areas

Though breeding-species diversity for nonforested areas is rather low at about 10 species, many noteworthy birds utilize such habitats for breeding, wintering, and migration stopovers.

Eastern Meadowlark (D), Upland Sandpiper, Grasshopper Sparrow (T) and Vesper Sparrow (T) breed in various open, short-grass habitats; it is also likely, though unconfirmed, that Savannah Sparrow (T) breeds in such habitats.

The only breeding records of both Dickcissel and Vesper Sparrow in the PNR/PA are from airports.

Northern Harrier (T), Red-tailed Hawk, Rough-legged Hawk, and American Kestrel use open areas for hunting.

Common breeding species include Ring-necked Pheasant, Killdeer, and Horned Lark (D).

Such areas, particularly airports, are especially important to migrating shorebirds--American Golden Plover, Upland Sandpiper (T), Buff-breasted Sandpiper--and to migrating Bobolink (T) and Water Pipit.

During severe freezes, large numbers of Brant and Canada Geese may frequent open, grassy areas (golf courses, lawns, roadsides) to feed.

NAFEC and Woodbine Airport are important breeding areas.

Old Fields

About 24 species of birds, a fairly high diversity, are known to breed in old fields of various ages and vegetational compositions.

Old-field breeders include Eastern Bluebird (U), Yellow-breasted Chat (D), and grasshopper Sparrow (T).

Common breeding species are Bobwhite, Ring-necked Pheasant, Blue-winged Warbler, Indigo Bunting, American Goldfinch, and Field Sparrow.

An Eastern Bluebird nest-box program in the fields at Colliers Mills WMA was very successful; 47 young fledged there in 1979 from the second-largest colony in the state.

Islands

Although only about 20 species of birds are recorded as breeding on islands in coastal bays, almost all the species involved are virtually dependent on these islands, whether natural marsh or spoil, as their only breeding habitat in NJ.

The Endangered Least Tern and Black Skimmer use bare, clean sand on spoil islands, spits, and sandbars as breeding habitat, and the Skimmer is showing some signs of adapting to the use of marsh wrack as well.

Yellow-crowned Night Heron (D) breeds on shrubby islands, and Common Tern (D) on marsh islands.

Such islands are the exclusive sites of the most important heronries in the PNR/PA, and of some of the most important in the state (see habitat charts for species). Various species of gulls also nest in colonies on islands, the Laughing Gull often in colonies of thousands. The American Oystercatcher, now establishing itself as a breeder in the state, nests largely on coastal islands, and marsh islands represent the only breeding habitat for forster's and Gull-billed Terns.

Large marshy islands may harbor significant wintering and migrating populations of geese and dabbling ducks.

Currently known island breeding locations of colonial species are marked on topographic maps submitted with this report; these locations may shift from year to year and even within breeding season if disturbances occur.

Barrier Beach

Barrier beaches can be expected to support at least 20 breeding-bird species, and in addition are exceptionally important migratory habitat for a wide variety of species.

Least Tern (E), Black Skimmer (E), and Common Tern (D) formerly nested on barrier beaches but have been virtually forced off by habitat loss to development and by human and animal disturbance (rats, dogs) even in the few remaining undeveloped areas. Piping Plover (U), a solitary nester, still persists in a few locations. Yellow-breasted Chat and White-eyed Vireo (both D) nest in dense thickets bordering moist areas and marshes. Osprey (E) formerly nested

commonly on telephone poles at Island Beach State Park and will also use trees along marsh borders for nest sites.

Peregrine Falcon (E), Merlin (T), Cooper's Hawk (E), and Sharp-shinned Hawk use barrier-beach areas for hunting during migration.

Coastal and bay beaches are heavily used by a variety of shorebirds, and banding studies have shown that barrier beaches attract a vast array of migrating passerines--some, such as Yellow-rumped Warbler, in immense numbers. Tree Swallows also migrate along barrier beaches in huge flocks. The few Loggerhead Shrikes (U) that occur in the PNR/PA are found almost exclusively on barrier beaches. The "Ipswich Sparrow" (T) is restricted to barrier beaches.

Island Beach State Park and Brigantine Island are the only barrier beaches located within the PNR/PA.

Bay

Coastal bays, including tidal flats, saltmarsh edges, and lower reaches of estuaries, are the primary migration and wintering habitat for loons and grebes, including Red-necked (D), and a host of swans, geese, and diving ducks. Greater Scaup, Canvasback, Bufflehead, and Red-breasted Merganser are particularly common.

At low tide, exposed mud and sand flats are important feeding areas for migrating shorebirds, including Marbled and Hudsonian Godwits (D).

Wintering and migrating Bald Eagle (E) and breeding and migrating Osprey (E) use bays for fishing.

Little Egg Harbor attracts wintering flocks of several thousand Greater Scaup, and Reed's and Absecon Bays also support a variety of wintering waterfowl, including Ruddy Duck (U).

Non-Pine-Barrens Forest

This habitat may have the highest diversity of breeding species in the PNR/PA, but it also occurs extremely infrequently within the area boundaries, and then usually in small tracts, so its true contribution to the bird species diversity of the entire region is questionable.

Non-Pine-Barrens forests may formerly have provided breeding habitat for Cooper's Hawk (E) and Sharp-shinned Hawk (U), now apparently absent as breeders, though they still use this habitat in winter and on migration.

Least Flycatcher (D) may be less rare in this habitat than in typical Pine Barrens forests. Other species which may be less rare here, or which may use only non-Pine-Barrens areas as breeding habitat within the PNR/PA include Black-billed Cuckoo, Pileated Woodpecker, Veery, Yellow-throated Vireo, Worm-eating Warbler, Scarlet Tanager, and Rose-breasted Grosbeak. As groups, the woodpeckers and flycatchers are probably generally more common as breeders in non-Pine-Barrens forests. Many of these species may be limited in their occurrence by their requirements for certain minimum forest sizes.

