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Birds of the Arthur Kill Tributaries, 1990

by Richard Kane,
Paul Kerlinger and Richard Radis

Introduction

The New Jersey Conservation Foundation proposed to conduct an inventory and evaluation of stream corridor, open space lands including wetlands, derelict properties, and quasi-public and public lands along the lower tributaries (below the 100 foot contour) in the Arthur Kill watershed. The properties were to be evaluated for open space potential through government funded programs such as Green Acres. Municipalities were to be contacted to determine their interest in open space preservation projects so that they could be assisted in working with Green Acres on acquisition. The study area included municipalities in Union and Middlesex counties, New Jersey. The lands to be inventoried included the stream corridors of the major tributaries to the Arthur Kill and their branches between Perth Amboy and Elizabeth Port. (Stream corridor was defined as the area from the centerline of the stream to the first cultural boundary, such as a road or a building). The six tributaries are the Elizabeth River, Morses Creek, Piles Creek, Rahway River, Smith Creek, and Woodbridge Creek.

New Jersey Conservation Foundation contracted with the New Jersey Audubon Society to provide natural resource inventory assistance to identify properties with potential for wildlife habitat. Likewise, New Jersey Conservation Foundation contracted ANJEC to survey the political units in the drainage and work directly with the municipalities and acquisition agencies. Lands along the tributaries were evaluated by NJAS for plant and animal species, topography, open space potential, proximity to existing protected open lands, improvements, dereliction, and greenway potential. Political units were inventoried by ANJEC to identify councils and mayors, planning boards, recreation commissions, environmental commissions, Board of Freeholders, Park Commissioners, and key staff members. The habitat and open space evaluation by NJAS was conducted over ten months from March to December, 1990.

Methods

The tributary lands were inventoried weekly (sometimes more often) by the study team from the third week in March to the third week of December 1990. The study team consisted of three NJAS staff and a research associate. Additional visits were made by individual study team members to priority sites not in public ownership which the team judged to have high habitat potential. Most site visits were on foot; a few were made by boat to the tributary mouths which could not be easily surveyed from land.

Newark Bay Study Area
Records of N.J. Birds
NBSA-00011

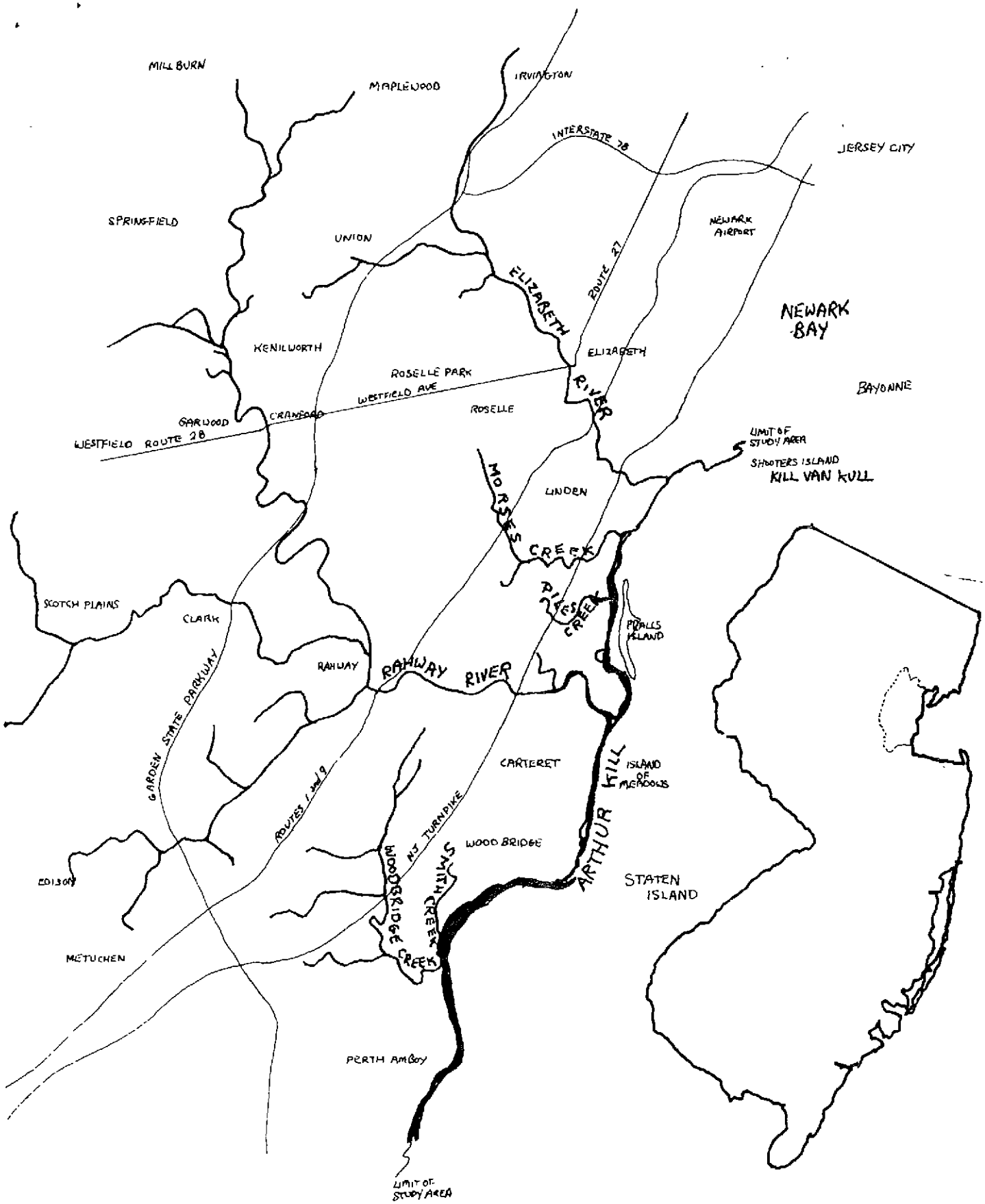


Figure 1. *Map of the six New Jersey tributaries to the Arthur Kill, with area of detail at right. Courtesy of Association of New Jersey Environmental Commissions (ANJEC).*

Sites were named usually from the nearest USGS chart name, unless the land was a public park with its own name. Sites were defined mostly by cultural boundaries such as roads, except for large public parks, which were treated as single units. Inventories were made of birds, mammals, herps, plants and vegetation types on each site. Bird counts were made of singing males for resident species and total number of birds seen and heard for migrants. For this study, the presence of a singing male after the spring migration period was taken as indicative of breeding if the species' known range includes this part of North Jersey These numbers are those seen or heard from our observation sites and do not reflect a census of the area. (The numbers are not published here). We did not keep track of the numbers of Rock Dove (pigeon), House Finch, and House Sparrow. Site vegetation is described by the common plant species in the canopy, shrub layer and forest floor. More extensive plant lists were made for the priority sites deemed by the team to have the best potential for habitat protection. Public sites were also evaluated for habitat contribution.