Because of their general occurrence along the outer fringes of the PNR/PA, non-Pine-Barrens forests probably attract greater numbers and a greater variety of migrant passerines than do other, typical, Pinelands forests.

Relative Importance of Each Habitat

Within Each Watershed

In this section we gauge the importance of habitats within watersheds by the extent of each habitat within the watershed and in relation to its extent throughout the PNR/PA; thus, any occurrence of NPB is important because very little of it occurs anywhere in the region.

The current paucity of field reports makes it impossible to say whether, biologically, a given habitat is equally diverse or productive in all watersheds. Nor have we made judgements as to what, biologically, makes a given habitat more or less "important" than another.

Our estimates of extent of habitats are based on the 1973 maps of McCormick and Jones; it is likely that the updated vegetation survey being prepared for the Commission will reveal some significant changes.

Rancocas Creek North Branch

This area is notable for its large amounts of Agricultural habitat, and for much Urban development. It is one of the few watersheds with tracts of Non-Pine-Barrens forest, though these are small. A very important Bog (Whites-bog) is located here. Oak-Pine forest appears to be more prevalent than Pine-Oak. It is difficult to estimate the extent of Old Field and Nonforested habitat, but given the presence of so much Agriculture and Urban, there is probably some. Hardwood Swamp, Cedar Swamp, Pitch-Pine Lowland, and Water are present only in limited amounts.

Rancocas Creek South Branch

Many artificial lakes make Water an important habitat

in this watershed, also notable for many Urban areas. Though the extent of Hardwood Swamp is not large, it includes the valuable Bear Swamp. The large and well-reported West Jersey Bog is located at the juncture of the RCSB and Mullica River watersheds. Some Agricultural habitat is present. Forests are mostly Oak-Pine.

Crosswicks Creek

The Fort Dix area accounts for the prevalence of Nonforested and Urban areas in the small part of this watershed located in the PNR/PA. Agriculture is prevalent as well. Relatively large areas of Pitch-Pine Lowland occur here, and apparently on the Fort Dix property is the largest Inland Marsh in the PNR/PA.

Maurice River

The dominant habitat in this watershed is Coastal Marsh, occurring in vast stretches along the Maurice River. Inland Marsh and Hardwood Swamp are extensive along Manamuskin and Muskee creeks. Woodlands are predominantly Oak-Pine.

Dennis Creek

The huge Coastal Marsh bordering Dennis Creek is the largest habitat area here, but the rest of the watershed features an interspersed variety of habitats. There is quite a bit of Agricultural land bordering the Coastal Marsh and Urban areas. Leesburg State Prison and Woodbine Airport provide large Nonforested tracts. Timber-Beaver Swamp is a vast Hardwood Swamp, and the Great Cedar Swamp includes both Cedar and Hardwood. Belleplain State Forest also includes large Hardwood Swamp areas, with upland areas mostly Oak-Pine. Small areas of Water and Non-Pine-Barrens forest are present.

Mullica River

Lower Mullica. Huge Coastal Marshes border the Mullica estuary as far up as Lower Bank and up the lower reaches of the Wading River. A large Cedar Swamp is located along Landing Creek; several others of fairly good size are scattered throughout the watershed. The area is also notable for very large tracts of Pitch-Pine Lowland.

Wading River. Large areas of Pine-Oak forest, including Pine Plains, occur here. Many Bogs and much Water are to be found. Cedar Swamps grow along the lower stretches of the Wading River. The watershed includes some very large

Pitch-Pine Lowlands, and small Urban areas, notably Chatsworth.

Batsto River. This watershed features very large areas of Pine-Oak forest and Pitch-Pine Lowland. Several large Bogs are present. Agricultural areas in the river's upper reaches may also include some Old Fields. Strips of Cedar Swamp and Hardwood Swamp border the river. There is little Urban development and little open Water other than the river itself.

Mechesactauxin-Atsion Rivers. A considerable amount of Agricultural land is present in the upper third of this drainage. Upland forests are mostly Oak-Pine. Smaller areas of Hardwood Swamp, Cedar Swamp, and Pitch-Pine Lowland are found along the streams.

Nescochaque Creek. Urban development and Agricultural land predominate in the watershed. Oak-Pine forests are prevalent near Hammonton, and some large Hardwood Swamp areas are present.

Forked River. Considerable Urban development has taken place along major roads in this watershed, but much natural habitat is left. Most of the small streams are bordered by strips of Cedar Swamp; larger tracts of this habitat occur along Cedar Creek and Chamberlin Brook. Large Hardwood Swamps border the Coastal Marsh, which in turn borders the west shore of Barnegat Bay along the entire watershed and becomes very extensive below Tuckerton.

Great Egg Harbor River

Lower. This watershed is notable for the vast Coastal Marsh bordering the river. There are also tracts of Oak-Pine woods, some Hardwood Swamp, and some Urban development.

Upper. This watershed has important areas of many habitat types. A huge Hardwood Swamp on the river north of Mays Landing includes a large Cedar Swamp. Another large Hardwood Swamp is near Babcock. Cranberry Bogs are widespread. Near Penny Pot is a large Oak-Pine tract. Lakes such as Lenape and Makepeace provide large Water areas. There is some Agriculture near Buena and Folsom.

Tuckahoe River

In this drainage are tremendous Coastal Marshes and equally impressive Hardwood Swamps bordering them; additional Hardwood Swamp areas that are part of the Great Cedar Swamp of Cape May County; fairly large Inland Marsh areas on the river's upper reaches; and tracts of Oak-Pine forest.

Toms River

Extensive Urban development is characteristic of this watershed, which also has large Nonforested areas in Lakehurst Naval Air Station. Forests are predominantly Pine-Oak. Ridgeway Branch supports a large Hardwood Swamp, and there is a very large Pitch-Pine Lowland at Colliers Mills.