All sites (with wildlife potential) were visited by the team once every four weeks. Priority sites were visited more frequently, as were shorebird and heron habitats having tide-dependent use. Regular weekly site visits were performed from 0900 a.m. to 1500 p.m.; the additional visits were planned to coincide with optimal tide and weather conditions at priority sites. Typical visits to these sites were 30 to 40 minutes in duration.

Priority sites were those in private ownership not yet protected, but having high habitat value. These were selected for the following values:

1. Contiguity to already preserved tract
2. Possibility of linkage of 2 existing preserves or of a corridor between existing preserves.
3. Habitat type rare in the Arthur Kill area
4. High ranking (best or close to it) remnant habitat type
5. Insular (only) site in a broad urban area
6. Size - large size preferred
7. Abundance and diversity of wildlife including migratory, nesting and wintering birds
8. Diversity of native vegetation - including rare plants
9. Mature forest
10. Flood control/water quality contribution
11. Possibility of public use and access

Note: Two other values were assigned: "T&E" for threatened and endangered species and "Headwaters" = headwaters of that particular tributary.

Results

The NJAS study team found a surprising diversity of vegetation and bird species on the stream corridors along Woodbridge Creek, the Rahway River, the Elizabeth River and their branches. Woodbridge Creek, with tidal and fresh water marshes, also has in its upper reaches an extensive swampy pin oak forest of the type which once covered 25% of the Rahway-Linden area (Turnpike Technical Study Vol. II 1986). The Rahway and Elizabeth Rivers, although channelized and bulkheaded over some portions, had extensive stands of alluvial forest, including some of the sycamore-silver maple association and some pin oak forest, with 100-200 year old trees. Many of these tracts, especially in Union County, were placed in public ownership in the 1920's and 1930's and represent the only protected open space in Union County, outside of the Watchung Reservations, park and golf courses.

Smith and Piles creeks are shorter in length than the other streams and are not forested. Despite this fact, they had some productive areas nestled within the heavily developed banksides. The mouth of Smith Creek at Boynton Beach, Piles Creek, the Rahway River mouth, and Morses Creek between Bayway and the Cemetery had significant waterbird use. Piles Creek was found to have valuable *Spartina* marshes adjacent to the N.J. Turnpike.

The lower reaches of most tributaries were bulkheaded, riprapped or channelized to allow for commercial development. In the Rahway, the largest of the 6 rivers, the marshes in the lower reaches are still extensive. The lower marshes of the Woodbridge Creek have had extensive development inroads. Despite development, and in some cases, trashing, the lower reaches of five of the creeks east of Route 1 still afford significant habitat for feeding herons from the Arthur Kill rookeries, migrant shorebirds and waterfowl. Our observations of heron use indicate that herons from the harbor rookeries fan out in all directions to feed on the tributaries (*The Harbor Heron Report*, TPL & NYC Audubon, Feb. 1990; Maccarone, A.D. and K.C. Parsons, 1988, Differences in flight patterns among nesting Ibises and Egrets. *Colonial Waterbirds* 11(1):67-71). In fact, heron and shorebird use extended far up the tributaries beyond tidal portions (see Figure 2.).

Figure 2. Use of New Jersey Arthur Kill Tributaries by foraging herons and ibis at selected sites from March to October, 1990.

	Heron Species								
Sites	*GB*	*BCN*	*YCN*	*GE*	*SE*	*CE*	*LB*	*LA*	*GI*
Kawahmee Park	●	●		●	●			●	
Morses Creek (Rte. 1)	●	●		●	●			●	
Piles Creek	●	●		●	●	●	●		●
Lower Rahway	●	●	●	●	●	●	●	●	●
Winfield Park	●	●		●	●		●		
Rahway River Park	●	●		●	●				
Up. Middlesex Res.	●	●		●	●		●		●
Boynton Bch. (Smith Cr.)	●	●	●	●	●				●

GB = Great Blue Heron; BCN = Black-crowned Night-Heron; YCN = Yellow-crowned Night-Heron; GE = Great Egret; SE = Snowy Egret, CE = Cattle Egret; LB = Little Blue Heron; LA = Tricolored (Louisiana) Heron; GI = Glossy Ibis.

Vegetation types on the tributaries ranged from arrow-arum/spatterdock marshes to *Spartina* marshes in tidal portions, and bottomland forests of various associations in the upper portions. Common forest trees include sycamore, sweet gum, red maple, pin oak, tulip poplar, and silver maple. The shrub layer in most portions was dominated by arrowwood, spicebush, and alternate-leaved dogwood The forest floor was frequently covered by native herbaceous species such as mayapple, spring beauty, Canada mayflower, and in wetter portions, skunk cabbage, over much of the Rahway, some of the Upper Woodbridge, and portions of the Elizabeth West Branch and main stem. Disturbed portions of the Elizabeth exhibited large stands of invasive aliens such as Japanese knotweed, as did the Rahway River.

In excess of 195 species of birds were found in the drainage or deemed likely during the study. About 88 species were found to breed in the river corridors. Among the resident water birds were numbers of Wood Duck and the "Harbor" herons; upland species included vireos, warblers, flycatchers, tanagers, grosbeak, orioles, blackbirds, and sparrows. Few raptors were



Vauxhall Road site on West Branch of Elizabeth River. Some 20 species of warblers (100+ individuals) were recorded here on one day in May. Photos in color by Rich Kane.

recorded, possibly owing to small tract sizes. A tremendous diversity of migrants used the streams. Migrant shorebirds were found to utilize both the tidal and non-tidal portions of the creeks. Feeding gulls, cormorants, and ducks were found on lower portions. Migrant landbird numbers were high because the river corridors represent the only suitable open spaces over much of the study area. This finding demonstrates the value of river corridor small tracts for migratory birds. Twenty-six species of warblers were found in the drainage during the study. As many as 20 species and 100+ individuals were found in one small block-long tract on the Elizabeth River in May. Surprising resident species were Belted Kingfisher, Least Bittern, Virginia Rail, and Kentucky Warbler. Surprising also were the numbers of Warbling Vireo found in the drainage.

Among the mammals found on the survey were raccoon, chipmunk, rabbit, and muskrat, commonly throughout. White-tailed deer was found only in Lenape Park in Westfield although it probably also occurs at Ashbrook. Dead opossums were seen along roadways within the study area. Gray squirrel was common to abundant as was the house cat. Red fox occurs in Ashbrook and Nomahegan and perhaps in some of the other larger parks in the Rahway drainage.

Species of reptiles found included painted turtle, commonly in freshwater sites, and diamond-backed terrapins in saltwater areas such as Piles Creek. Slider (sp.) was found in Winfield Park on the Rahway River, although it is not native to the area. Snapping turtles were observed at several freshwater sites. Snakes seen include black racer, common garter, and water snake, although other species probably occur. Most common among the amphibians were green frog, bull frog, wood frog, and leopard frog. Spring peepers were also evident.

Discussion

Priority Sites

After the initial two visits to all sites (mid-May), the study team identified the following sites as priority sites based on the criteria given in the **Methods** section above (priority sites meaning sites in private ownership to be acquired).

Upper Woodbridge Creek: Extending from Homestead Avenue in Woodbridge to the woods north of Omar Avenue, this tract is a complex of upland hardwood forest, streamside ecotone wetlands, marsh, wooded wetlands, disturbed ground and successional fields. All of the surrounding land is heavily developed. Of special note within the tract is a pristine forest north of Omar Avenue near the headwaters of the Woodbridge Creek. Although it is trashed and weedy near the road, its interior is undisturbed, with few invasive or alien species. The majority of this tract is composed of wetlands, a matrix of seeps and poorly drained areas in the gray area of the wetlands continuum. The predominant tree species is pin oak, with some white oak, white ash, cherry and gray birch, red maple, sweet gum willows and black locust. The understory is composed of saplings, spicebush, pussy willow, silky and alternate-leaved dogwood, sumac and blackberries. More than 20 species of warblers were recorded on-site several dates in May.

Piles Creek: This site is perhaps one of the two best tracts of salt marsh surviving on the Arthur Kill drainage. All three salt marsh grasses are present, Spartina patens being most common Phragmites is on the site, but it does not appear to be taking over. Also found on the marsh are marsh elder, high tide bush, glasswort, salt marsh fleabane, sea lavendar and switchgrass. This site was regularly used by Northern Harriers at all four seasons. An adult male seen on the site in June was clearly a breeding bird either from on-site or nearby. Herons and ibis consistently used the site for foraging as did migrant yellowlegs and other shorebirds.

Lower Rahway River: Extending from Liberty Park in Carteret, with its maintained lawns, plantings and natural shoreline vegetation, to the mouth of the Rahway at the Arthur Kill, this site supports the other large tract of remnant salt marshes on the Kill drainage. The largest such area runs from east of the New Jersey Turnpike to Potter's Island. These wetlands support breeding Clapper Rail, salt sparrows, Willow Flycatcher and wintering Northern Harrier. Yellow-crowned Night-Herons regularly used the Liberty Park portion of the area as did Cattle Egrets. Little Blue and Tricolored Herons were also found on-site, along with Snowy and Great Egrets, Black-crowned Night-Herons and Glossy Ibis. Short-billed Dowitchers, both yellowlegs and other shorebirds used the extensive flats in migration Hooded Mergansers and other waterfowl were present in numbers in late fall and winter

Evergreen Road: At the headwaters of the South Branch of the Rahway River, the site is a complex of stream-side wetlands, scrubby fields and wet woods on both sides of Evergreen Road in Edison. Wooded wetlands are composed of seeps and poorly drained areas, while high banks limit the amount of palustrine wetlands along the stream. The portion of the site bordering the railroad is disturbed, where the hydrology has been markedly altered. Tree species include elm, red maple, ashes, sweet gum,



Northern Woodbridge Creek above Omar Avenue, Woodbridge, with pin oak forest in background.

sour gum, box elder, oaks and maples. Shrubs here were alder, maple-leaved viburnum, arrowood, elderberry, dogwoods, blueberry and spicebush. Over 90 species of birds were identified on site during the survey. Warbler use of the site was particularly intense, with 20 or more warbler species on several dates in May. This site, which protects the headwaters of the South Branch and is the only open space for 16 square miles, is up for conditional sale for development, pending the necessary permits. At issue is whether an Army Corps of Engineers permit is required to put a building on pilings in wetlands State conservation groups including NJAS have appealed the issuance of a stream encroachment permit for the project.

Inman Avenue: Between the Ashbrook Reservation in Union County and Inman Avenue in Middlesex County lies a large unprotected portion of Ashbrook Swamp. The tract consists of cattail/common reed, hardwood swamp, successional fields, upland hardwood and a disturbed area along a railroad right-of-way. The wooded wetland is seasonally flooded. Cattail marsh is not dominant; most of it is near the railroad. The dominant tree is red maple, followed by sycamore, maple, ash, pin oak, other oaks, tulip-poplar, sweet gum and sour gum. Shrubs include pepperbush, blueberry, spicebush, arrowwood, dogwood and shadbush. Herbs noted on spring surveys included trout lily, tussock sedge, marsh marigold, sensitive, cinnamon and royal ferns, spring cress, false hellebore and many others. Barred Owl, Red-shouldered Hawk, Virginia Rail, Wood Duck and numerous woodpeckers were among the resident birds. Large numbers of landbirds used the site in migration. As it protects the headwaters of the Robinson's Branch, this large wetland is crucial to the continued viability of the Rahway River.

Upper Middlesex Reservoir: This portion of Middlesex Reservoir off Old Raritan Road and Featherbed Lane in Clark, Union County is a shallow marshy area with good growths of emergent and aquatic vegetation such as spatterdock, pickerel weed, cattail, sedges, rushes, pondweeds, water lily, buttonbush and water millfoil. Trees on the edge include sycamore, ash, red maple, pin oak and hackberry. Shrubs included silky and red osier dogwood, witch hazel and spicebush. Herbs included ferns, jewelweed, marsh mallow, smartweeds and common reed. Species community of resident birds at this site included Warbling Vireo, Orchard Oriole, N. Oriole, Rough-winged Swallow, Yellow Warbler and Common Yellowthroat, and Red-winged Blackbird. The site was heavily used by migrant



Upper Middlesex Reservoir on Featherbed Lane in Clark, Union County, was regularly used by foraging herons, shorebirds and waterfowl (Robinson Branch, Rahway R.).



Middlesex County portion of Ashbrook Swamp off Inman Avenue, critical for protecting the headwaters of the Robinson Branch of the Rahway River.

snipe in spring and had regular use from Great Blue Herons, Snowy and Great Egrets and Little Blue and Black-crowned Night-Herons from spring through fall. Ibis, kingfishers and swallows also used the site, as did migrant yellowlegs and other shorebirds. Noteworthy was the presence of several dozen N. Shovelers for much of the fall.