Atlantic Drainage (Doughty, Absecon, and Patcong Creeks)

Along with the Urban developments in this watershed are large Coastal Marshes (including BNWR), large Nonforested Areas (NAFEC), and some large bodies of Water (Atlantic City Reservoir). There are also some small Non-Pine-Barrens forests, a small amount of Agriculture, and mostly Oak-Pine woodlands.

Geographical Locations of Specific Critical and Environmentally Sensitive Habitats

In this section we have included known breeding locations of noteworthy species; areas of seasonal concentration; areas whose diversity is documented by field reports; and especially large tracts of habitat, where efforts to avoid fragmentation should be focused.

Pine-Oak

- . Great Blue Heronry--Pomona (Atlantic County).

Oak-Pine

- . Red-headed Woodpecker colonies--Pomona (Atlantic County), Pasadena (Ocean County), Batsto (Burlington County), Cedar Run Lake (Medford Twp., Burlington County).

Pitch-Pine Lowland

- . Large areas in MA drainage, BR drainage, WR drainage near Friendship, LM drainage near Landing Creek and Lower Bank (Burlington County), and at Colliers Mills WMA (Ocean County).

Cedar Swamp

- . Great Cedar Swamp--northern Cape May County.
- . Lower reaches of Landing Creek (egg Harbor Twp, Atlantic County).
- . Great Swamp--north of Pleasant Mills (Burlington County).
- . Two large swamps on UGERR in Hamilton/Mullica Twps. north of Makepeace Lake--breeding site for Black-throated Green Warbler.

- . On Oswego River west of Warren Grove (Bass River Twp., Burlington County--breeding site for Black-throated Green Warbler.
- . Cedar Creek below Toms River estuary--FR drainage.
- . East of Weekstown on Mullica River.
- . East of Rt 9 and north of Rt 72, near Manahawkin, FR drainage.

Hardwood Swamp

- . Upper GEHR--east and south of Williamstown, east and west of Folsom.
- . Bear Swamp--SBRC (Southampton Twp. Burlington County); diverse area noted for E. Bluebird, Barred Owl, Ruby-throated Hummingbird.
- . Ridgeway Branch--upper reaches of TM drainage (Ocean County).
- . Large areas border saltmarsh along Barnegat Bay, Little Egg Harbor, Atlantic Drainage, and Tuckahoe River.
- . Timber Beaver Swamp--(DC drainage, Cape May County).
- . Great Cedar Swamp--Cape May County along Tuckahoe River and Cedar Swamp Creek.
- . Along Manamuskin and Muskee Creeks--(Maurice River drainage, Cumberland County).
- . Upper Great Egg Harbor River--north of Mays Landing.

Water

- . Centennial Lake, Braddock's Mill Lake, Cedar Run Lake--(Medford Twp., Burlington County)-waterfowl concentrations.
- . Atlantic City Reservoir--waterfowl concentrations.

Bog

- . Whitesbog--Pemberton and Manchester Twps. (Burlington County); diverse community of breeding and migrating species. Winter concentrations of Whistling Swan and Ring-necked Duck.
- . Hog Wallow Bogs and Friendship Bog--Bass River Twp. and Washington Twp. (Burlington County).
- . West Jersey Bogs--Medford Twp. (Burlington County)--diverse community of breeding and migrating species; winter concentrations of Whistling Swan and Ring-necked Duck.
- . Bogs in Tabernacle Twp. (Burlington County).
- . Bogs in Southampton Twp. south of Pemberton (Burlington county).

Inland Marsh

- . On Fort Dix in Plumstead Twp. (Ocean County)--probably the largest inland marsh in the PNR/PA.
- . East of West Jersey Bogs in Medford Twp. (Burlington County).
- . Upper reaches of Tuckahoe River

Coastal Marsh

- . All coastal marshes should be considered sensitive and critical to waterfowl, shorebirds, wading birds, raptors, and others.
- . West shore of Barnegat Bay and Little Egg Harbor, and Mullica River estuary up to Lower Bank.
- . Brigantine National Wildlife Refuge.
- . Lower Great Egg Harbor River and Tuckahoe River.
- . Delaware Bayshore--Reed's Beach to Maurice River; breeding site for Northern Harrier.

Agriculture

- . Large areas of NBRC watershed.
- . SERC watershed south of Medford.
- . Upper MA watershed.
- . UGEHR watershed near Williamstown and Folsom.
- . BR watershed near Indian Mills and Tabernacle.
- . CC watershed east of Wrightstown.
- . On Delaware Bayshore bordering Coastal Marsh between Reed's Beach and Maurice River.

Urban

Not considered critical or environmentally sensitive habitat.

Islands

Critical habitat for colonial waterbirds. Colony locations as of 1978 marked on topographic maps. Note that colony locations may shift from year to year.

Nonforested Areas

- . NAFEC (Egg Harbor Twp., Atlantic County) and Woodbine Airport (Woodbine Twp., Cape May County) are known breeding locations for Upland Sandpiper, Vesper Sparrow, and Grasshopper Sparrow
- . Fort Dix, McGuire AFB, and Lakehurst NAS may be utilized by these species, but no field reports are made from these sites.

Bay

All Bay areas should be considered environmentally sensitive and critical habitat for waterfowl and colonial waterbirds.

- . Reed's Bay, Absecon Bay, and Great Bay are noted for wintering concentrations of waterfowl.

Barrier Beach

- . Island Beach State Park and Brigantine Island are the only

areas of Barrier Beach habitat in the PNR/PA. IBSP is under state protection but Brigantine Island is not. It is a known breeding area for the Endangered Least Tern, and this colony is under threat of development. Should be considered critical.

Non-Pine-Barrens Forest

This habitat type occurs in scattered, rather small tracts around the fringes of the PNR/PA. It has the potential for adding a high degree of diversity to the avifauna of the region, and priority should be given to acquiring the largest tracts available.