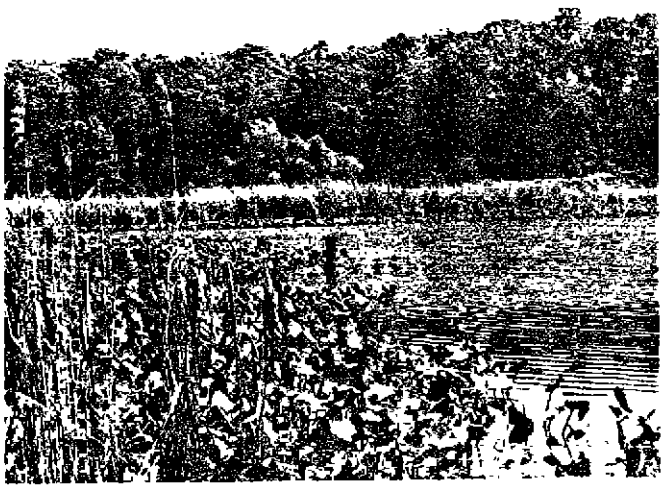
Kawahmee Park: Named from the adjacent park in Union, the site is a large freshwater marsh (perhaps the best on the Kill drainage) owned by the Elizabethtown Water Company, located at the junction of the Garden State Parkway and Route 22, just off Morris Avenue, Union. Surrounding the marsh area are sycamores, willows, maple and tree of heaven. Shrubs around and in the marsh were dogwoods, alder, mulberry, button bush and non-native plantings. Despite considerable amounts of common reed around the perimeter, much of the marsh consists of open water and healthy emergent and aquatic vegetation such as cattail, spatterdock, pickerel weed, arrowhead, water plantain, bullrush, sedges, duckweed, pondweeds and water lily. Other herbaceous vegetation included smartweeds, jewelweed, mugwort, swamp milkweed, pokeweed, pilewort, goldenrods and marsh mallow. The marsh housed an intact wetland species community of resident Least Bittern, Green-backed Heron, Virginia Rail, Wood Duck, Willow Flycatcher, Swamp Sparrow and Red-winged Blackbird. Also resident on the site were Belted Kingfisher, N. Rough-winged Swallow (on structures), Orchard Oriole, Warbling Vireo and probably Least Flycatcher. The site was regularly used for feeding by the harbor herons and also held large numbers of land birds during fallouts in autumn, especially Yellow-rumped Warblers.

Other Important Sites: In addition to the priority sites not yet protected by public ownership, certain sites in public ownership were found to be outstanding for habitat quality and migratory bird use. Slater Park on the Arthur Kill shore in Elizabeth has a small salt marsh, one of the few on the New Jersey Kill shore; use by gulls, shorebirds, and waterfowl, notably bufflehead, was regular and probably not as extensive as in the past, owing to impacts from oil spills. Likewise, the mouth of Smith's Creek, in the Sewaren section of Woodbridge, was found to be an important site for the harbor herons, gulls, cormorants and waterfowl, especially wigeon and bufflehead. All were observed feeding on site and efforts need to be made to keep the land behind the beach and tidal flats in open space as buffer. Many public parks on the Rahway contain outstanding wildlife habitat: the three adjacent parks (Echo Lake, Lenape and

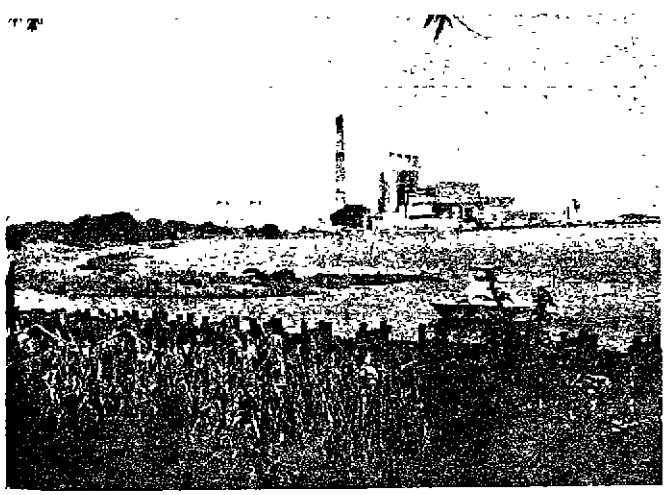
Nomahegan) in Westfield/Cranford are heavily used by migrant landbirds and are extensive enough to have significant breeding bird populations. Use by birders is intensive because of easy access and good conditions, wide paths and habitat variety. Elsewhere on the Rahway, Rahway River Park in the city of Rahway is an excellent landbird trap, has a large population of Wood Ducks in its tall trees, and an abundant woodpecker population in standing dead wood. Red-headed Woodpeckers using the site as a wintering ground in 90-91 might breed on site in the future. The nearby Winfield marshes are also excellent habitat for waterfowl and migrant landbirds One of the surprises of the survey was the excellent use by migratory birds of good wooded habitats along the West Branch of the Elizabeth River in Elizabeth, in particular sites at Salem Road and Vauxhall Road (the latter is the site previously noted as having over 100 individuals of 20 warbler species on a day in May)

Management Recommendations for Public Properties

During the 1920's and 1930's Union County preserved a great deal of land along the Rahway River tributaries. This land has succeeded into relatively mature stands of forest with adjacent active park space. The now maturing forest pieces proved to be very fine foraging habitat for migrating birds and, to a lesser extent, breeding habitat. The small habitats, even though they do not hold many breeding species, are critical in the highly developed region to migrating warblers, vireos, thrushes, tanagers, orioles, and other birds. In addition, these tracts serve as wintering areas for more than 2 dozen species of birds.



Elizabethtown Water Company marsh near Kawahmee Park, Union, on West Branch of Elizabeth River. Excellent wetland with Least Bittern, Green-backed Heron and Virginia Rail



Boynton Beach at the mouth of Smith Creek on the Arthur Kill in Sewaren, Middlesex County. Important for feeding herons and water fowl.

On the Rahway River, in particular, the shrub layer and understory (the forest floor) were usually composed of native plant species. On the Elizabeth River, many of the parks in public ownership contained fine maturing stands of the sycamore silver maple association, sometimes with a good native shrub layer even when the forest floor was disturbed and invaded by alien plants. Likewise, on the Woodbridge River, the pin oak forests often revealed a carpet of native plants on the forest floor even though downstream portions were "trashed" and invaded by *Phragmites*. These conditions should be kept in mind by the agencies responsible for managing these parks.

In general, this survey revealed that a number of the riverfront parks had been "manicured" to the water's edge and frequently lands not in public ownership were also developed to the water's edge, showing the importance of acquisition for open space in river corridors. One recommendation of the study team is to allow vegetation to grow on the stream bank or plant suitable native trees or shrubs to prevent erosion and to provide foraging habitat for migrant birds. An associated suggestion is to limit the cutting out of the underbush and the shrub layer to preserve the natural characteristics of the park's forest lands, to maintain a blend of active and passive recreation. The shrub layer is critical for breeding and migrant thrushes and certain warblers.

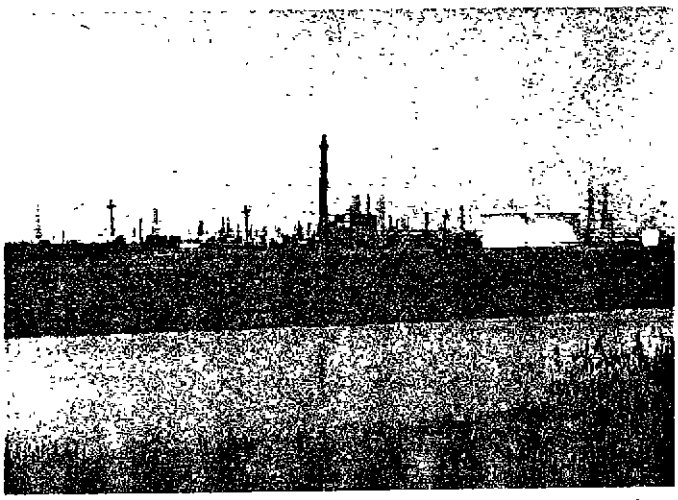
Standing dead wood should be left if it does not present a liability problem. Wood Duck (an important speces in New Jersey) and Screech-Owl benefit from dead wood. When dead wood is cut, let it stay where it is. It supports insects, mice, and other prey items for birds. Some 85 bird species in North America depend on snags for nest holes. A large percentage of these species are found in northern New Jersey and the Arthur Kill drainage.

Trashing and dumping along the Elizabeth River needs to be controlled. Some sections of parkland might have to be fenced to prevent trash heaps. Dumping in the floodplain by park employees of dirt, gravel and leaf debris should be diverted to upland portions. Dumping in wetlands is illegal. Carelessness in this matter can be reversed by firm management of park employees.

Improper silt fencing is a threat to the tributaries of the Arthur Kill. On the Elizabeth River was an example of a large



Rahway River Park in Rahway on East Branch of Rahway River. Outstanding habitat for Wood Duck, woodpeckers and migrant warblers.



Piles Creek in Linden, an intact salt marsh community with Northern Harrier, Clapper Rail, salt sparrows, herons, shorebirds and waterfowl.

industrial property at which a silt fence was breached and the river was receiving erosive debris from the adjacent property. Planning boards and/or parks need to be vigilant to prevent this type of activity. It can alter habitats for the worse. Silt may destroy an area for insects, reptiles, fish, and amphibians as well as eliminating prey items for birds. Double silt fencing near the river may be a decent management strategy.

Additional Management Suggestions for Private and Public Holdings

With the intense development pressure within the drainage of Arthur Kill tributaries, there are still many things that can be done to manage habitat for wildlife. This management can be done in publicly owned parks, office parks, industrial centers, township lands, and residential neighborhoods.

Available from New Jersey Audubon Society are two New Jersey Audubon Society/Cape May Bird Observatory publications that will help township officials, businesses, landscape architects, land-use planners, park commissions and private landowners (farmers and homeowners) to manage their land for wildlife. These publications, *New Jersey at the Crossroads of Migration* and *Backyard Habitat for Birds* were published specifically to help land-use planners, policy makers, homeowners, farmers, and others ameliorate the effects of development. By implementing some of the suggestions in these books and others listed here, many species of birds, frogs, butterflies, wildflowers, and other wildlife can coexist with human development. These forms of wildlife not only are beneficial from an intrinsic perspective, but they bring beauty to property, thereby enhancing its *economic* value. Below are several suggestions that will help landowners encourage habitat for wildlife.

1. Nest Boxes — New Jersey Audubon has some literature that will help a landowner construct and erect nest boxes for Wood Duck, Screech-Owl, Barn-Owl, Black-capped Chickadee, Chickadee, Tree Swallow, Purple Martin, and several other species. When constructing and erecting these nest boxes, particular attention should be paid to detail. Birds will not nest in any old structure nor will they nest in a properly constructed nest box if it is not *placed* properly. Good construction, proper positioning and adequate habitat are prerequisite to attracting birds to nest boxes.

2. Plantings of Native Trees, Shrubs and Annual Plants — With the development of many areas, the natural vegetation often disappears. It is replaced with sod-grass lawns, exotic shrubs and other plants that never occurred in the area. Although these plants may be pleasing to many, they are, most often, unsuitable to wildlife. There are many native trees, shrubs and annual plants that not only attract wildlife such as birds and butterflies, but are also very attractive to humans. These plants have the added benefit of being suited to the soil conditions and climate of the area. After all, they existed in the area for millennia prior to human presence. By letting a grassy field grow up without mowing, a backyard or office park lawn can become a wildflower garden, attracting dozens of species of butterflies and some birds. The flowers that grow naturally will be both perennials and annuals providing more color. These wildlife gardens have the added advantage of being easy to care for. They do not need watering or mowing, so they are relatively maintenance free.

The booklet entitled *Backyard Habitat for Birds* is the perfect way to start a wild garden. In the booklet are many more references that the homeowner or maintenance worker can use to plan a wild garden or habitat for native wildlife. The lawns within many of the office and industrial parks and recreational parks are ideal for backyard habitat programs. They offer large grassy areas that will be perfect for a succession of wildflowers and butterflies if they are not mowed.

3. Habitat Planning Prior to Development — Although most of the land within the study area is already developed, it is not too late to preserve the remaining tracts of habitat for wildlife. These areas need not be in public ownership as wildlife sanctuaries. The topic of sound planning is too lengthy to go into here, but there are some aspects of planning that are appropriate. For example, the borough of Cape May Point, Cape May County, New Jersey passed an historic ordinance in 1989 by establishing a landscaping standard for homeowners. Prior to the granting of a building permit, a contractor or property owner must submit a vegetation plan for the site. Such vegetation plans would be most helpful in the Arthur Kill drainage because some areas along the creeks and rivers have high potential as wildlife habitat. We encourage townships to enact such vegetation ordinances, or at minimum, suggestions for property owners. By maintaining large vegetated areas, towns will reduce problems such as air pollution and noise, as well as beautify the area.

New Jersey at the Crossroads of Migration was published by the New Jersey Audubon Society in 1990. It is a short book that was written to educate land-use planners, policy makers, and land managers (as well as homeowners) as to the needs of migratory birds. The book is a general introduction. Those who read it may have questions and are welcome to call the New Jersey Audubon Society or the Cape May Bird Observatory for advice.