- . South and west of Medford (Burlington County).
- . East and south of Pemberton (Burlington County).
- . Small areas just east of the Burlington-Camden County line north of Berlin.
- . Along coastal strip east and north of Oceanville (Galloway Twp., Atlantic County).
- . Bordering Delaware Bayshore marshes between Heislerville and Eldora (Cumberland and Cape May Counties).

IMPACTS, ISSUES, AND LAND MANAGEMENT TECHNIQUES

Potential Impacts of Development

on Pinelands Birds and Habitats

In general, development (i.e., residential and commercial construction) both literally destroys habitat for the native birdlife of the PNR/PA and renders habitats unusable by fragmenting them into small parcels and increasing human disturbance within them. Obviously, any piece of any habitat which is built on, paved over, or transformed into a lawn is simply eliminated as natural habitat. However, other, less direct effects of development can severely reduce the acceptability to many birds of apparently untouched areas of habitat.

One such effect is that haphazard, "sprawling" development and road construction may reduce large areas of good habitats to fragments so small or isolated that certain species will not use them. For example, Forman, et al. (1976) found that many deciduous woodland birds do not occur in forest "islands" smaller than certain sizes. Though this phenomenon has not been documented for habitats of the PNR/PA, it probably does occur.

Furthermore, undeveloped areas of habitat adjacent to developed areas may be subjected to levels of disturbance (from humans and their pets, off-road vehicles, noise pollution, and so on) intolerable to many bird species. Under such conditions, birds may not nest at all, may abandon nests, or may suffer excessive rates of nest predation (e.g., by cats on ground-nesting passerines, by humans and vehicles on beach-nesting gulls, terns, and skimmers).

These effects may be considered to apply generally to all breeding habitats within the PNR/PA. Effects on specific habitats and their noteworthy species are discussed below.

Pine-Oak--Oak-Pine

These upland habitats are the most desirable and the easiest to develop, and have thereby been subjected to a disproportionate share of development pressure in the PNR/PA. Although large tracts still remain, as discussed above their very size may be exceedingly important and special attention is needed to ensure that these extensive woodlands are not overly fragmented.

"Listed" species eliminated by development: Great Blue Heron (T)--colony near Pomona; Red-headed Woodpecker (T)--though it may persist in parklike environments; Whip-poor-will (D); Least Flycatcher (D); Eastern Bluebird (U)--though it may nest in sparsely developed areas if nest boxes are provided.

Species restricted to this habitat: Common Nighthawk, Black-and-white Warbler, Pine Warbler, Prairie Warbler, Ovenbird, Red Crossbill.

Pitch-Pine Lowland--Cedar Swamp--Hardwood Swamp

These three habitats almost always occur in close association, and development of one would usually entail disturbance to all. They should be treated as a single complex in land-use planning. In the swamp habitats it is evident that disturbances of drainage patterns in any part of a tract may be detrimental to the entire tract.

"Listed" species eliminated by development: Great Blue Heron (T) (potential breeder); Red-shouldered Hawk (T); Barred Owl (T); Eastern Bluebird (U); White-eyed Vireo (D); Northern Parula (Extirpated but now possibly reestablishing); Hooded Warbler (D)

Species restricted to this habitat: Saw-whet Owl, Ruby-throated Hummingbird, Eastern Wood Pewee, Wood Thrush, Prothonotary Warbler, Black-throated Green Warbler, Louisiana Waterthrush, Kentucky Warbler.

Water

Water does not provide actual breeding habitat, however, it is obvious that various forms of pollution associated with development could render Water habitats unusable to the many species dependent on them for feeding, resting, and refuge.

Bog

Although development of such areas seems unlikely, they might possibly be converted to lakes surrounded by residential development. This course of events should be avoided, for

abandoned Bogs provide excellent lake or marsh-type habitat.

"Listed" species eliminated by development: If stocked with fish large Bogs would offer excellent potential breeding habitat for Bald Eagle (E) and Osprey (E) if these species should become reestablished inland; pied-billed Grebe (T); American Bittern (D); Least Bittern (D); Purple Martin (D) (if houses are provided); White-eyed Vireo (D); Yellow-breasted Chat (D); King Rail (U); Eastern Bluebird (U) (if houses are provided); American Coot (U) (if species becomes reestablished inland).

Inland Marsh

Inland marshes within the PNR/PA occur mainly as the marshy edges of ponds, lakes, and streams, and so do not offer great potential for development. However, it is important that such areas be left in their natural state and not developed into conventional parks, stream- and lakeside roads, and so on. Many species will not breed near, or even use temporarily, bodies of water that do not have natural marsh edges.

"Listed" species eliminated by development: All the following species may potentially nest in Inland Marshes, though we have no confirmed records. Pied-billed Grebe (T), Short-billed Marsh Wren (T), Henslow's Sparrow (T), American Bittern (D), Least Bittern (D), King Rail (U).

Coastal Marsh

Coastal Marsh is treated here as saltmarsh only, since the only large freshwater coastal marsh in the PNR/PA is at BNWR and is under government protection. Drainage and/or development of coastal marsh would eliminate habitat for a large number of species, including many threatened and endangered ones.

"Listed" species eliminated by development: Breeding--Bald Eagle (E), Osprey (E), Northern Harrier (T), Short-eared Owl (T), Henslow's Sparrow (T), Common Tern (D); Wintering, Migration, or Summer Nonbreeding--Bald Eagle (E), Northern Harrier (T), Short-eared Owl (T), American Bittern (D), Least Bittern (D), Hudsonian Godwit (D), Marbled Godwit (D), Eastern Meadowlark (D), Savannah Sparrow (T), wading birds including Great Blue Heron (T), waterfowl, raptors, shorebirds.

Species restricted to this habitat: Clapper Rail, Willet, Boat-tailed Grackle, Seaside Sparrow, Sharp-tailed Sparrow.

An additional impact on Coastal Marsh is mosquito ditching. Dunne (1979) speculates that this practice may decrease suitability of saltmarsh for breeding Northern harrier, since this species has virtually disappeared from the heavily ditched

Atlantic coast marshes, but still nests in a few places in the largely unditched Delaware Bayshore marshes. Dunne's state-wide breeding survey also revealed Northern Harrier to be exceptionally intolerant of human disturbance near the nest.