4. Discourage Development Adjacent to Existing Open Space — The value of open space is enhanced (to wildlife and humans) when it is large or when there are significant buffers around the open space. This is especially the case along stream corridors or wetlands. Even in areas where endangered species are absent and large buffers are not mandated, buffers are of extreme importance to wildlife and water quality.

Effects of Stream Channelization on Birds

Channelization of streams by the use of walls, rip-rap, bulkheads and berms causes changes in the suitability of the banks and the stream itself for use by birds. A wall or a bulkhead, for example, eliminates the natural bankside slope and vegetation which is required for the nest substrate by such species as Louisiana Waterthrush. This species nests on the bank, close to the

water, under an exposed tree root usually. The waterthrush cannot use at all a stream with an artificial bank. The same may be true for Spotted Sandpiper, another streamside species dependent upon natural conditions at the water's edge Certain other species using stream side areas for nesting, such as Yellow Warbler, require bushes at or near the stream. The artificial banks do not allow such vegetation to grow, rendering the stream unsuitable for Yellow Warbler and other species requiring bushes.

It is not only breeding birds that require natural stream banks; migrant and wintering birds require these areas to be intact for feeding. Snipe feed by probing in mudflats at the stream edge; herons stand on the bank or the shoreline to capture frogs and fish. Channelized streams either make the bank too high or eliminate waterline mudflats entirely. Also, the channelized banks reduce the number of insects breeding in the stream environs, which in turn reduces prey availability for birds. There may be similar effects on fish, salamanders and turtles and snakes as well, since these depend on a healthy supply of insects.

One species whose breeding range has been restricted by channelizing on the Arthur Kill tributaries is the Belted Kingfisher. We found that the species occurred on all the tributaries, but the available natural banks for nest holes were few owing to bulkheading and other channelizing practices. The only nest site on the Elizabeth River was in a suboptimal location because of few alternatives. The remaining natural banks on the rivers should be kept natural and allowed to revegetate where they are barren. If they are planted, they should be planted primarily in native shrubs. Another species which commonly nests on the Kill rivers is the Warbling Vireo, but its breeding is restricted to those portions of the river where native trees overhang the stream, especially box elder, maples and elms.



Big sycamores on West Branch of Elizabeth River.



Towering sweet gums in Rahway River Park, Rahway.

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Checklist of Birds of the Arthur Kill River Tributaries

Codes: C = common - one or more individuals can be seen in the right habitat and on the right season; U = uncommon, not likely to be encountered in the right habitat in the right season (encountered annually); R = rare, not occurring annually; (E = endangered, T = threatened - NJ DEP listed; fed = federally endangered).

Stream system codes: AK = Arthur Kill; WC = Woodbridge Creek; MC = Morses Creek; PC = Piles Creek; SC = Smith Creek; RR = Rahway River; ER = Elizabeth River.

Seasonal Status: B = breeder; M = migrant; W = winter; S = suspected presence because of suitable habitat and occurrence on adjacent sites - but undetected in 1990 study.

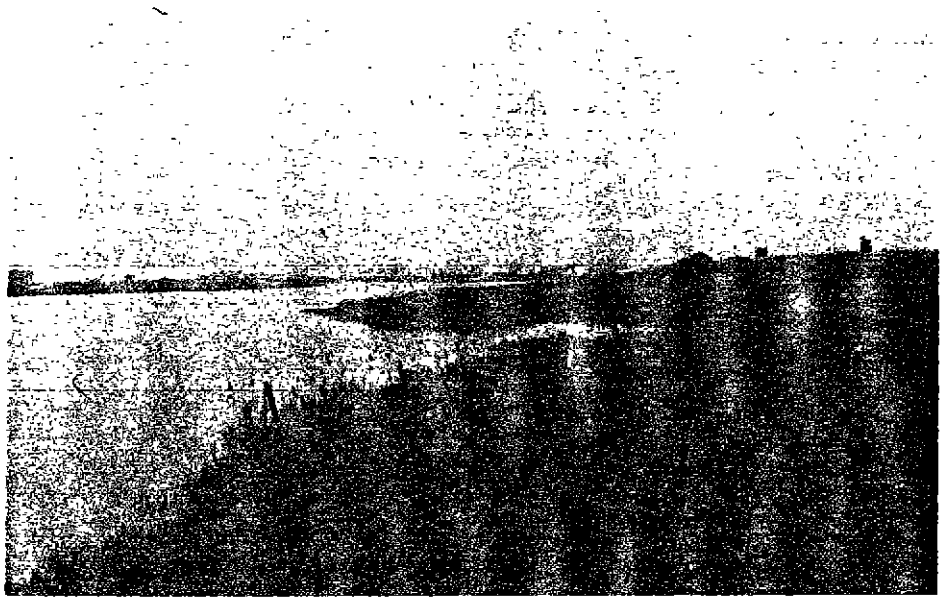
*Winter surveys were not conducted. Information on winter occurrence was acquired from personal observations of the study team (Rick Radis and Chris Aquila) and several other birders we consulted. * = seen before study.*

Species	Tributary	Status	Abundance
Red-throated Loon	AK		S
Common Loon	AK		S
Pied-billed Grebe (e)	MC	M	u
Horned Grebe	AK	M,W	c
Eared Grebe*	AK	W	r
Brown Pelican	AK		S
Great Cormorant	AK,ER,SC	W	u
Double-crested Cormorant	AK,RR,MC	B,M,W	c
American Bittern (t)	WC	M	u
Least Bittern	ER	B,M	u
Great Blue Heron (t)	AK,RR,ER	B,M,W	u
Great Egret	AK,ER,PC,RR,SC,WC	B,M	c
Snowy Egret	AK,ER,PC,RR,SC,WC	B,M	c
Little Blue Heron (e)	RR	B,M(?)	u
Tricolored Heron	MC,RR	M	u
Cattle Egret	AK,RR	B,M,	c
Green-backed Heron	ER,RR,MC	B,M	u
Black-crowned Night-Heron	AK,ER,RR,PC,SC,WC,MC	B,M	c
Yellow-crowned Night-Heron(t)	AK,RR	B,M	u
Glossy Ibis	AK,RR,PC,SC,WC	B,M	c
Brant	AK,SC	M,W	c
Mute Swan	RR	M	U
Canada Goose	AK,RR,ER,PC,MC	B,M,W	c
Wood Duck	RR,ER,WC	B,M	c
Green-winged Teal	RR	M	u
American Black Duck	AK,ER,RR,PC,SC,WC	B,M,W,	c
Mallard	AK,ER,RR,PC,SC,WC,MC	B,M,W,	c
Northern Pintail		M,W	S
Blue-winged Teal	ER	B?,M	u
Northern Shoveler	RR	M,W	c
Gadwall	AK,PC,RR,MC,SC	B,M,W	c
American Wigeon	AK,SC	M,W	c
Canvasback	AK	W	c
Redhead		M,W	S,r
Ring-necked Duck		M	S
Greater Scaup	AK,ER	M,W	c
Lesser Scaup		M,W	S
Oldsquaw	AK	M,W	S
Black Scoter	AK	M,W	S,r
Surf Scoter	AK	M,W	S,r
White-winged Scoter	AK	M,W	S,r
Common Goldeneye	AK	M,W	S
Bufflehead	AKM,C,SC	M,W	c
Hooded Merganser	RR,MC,PC	M	c
Common Merganser	WC	M	u
Red-breasted Merganser	AK,RR	B?,M,W	c
Ruddy Duck		M,W	S
Turkey Vulture	ER,RR	M	u
Osprey (t)	RR	M	u
Northern Harrier (e)	PC,RR	B?,M,W	u
Sharp-shinned Hawk	AK,RR	M	u
Cooper's Hawk (e)	RR	M	u
Red-shouldered Hawk (e)	RR	B,M	u
Broad-winged Hawk	RR	B,M,	u
Red-tailed Hawk	RR,ER,WC	B,M,W	c
Rough-legged Hawk	RR	W	S
American Kestrel	RR	B?,M,W	u
Merlin	RR,PC	M	u
Peregrine Falcon (e, fed.)	AK,ER,SC	B?,M	u
Ring-necked Pheasant	WC,RR	B,W	u
Black Rail (t)	PC??		S
Clapper Rail	PC,RR	B,M	c
Virginia Rail	RR,ER	B,M,	c
Sora	RR	B,M,	u
Common Moorhen	MC	B?,M	u?
American Coot			S
Black-bellied Plover	RR,PC	M	c
Semipalmated Plover	AK,PC	M	u
Killdeer	ER,PC,RR	B,M	c
Greater Yellowlegs	PC,RR,WC	M	c
Lesser Yellowlegs	RR	M	c
Solitary Sandpiper	RR,ER,PC	M	c
Willet	PC	B?,M	u
Spotted Sandpiper	ER,RR,PC,MC	M	c
Whimbrel	PC	M	c
Ruddy Turnstone	AK	M	S
Red Knot	AK	M	S
Semipalmated Sandpiper	ER	M	c
Western Sandpiper		M	S
Least Sandpiper	RR,PC	M	c
White-rumped Sandpiper			S
Pectoral Sandpiper	RR	M	u
Purple Sandpiper	AK	W	S
Dunlin	AK	M,W	S
Stilt Sandpiper	RR	M	u
Short-billed Dowitcher	RR,PC	M	c
Long-billed Dowitcher	PC	M	r
Common Snipe	RR,WC	M	c
American Woodcock			S
Wilson's Phalarope			S
Laughing Gull	AK,RR,SC,PC,MC	M	c
Little Gull	AK		S
Common Black-headed Gull	AK		S
Bonaparte's Gull	AK,SR,ER	M,W	c
Ring-billed Gull	AK,RR,ER,PC,WC,MC,SC	M,W	c
Herring Gull	AK,RR,ER,PC,WC,MC,SC	B,M,W,	c
Iceland Gull		W	S
Glaucous Gull	AK	W	u
Lesser Black-backed Gull	ER,AK	M,W	u
Great Black-backed Gull	AK,RR,PC,WC,MC,SC	B,M,W	c
Gull-billed Tern	PC	M	u
Caspian Tern	AK	M	u
Royal Tern			S
Roseate Tern (e)	AK		S
Common Tern	AK,RR,MC	M	c
Forster's Tern	AK	M	S
Least Tern (e)	AK,RR,PC	B?,M	c
Black Tern	PC	M	u
Black Skimmer (e)		M	u
Rock Dove	AK,RR,ER,PC,WC,MC,SC	B,W	c
Mourning Dove	AK,RR,ER,PC,WC,MC,SC	B,W	c
Black-billed Cuckoo	WC,RR,ER	B?,M	c
Yellow-billed Cuckoo	WC,RR	B?,M	c
Common Barn-Owl	AK	B?	u
Eastern Screech-Owl	RR	B,W	c
Great Horned Owl	RR	B,W	u
Snowy Owl		W	S

Species	Tributary	Status	Abundance
Barred Owl (t)	RR	B,W	u
Long-eared Owl (t)		M,W	S
Short-eared Owl (e)		M,W	S
N. Saw-whet Owl*	RR	M,W	u
Whip-poor-will		M	S
Common Nighthawk	WC	B?,M	u
Chimney Swift	RR,WC,PC,MC	B?,M	c
Ruby-throated Hummingbird	RR,WC	M	u
Belted Kingfisher	AK,ER,RR,WC,MC,SC,PC	B,M,W	c
Red-headed Woodpecker (t)	RR,ER	M,W	u
Red-bellied Woodpecker	RR,ER,WC,MC	B,W	c
Yellow-bellied Sapsucker	RR	M	u
Downy Woodpecker	RR,ER,WC,MC,SC	B,W	c
Hairy Woodpecker	ER,RR	B,W	c
Northern Flicker	AK,RR,ER,MC,WC	B,M,W	c
Pileated Woodpecker	RR,	B,W	u
Olive-sided Flycatcher	RR	M	u
Eastern Wood Pewee	RR,ER,WC	M	c
Yellow-bellied Flycatcher	RR	M	u
Acadian Flycatcher		M	S
Alder Flycatcher		M	S
Willow Flycatcher	ER,RR,WC	B	c
Least Flycatcher	ER,RR	B?,M	u
Eastern Phoebe	RR,ER,PC,WC	B,M	c
Great-crested Flycatcher	RR,ER,WC,MC	B,M	c
Eastern Kingbird	AK,RR,ER,WC	B,M,	c
Purple Martin		M	S
Tree Swallow	RR,PC,WC,	B?,M	c
N. Rough-winged Swallow	ER,RR,PC	B,M	c
Bank Swallow	AK,ER,MC	M	c
Cliff Swallow (t)		M	S
Barn Swallow	AK,RR,ER,PC,MC,SC,WC	B,M	c
Blue Jay	RR,ER,WC	B,W	c
American Crow	AK,RR,ER,WC,SC,PC,MC	B,M,W	c
Fish Crow	AK,RR,ER,WC,SC,PC,MC	B,M	c
Black-capped Chickadee	RR,ER,WC,MC	B,W	c
Tufted Titmouse	RR,ER,WC,MC	B,W	c
Red-breasted Nuthatch	RR,WC	M	u
White-breasted Nuthatch	RR,ER,WC,MC	B,W,	c
Brown Creeper	RR	B,M	u
Carolina Wren	RR,ER,WC,MC	B,W	c
House Wren	RR,ER,WC	B,M	c
Winter Wren	RR,ER	M	u
Marsh Wren	AK,RR,ER,WC,PC,SC,MC	B,M	c
Golden-crowned Kinglet	RR,ER	M,W	c
Ruby-crowned Kinglet	RR,ER	M,W	c
Blue-gray Gnatcatcher	RR,ER,WC	B,M	c
Eastern Bluebird		M	S
Veery	RR,ER,WC	B?,M	c
Gray-cheeked Thrush	RR,WC	M	u
Swainson's Thrush	RR,ER,WC	M	c
Hermit Thrush	RR,ER,WC	M,W	c
Wood Thrush	RR,ER,WC	B,M	c
American Robin	AK,RR,ER,WC,MC,SC	B,M,W	c
Gray Catbird	RR,ER,WC,SC,	B,M	C
Northern Mockingbird	RR,ER,WC,MC	B,W	c
Brown Thrasher	RR,ER,WC	B,M	c
Water Pipit		M	S
Cedar Waxwing	RR,ER,WC	B?,M,W	c
European Starling	AK,RR,ER,WC,PC,SC,MC	B,W	c
White-eyed Vireo	RR	B?,M	u
Solitary Vireo		M	S
Yellow-throated Vireo	RR,ER,	B,M	c
Warbling Vireo	RR,ER,WC,MC	B,M	c
Philadelphia Vireo		M	S
Red-eyed Vireo	RR,ER,WC	B,M	c
Blue-winged Warbler	RR	B?,M	u