Agriculture

Like the upland forested sites, agricultural land is highly desirable for development. Relatively little of this habitat type occurs within the PNR/PA, and as it adds an important element of diversity to the area's birdlife, high priority should be given to preserving it.

"Listed" species eliminated by development: All the following are potential breeders in this habitat--Upland Sandpiper (T), Savannah Sparrow (T), Grasshopper Sparrow (T), Vesper Sparrow (T), Horned Lark (D), Purple Martin (D) (if houses are provided), Eastern Meadowlark (D), Eastern Bluebird (U) (if houses are provided).

Nonforested Areas

In general, these habitats are already developed (for airports, rights-of-way, golf courses, landfills, and so on), and by their nature are maintained as open, short-grass habitats. Although the species attracted to Nonforested areas are much the same as those utilizing Agricultural areas, Nonforested areas, by virtue of their public use, are better reported and provide many breeding records.

"Listed" species using this habitat: Upland Sandpiper (T), Grasshopper Sparrow (T), Vesper Sparrow (T), Eastern Bluebird (U). Potential breeders--Savannah Sparrow (T), Horned Lark (D), Purple Martin (D) (if houses are provided), Eastern Meadowlark (D). The only record of breeding Dickcissel for the PNR/PA is from this habitat.

Old Fields

It is difficult to estimate how much of this successional habitat occurs within the PNR/PA; however, what there is will probably be located on upland sites, such as abandoned farms, which would be desirable for development. Old fields are generally rather small, isolated parcels by nature, and the species occurring in them are adapted to such conditions, so the caution about not fragmenting habitats does not apply in this case.

"Listed" species eliminated by development: Yellow-breasted Chat (D), Eastern Bluebird (U) (if houses are provided). Most nesting records of Bluebirds are from such habitats.

Islands

These habitats are threatened more by improper spoil dumping and human disturbance than by development (see Issues). Pipelines and sewer outfall lines should be carefully routed to avoid these critical nesting areas for colonial waterbirds.

"Listed" species eliminated by development: Least Tern (E), Black Skimmer (E), Common Tern (D), Yellow-crowned Night Heron (D).

Bays

Not directly subject to development, but obviously pollution emanating from developed areas could render Bay areas unusable by the great variety of waterfowl, wading birds, gulls and terns, and shorebirds that use them for feeding, resting, and refuge.

Barrier Beach

Development and human activity on Barrier Beaches are detrimental to beach-nesting species, colonial-nesting wading birds, and the great numbers of migratory birds which utilize this habitat.

"Listed" species eliminated by development: Least Tern (E), Black Skimmer (E), Piping Plover (U), Yellow-crowned Night Heron (D).

Non-Pine-Barrens Forest

Very little of this mesic, deciduous woodland habitat occurs within the PNR/PA. It does, however, have potentially the highest species diversity of all the area's habitat types. As it is desirable for development, care should be taken to preserve all available parcels and especially to avoid their further fragmentation.

Although field records mentioning Non-Pine-Barrens forests specifically are virtually nonexistent, such areas represent potential breeding habitat for Cooper's Hawk (E) and Least Flycatcher (D). Many species, while not rare, are virtually restricted within the PNR/PA to Non-Pine-Barrens forests for breeding habitat.

Issues and Recommendations

Involving Land-Use Controls and Standards

A wide range of issues must be considered in developing land-use controls and standards to minimize detrimental effects on birds and bird habitats in the PNR/PA. General recommendations for dealing with these issues are outlined below; the development of more specific recommendations would require a considerable amount of field investigation.

Issue:

Placement, size, and design of residential developments.

Recommendations:

- (1) Developments should be located in upland Pine-Oak or Oak-Pine habitats rather than in any of the lowland or coastal habitats.
- (2) Development of Agricultural and Non-Pine-Barrens areas should be vigorously discouraged because, while they are uncommon within the PNR/PA, they contribute greatly to its overall bird species diversity.
- (3) Development of Coastal Marsh, Inland Marsh, and Barrier Beach habitats should be strictly prohibited. Forests along inland borders of saltmarshes should be protected as a buffer zone and because they also represent potential nesting habitat for Bald Eagle (E) and Osprey (E).
- (4) A buffer zone should be provided between lowland habitats and any developments in adjacent upland habitats. Size of this zone cannot be specified, as controlled studies have not been conducted to determine the sensitivity of bird communities in the habitats under consideration. Obviously, however, the larger such a zone can be, the better, and preference can be given to developments which can establish the largest zones.
- (5) Developments should be placed and designed to reduce to an absolute minimum the fragmentation of large, unbroken tracts of any habitat into small, isolated parcels. From their study of Piedmont forest islands Forman et al. (1976) determined that parcels of at least 40 ha are apparently needed to support "forest interior" insectivores, and recommended that "to maintain maximum regional diversity, top priority should be placed on identifying and protecting large forests; rather than protecting an equal area of small forests" (p. 6). This policy is highly recommended to the Commission.

- (6) Though it has not been documented, it is highly likely that "cluster" developments (in which the dwelling units are grouped on a small percentage of the development's actual acreage) would preserve more of the natural bird community than would conventional developments (in which the units are spaced equally over the entire tract). Cluster-design developments should therefore be encouraged, with requirements that unused areas be left as natural as possible.
- (7) Developments should be located near existing roads to minimize additional road-building.
- (8) Strong encouragement should be given to the use of structural designs which discourage nesting by Starlings, House Sparrows, and Rock Doves. For example, open eaves, latticework, and in general structures which provide many "nooks and crannies" provide ideal nesting habitat for such birds, and should be avoided. Such discouragement of nesting may reduce the populations of these species that usually thrive around developed areas, and thus reduce their competition with native species.
- (9) There is currently no information available on which to base recommendations as to the optimum size of developments; however, fewer, larger, developments may be preferable to more, smaller ones, since the larger ones would probably result in less fragmentation of natural habitats.

Issue:

Logging.

Recommendations:

- (1) Logging of upland forests is generally not detrimental, for these forests are extensive and sprout growth in regenerating areas probably maintains a high species diversity. This practice should therefore be controlled only to the extent that it not become so extensive that immense even-aged stands are created.
- (2) Logging in the lowland forest complex should be discouraged. Cedar is probably the most valuable wood in these habitats, but Cedar Swamp is also the most limited in extent, occurring with few exceptions in narrow strips bordering watercourses. Removal of such trees would obviously increase erosion into streams and perhaps change their physical and chemical characteristics. Most of the species breeding in Cedar Swamps (e.g., Saw-whet Owl, Wood

Thrush, Black-throated Green Warbler) do not occur in other habitats (and may occur only rarely in Cedar Swamps themselves), and destruction of significant amounts of their habitat would definitely jeopardize their existence in the PNR/PA. It should also be noted that it is difficult to log Cedar Swamps without extensive disturbance to surrounding areas of Hardwood Swamp and Pitch-Pine Lowland usually associated with it.

Issue:

Fire.

Recommendations:

The importance of natural fire in the overall Pinelands ecosystem should be recognized and policies formulated to ensure that its role is maintained to the extent consistent with public safety. Though fire drastically alters the environment, many bird species are adapted to take advantage of burned areas; some, such as the Common Nighthawk, may require them for breeding.

Issue:

Cranberry bog management.

Recommendations:

- (1) Cranberry bogs and their environs are highly beneficial to birdlife, and their maintenance should be encouraged.
- (2) During periods of flooding, water levels should be kept as stable as possible to benefit wintering waterbirds.
- (3) Natural vegetation (thickets, hardwood swamps) surrounding bogs should be preserved.
- (4) Abandoned bogs should either be permanently flooded or water maintained at a level that will produce an inland marsh, a relatively scarce habitat in the PNR/PA.

Issue:

Routing of rights-of-way for roads, power lines, gas lines, pipelines, sewer lines, and so on.

Recommendations:

- (1) As far as possible, new rights-of-way should be routed along existing ones (e.g., new power lines along existing roads) and through already developed areas, to

minimize additional habitat destruction, disruption, and fragmentation.

- (2) Routing of right-of-way through lowland habitats should be avoided. These habitats are slow to recover from disruption, may be adversely affected by drainage alterations, and are sensitive to increased levels of pollution likely to emanate from roads and pipelines.
- (3) Rights-of-way should not be routed through extensive unbroken tracts of upland forest, to avoid the effects of fragmentation discussed above. Every effort should also be made to avoid further fragmentation of already isolated forest islands.
- (4) Routing rights-of-way through Coastal Marsh, Island, and Barrier Beach habitats should be strictly prohibited. These are fragile habitats used for breeding by a number of endangered and threatened species, and for breeding, migration, and wintering by a vast array of other species.

Issue:

Siting of landfills and chemical dump sites.

Recommendations:

These should be strictly prohibited within the PNR/PA because the rapid drainage characteristic of the area's soils would spread polluting leachates into groundwater and thus possibly into a vast area of many down-drainage habitats.

Issue:

Construction of major airports.

Recommendations:

Although the open areas created by such areas benefit certain species, these benefits would be offset by the immense amount of destruction of much more diverse habitats that would be necessary for an airport, support facilities, access roads; by the other residential and commercial development likely to be associated with it; by increased air, water, and noise pollution emanating from it. Such construction should be strictly prohibited; however, small, local airports may be permitted.

Issue:

Construction of ~~o~~power plants, oil refineries, ports, etc.

Recommendations:

Such facilities would by their nature have to be located in coastal areas and would destroy large areas of fragile, biologically productive, and diverse habitat; in addition, they would pose severe air and water pollution hazards and would promote, if not necessitate, a great deal of additional associated development. Their construction should be strictly prohibited.

Issue:

Construction of dams and artificial lakes.

Recommendations:

Such alterations of habitat should be judged on a site-by-site basis. Created lakes, ponds, and associated marshes can provide valuable habitat to replace that destroyed; however, upstream sites that will be flooded (especially Cedar and Hardwood Swamps) should be carefully surveyed (in the breeding season) for noteworthy species whose presence would make construction of a dam inadvisable.

Issue:

Saltmarsh management.

Recommendations:

- (1) Until a comprehensive survey of the effects of ditching on saltmarsh species is conducted, this practice should definitely not be extended into unditched marsh (i.e., the Delaware Bayshore).
- (2) All draining of saltmarsh should be strictly prohibited.
- (3) Mowing of marshes apparently has no detrimental effects and may in fact be beneficial to some species of shorebirds (Bull 1964, p. 204). It may be permitted provided it is begun no earlier than August 15, to allow completion of breeding by all saltmarsh species.

Issue:

Active recreational use.

Recommendations:

- (1) Off-road vehicles and all-terrain vehicles can obviously wreak havoc with birdlife in virtually any habitat. It is probably impossible to control their use in the extensive upland forests interlaced with

sand roads, therefore attempts to do so are not recommended. It is unlikely that the densely vegetated lowland forests receive much use even from these machines. However, OTRs and ATVs can and should be strictly prohibited from saltmarshes and controlled on Barrier Beach areas, where ground-nesting birds, especially colonial nesters such as gulls, terns, and skimmers, are highly vulnerable. Least Terns nesting on Cedar Bonnet Island, for example, have been severely disturbed by recreational vehicle traffic in defiance of posted signs (Galli 1979, p. 186). Active cooperation with the Nongame and Endangered Species Project in protecting such sites is highly recommended. Excellent, detailed guidelines for protecting colonial waterbirds from people, pets, and vehicles are presented in Buckley and Buckley (1976). It should be noted that Island Beach State Park allows fishermen to use vehicles on the beach, and any attempt to curtail this privilege would probably be strongly resisted; however, stringent control of recreational vehicles here should be seriously considered, as the area offers a great deal of potential nesting habitat for terns and skimmers.