Species	Tributary	Status	Abundance
Golden-winged Warbler			S?
Tennessee Warbler	RR,ER,WC	M	c
Nashville Warbler	RR,ER	M	c
Northern Parula	RR,ER,WC,MC	M	c
Yellow Warbler	RR,ER,WC,MC	B,M	c
Chestnut-sided Warbler	RR,ER,WC	M	c
Magnolia Warbler	RR,ER,WC,MC	M	c
Cape May Warbler	RR,ER	M	c
Black-throated Blue Warbler	RR,ER,WC,MC	M	c
Yellow-rumped Warbler	RR,ER,WC,MC	M	c
Black-throated Green Warbler	RR,ER,WC,MC	M	c
Blackburnian Warbler	RR,ER,WC,MC	M	c
Yellow-throated Warbler		B?,M	S
Pine Warbler		M	S
Prairie Warbler	RR,MC,WC	M	u
Palm Warbler	RR,ER	M	c
Bay-breasted Warbler	RR,ER,MC,WC	M	c
Blackpoll Warbler	RR,ER,WC,MC	M	c
Cerulean Warbler	RR,M	u?	
Black and White Warbler	RR,ER,WC,MC	B?,M	c
American Redstart	RR,ER,WC,MC	B,M	c
Prothonotary Warbler	RR	B?	r
Worm-eating Warbler		M	S
Ovenbird	RR,ER,WC	B,M	c
Northern Waterthrush	RR,ER,WC	M	c
Louisiana Waterthrush		M	S
Kentucky Warbler	RR	B,M	u(?r)
Mourning Warbler	RR	M	u
Common Yellowthroat	AK,RR,ER,WC,PC,MC,SC	B,M	c
Hooded Warbler	RR,ER	B?,M	u
Wilson's Warbler	RR,ER,WC	M	c
Canada Warbler	RR,ER,WC,MC	M	c
Yellow-breasted Chat		M	S
Summer Tanager		M?	S
Scarlet Tanager	RR,ER,WC	B,M	c
Northern Cardinal	RR,ER,WC,MC	B,W	c
Rose-breasted Grosbeak	RR,ER,WC,MC	B,M	c
Blue Grosbeak		B?,M?	S
Indigo Bunting	RR	B,M	c
Dickcissel	RR	M	r
Rufous-sided Towhee	RR,ER,WC,MC	B,M	c
American Tree Sparrow	ER	M,W	u
Chipping Sparrow	RR,MC,WC	B,M	c
Field Sparrow	RR	B,M	u
Vesper Sparrow (e)		M	S
Lark Sparrow		M	S
Savannah Sparrow (t)		M	S
Grasshopper Sparrow (t)		M	S
Sharp-tailed Sparrow	PC	B,M	u
Seaside Sparrow	RR,PC	B,M	c
Fox Sparrow		M,W	s
Song Sparrow	AK,RR,ER,WC,MC,PC,SC	B,M,W	c
Lincoln's Sparrow	RR	M	u
Swamp Sparrow	RR,ER,WC,PC,SC,	B,M	c
White-throated Sparrow	RR,ER,WC	M,W	c
White-crowned Sparrow	RR	M	u
Dark-eyed Junco	RR,ER,MC	M,W	c
Lapland Longspur		W?	S
Snow Bunting		W	S
Bobolink	RR,WC	M	c
Red-winged Blackbird	RR,ER,WC,PC,SC,MC	B,M,W	c
Eastern Meadowlark		M?	S
Rusty Blackbird	RR	M	c
Boat-tailed Grackle		M	S
Common Grackle	RR,ER,WC,PC,MC	B,M,W	c
Brown-headed Cowbird	RR,ER,WC,MC	B,M,W	c
Orchard Oriole	RR,ER	B,M	c

Species	Tributary	Status	Abundance
Northern Oriole	RR,ER,WC,MC	B,M	c
Purple Finch	ER,SC,WC,RR	M	u
House Finch	RR,ER,WC,MC,SC,PC	B,W	c
Common Redpoll		W	S
Pine Siskin	RR,ER	M,W	c
American Goldfinch	AK,RR,ER,WC,PC,MC,SC	B,M,W	c
Evening Grosbeak		M,W	S
House Sparrow	AK,RR,ER,WC,PC,SC,MC	B,W	c



South side of lower Rahway River looking east from N.J. Turnpike toward the river mouth at the Arthur Kill. This priority site harbored Northern Harrier, Clapper Rail, salt sparrows, Willow-Flycatcher, Yellow-crowned Night-Heron, Little Blue Heron, egrets, shorebirds and waterfowl.



Salt marsh on Arthur Kill waterfront in Elizabeth showing effects of oil spills. In the distance are the Bayonne bridge and Shooter's Island. The crew on shore is doing invertebrate sampling



(Left) Evergreen Road site in Edison of the headwaters of the South Branch of the Rahway River. Over 90 species of migrant birds were reported here in 1990.

(Below) Joe Collins site on East Branch of Rahway River in Union. Migratory bird habitat in river corridor next to active recreation park.



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