- (2) Heavy canoe traffic on Pinelands streams may be a source of disturbance to birds in streamside habitats, especially when people leave their canoes to wander around; however, it is probably the vegetation of streamside bogs that is most vulnerable to such foot traffic. For the protection of both birds and vegetation it is recommended that on heavily traveled streams concentration points be established by creating attractive sandy beaches for stopping points in less fragile upland habitats.
- (3) In general, it is recommended that all agencies having jurisdiction within the PNR/PA develop coordinated policies governing acceptable forms and levels of active recreational use within the area.

Issue:

Spoil deposition.

Recommendations:

Dredge spoil can, if properly handled, be used to create breeding habitat for colonial waterbirds, including the Endangered Least Tern and Black Skimmer. Although there are as yet no studies documenting the best ways to handle dredge spoil for this purpose, observations by NJ Audubon personnel on the Coastal Colonial Waterbird Survey suggest the following procedures:

- (1) Only clean, white sand should be deposited; if mud or silt must be deposited, clean sand should be placed on top of it.
- (2) Spoil islands should be dome-shaped and undiked.
- (3) Extreme care should be taken that spoil is not dumped on active colonies during the breeding season, and that shrubby areas supporting known heronries are not obliterated during the nonbreeding season.
- (4) New spoil should be dumped only on existing spoil when possible.
- (5) The Pinelands Commission should encourage cooperation in spoil management by the US Fish & Wildlife Service, the Army Corps of Engineers, and the Nongame and Endangered Species Project.

Issue:

Habitat protection for Endangered and Threatened species.

Recommendations:

The Commission should purchase all known nesting sites and wintering areas of Endangered and Threatened species not already protected by government ownership.

Issue:

Protection for Declining and Undetermined species.

Recommendations:

- (1) Special note should be made of the breeding locations for those species discovered in the course of all field investigations conducted for the Commission.
- (2) For Declining species suffering obvious habitat loss, serious consideration should be given to purchasing critical habitat before the species declines to even more precarious status.
- (3) Although the purview of the Commission is habitat protection rather than wildlife management, the Commission should encourage and cooperate in nest-box programs for appropriate species, namely, those which are now largely dependent on artificial nest sites. For example, a nest-box program for Eastern Bluebird (U) has been extremely successful at Colliers Mills WMA; similar programs should be encouraged at other areas with suitable habitat. The Purple Martin (D) is another species which could benefit from installation of nest-boxes in appropriate habitats.

DATA GAPS AND ISSUES

REQUIRING FURTHER INVESTIGATION

In many of the comments, discussions, and recommendations in this report we have had to resort to generalizations owing to lack of detailed information on the distribution and habitat requirements of particular species. This nonexistence of much-needed data has made it easy to identify problems and areas where further investigation would provide valuable information to aid the Commission in land-use planning.

- Though the field notes published by NJ Audubon proved one of our best sources of information, the reports therein seldom refer specifically to the habitat in which a species was seen (e.g., the reference will be to "Red-headed Woodpeckers near Batsto"). As a result, assignment of species to particular habitats, particularly the upland and lowland forest types, was often tentative, and the true richness of breeding species in these types may vary from the figures given. In fact, in most breeding reports, breeding is only inferred from presence of singing males and not confirmed by nest discovery or other evidence.

We therefore recommend thorough breeding censuses of a series of sample tracts of each of the forest habitats. Such surveys will provide a more reliable guide to the diversity of the bird community in each of the habitats.

- Of all the forest habitats the Pitch-Pine Lowland and Cedar Swamp are the most poorly known and should receive first priority for study.

- In the course of such surveys relative abundances of species should also be assessed, as in many cases they could only be guessed at.
- Investigations should be conducted to determine the minimum-sized tract of each habitat which will support the highest possible diversity. Such information will be invaluable in determining the effects of proposed developments on regional species diversity.
- Studies should be conducted to determine the size of buffer zone which is most effective in protecting the more fragile lowland and coastal habitats.
- Currently established developments should be studied to determine their various effects on surrounding habitat and bird communities.
- Effects of both natural and controlled fires on bird species diversity are not well known and merit study in the PHR/PA to determine what types of fire management would be most effective in maintaining the true character of this ecosystem.
- A comparative study of ditched and unditched salt-marshes is imperative to determine the effects of this widespread practice on the diversity and productivity of the marsh bird community.
- Studies of currently logged areas would help to determine whether various forest types can sustain bird diversity under such exploitation and whether various logging methods and practices vary in the severity of their effects on bird communities.
- A comprehensive study of dredge-spoil islands is highly desirable, for this is one of the few human disturbances which can, if carried out properly, actually create more habitat than it destroys. This habitat benefits one of the area's most hard-pressed bird groups--colonial waterbirds. However, there is as yet little documented information on how best to manage dredge spoil--what kind of spoil to dump where and in what configuration, the types of vegetational succession that occur and how they benefit different species, and so on. With this knowledge the immense volume of dredge spoil generated in NJ could be deposited and managed to the great benefit of an array of valuable species including the Endangered Least Tern and Black Skimmer.
- Because of the distribution and interests of birders in the state, field reports are biased in favor of certain habitats and sites, and many large areas within the

PNR/PA have gone completely unreported in the literature. In the course of conducting the field investigations recommended above, at least some sample tracts should be located in these "blank" areas to improve our distributional records.

Furthermore, the NJ Division of Fish, Game, and Shell Fisheries maintains many Wildlife Management Areas in both inland and coastal habitats in the PNR/PA, and detailed reports from these areas would be a valuable supplement to other field surveys. Unfortunately, except for Manahawkin, Great Bay, and Dennis Creek, these areas are not visited by field birders.

Among the counties, the following have virtually no field records:

- (1) Camden
- (2) Gloucester
- (3) Cumberland
- (4) Ocean, except Island Beach State Park and Manahawkin and Great Bay WMAs.

The poorly reported watersheds are:

- (1) Toms River
- (2) Upper Great Egg Harbor River
- (3) Neschochaque River
- (4) ForkedRiver, except Manahawkin and Great Bay WMAs
- (5) Mechesactauxin-Atsion Rivers
- (6) Crosswicks Creek
- (7) Maurice River--Manamuskin Creek

It should be noted that until this information is available, the relative merits of the watersheds cannot be evaluated, if the Commission desires to do so.

DOCUMENTATION

- "Annual Audubon Christmas Bird Counts," 1970-79. American Birds 24(2): 175-185; 25(2): 211-221; 26(2): 229-238; 27(2): 232-240; 28(2): 242-250; 29(2): 265-274; 30(2): 271-282; 31(4): 523-532; 32(4): 537-546; 33(4): 419-426.
- A.O.U. Check-list Committee. 1957. Check-list of North American Birds (5th Ed.). Amer. Ornith. Union.
- Arbib, Robert. 1977. "The Blue List for 1978." American Birds 31(6): 1087-1096.
- _____. 1978. "The Blue List for 1979." American Birds 32(6): 1106-1113.
- Bellrose, Frank C. 1976. Ducks, Geese & Swans of North America. Pennsylvania: Stackpole Books.
- "Birds of Brigantine National Wildlife Refuge," (list). US Dept. of the Interior Fish and Wildl. Ser. Fall, 1974.
- "Birds that have been seen at Island Beach," (list). Anonymous. May, 1972.
- Buckley, F. G. 1978. "A Study of the Use of Dredged Material Islands by Colonial Seabirds and Wading Birds in N.J." Manomet Bird Observatory, Manomet, MA. Contract # DACW-39-76-C-0166.
- Buckley, P.A., and F.G. Buckley. 1976. "Guidelines for Protection and Management of Colonial Nesting Waterbirds." North Atlantic Regional Office National Park Service, Boston, MA.
- Bull, John. 1964. Birds of the New York Area. New York: Harper & Row.
- Burger, Joanna, Shisler, J., and F. Lesser. 1978. "The Effects of Ditching Salt Marshes on Nesting Birds." Proc. Colonial Waterbird Group: 27-37.

- Dunne, Peter J. 1979. "Northern Harrier Breeding Survey, State of New Jersey." New Jersey Audubon Society, Cape May Bird Observatory.
- Endangered and Nongame Species Project. 1979. Endangered and Nongame Species Program in New Jersey. NJ Dept. of Env. Pro. Div. Fish, Game and Shellfish.
- _____. 1979. "Endangered, Threatened, Peripheral, Declining, Undetermined, and Extirpated Wildlife Species in NJ." NJ Dept. Env. Pro. Div. Fish, Game and Shellfish.
- Fables, D.G. 1947-1954. "Pine Barrens and Cedar Bog." Audubon Field Notes 1, 223-224; 3, 255-256; 4, 301; 6, 315; 7, 353; 8, 374-375.
- Fables, David Jr. 1955. Annotated List of New Jersey Birds. Newark: Urner Ornithological Club.
- Fables, David G. Jr. 1962. "Breeding Birds of the New Jersey Pine Barrens." NJ Nature News 17: 60-64.
- Ferrigno, Fred. 1979. "1979 Winter Waterfowl Trend Survey." Dept. Env. Pro. Div. Fish, Game and Shellfish.
- Forman, R.T.T., Galli, Anne E., and Charles F. Leck. 1976. "Forest Size and Avian Diversity in NJ Woodlots With Some Land Use Implications." Oecologia (Berl.) 26: 1-8.
- Galli, Joan. 1979. "The Colonial Waterbirds of New Jersey, Summer 1978." NJ Div. Fish, Game and Shellfish. Endangered and Nongame Species Project.
- Harrison, Hal E. 1975. A Field Guide to Birds' Nests. Boston: Houghton Mifflin.
- Leck, Charles F. 1975. The Birds of New Jersey. New Brunswick: Rutgers University.
- _____. 1979. "Birds of the Pine Barrens." in The Pine Barrens, R.T.T. Forman, ed. New York: Academic Press.
- McCormick, Jack. 1970. The Pine Barrens: A Preliminary Ecological Inventory. NJ State Museum, Res. Rep. No. 2.
- _____, and Leslie Jones. 1973. The Pine Barrens: Vegetation Geography. NJ State Museum, Res. Rep. No. 3.
- New Jersey Audubon. 1975-1979. Field Notes, regions 4 & 5. 1(1,4,7); 2(2,5,8,11); 3(2,5-6,7-8,11-12); 4(1,2,4,5); 5(1,2,3).
- New Jersey Nature News. 1962-1975. Field Notes, regions 4 & 5. Vols. 17-30.
- Ferrone, S., Ed. No date. Guide to Wildlife Management Areas. NJ Dept. of Env. Pro. Div. Fish, Game and Shellfish.
- Pough, Richard H. 1949. Audubon Land Bird Guide. New York: Doubleday.
- _____. 1951. Audubon Water Bird Guide. New York: Doubleday.

- Robbins, Chandler S., Bruun, Bertel, and Herbert S. Zim.
1966. Birds of North America. New York: Golden Press.
- Stone, Witmer. 1965. Bird Studies at Old Cape May. Vols.
1 & 2. New York: Dover.
- Swinebroad, J., and O. Sussman. 1964. "Breeding Bird Pop-
ulations in New Jersey." NJ Nature News 19: 102-110.
- Tate, James Jr., and D.P. Kibbe. 1974. "Update Your Field
Guides." American Birds 28: 747-753.
- Urner, Charles A. 1926. "Effects of Fires on Pine Barren
Bird Life." Auk 43: 558-559.

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