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NEPA SCOPING AVERTS AGENCY FUNDS FROM "BLOWING IN THE WIND":  
A NEPA SUCCESS STORY

Murray C. Wade, Oak Ridge National Laboratory, Oak Ridge, Tennessee  
Jim Van Dyke, Oak Ridge National Laboratory, Oak Ridge, Tennessee  
John Crew, Agricultural Research Service, Wyndmoore, Pennsylvania

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The National Environmental Policy Act (NEPA) process has been successful without the preparation of an Environmental Assessment (EA) or an Environmental Impact Statement (EIS). The Agricultural Research Service (ARS) has used early application of the NEPA process to make an informed decision and thus avoid negative ecological and financial results. The NEPA process was initiated to assess the potential impacts of constructing and operating a 6-9 megawatt wind turbine farm. The farm was to consist of up to 18 turbines to be placed along the spine of Plum Island which lies in the Atlantic Ocean off the shore of eastern Long Island. The rationale for the proposal was to provide an alternative energy source and thus avoid the expenditure of more than one million dollars per year on electricity and the dependency on the mainland public utility companies. A sufficient wind resource is readily available on Plum Island. Complicating the issue was a window of opportunity to obtain federal production tax credits if the wind energy system could become operational before July 1, 1999.

As part of the planning, preparation, and data gathering step of the NEPA scoping process, a preliminary assessment of environment impacts raised questions about potential impacts to birds and the economic viability of the wind turbine system. An early evaluation of potential risks and hazards to resident and migratory birds indicated that there would be a high probability of significant impacts from the wind turbines. In addition, the preliminary economic analysis revealed that the system as proposed was not the most economically advantageous and that there were other alternatives to the proposed wind farm. Due to the uncertainties associated with the wind system identified in the initial stages of the NEPA process, the ARS decided to pursue other alternatives that would ensure economic success as well as protect the environment.

The NEPA process was effective in assisting the deciding official in resolving issues of meeting requirements of the Energy Policy Act (EPACT) (P.L. 102-486), implementing a seemingly environmentally friendly wind turbine farm, and satisfying the electrical energy requirements of a remote federal research facility. Because NEPA scoping was applied early in the decision process, the ARS was able to make an informed decision before a one million dollar design contract for the wind farm was awarded and prior to the expenditure of time and dollars for a full EIS. This decision turned out to be the best for the Plum Island facility and to ensure the future protection of the migratory and resident bird populations of Plum Island.

This project demonstrates that the NEPA process is an important element of project planning and contributes far more than the final documentation of environmental impacts. Too often the process is criticized because of the focus on producing a document. This example illustrates clearly the importance of NEPA to the overall planning process.

**MASTER**

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## INTRODUCTION

On February 14, 1997, the U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS), issued notice of its intent to prepare an environmental impact statement (EIS) for the development of wind energy facilities at its Plum Island Animal Disease Center (PIADC) on Plum Island, New York. The purpose of the EIS was to "evaluate potential impacts of alternate means of reducing energy consumption, meeting heating and cooling energy needs, and supplying electrical power" to the PIADC facilities (62 Fed. Reg. 6940) (Figure 1). The primary technological alternative to be evaluated in the EIS was the construction and operation of facilities on Plum Island to generate electricity using wind power. In May 1997, after the NEPA scoping evaluation, ARS decided that it no longer intended to prepare the EIS because it considered the net benefits of the project, the potential adverse impacts of the project, and the costs to mitigate those impacts, unacceptable.

This paper has been prepared to describe how the NEPA process was successful in allowing ARS to identify, early, the potential for significant adverse impacts and unacceptable mitigation costs and to cancel its plans to develop wind energy facilities on Plum Island. The paper describes the initial stages of the NEPA process that led to the decision to cancel the project and presents some of the background information that was gathered for use in the EIS.

## PROBLEM DEFINITION AND PREPARING THE NOTICE OF INTENT

The first step in the NEPA process is to identify the purpose of and need for the proposed action. At the first meeting on Plum Island attended by Oak Ridge National Laboratory (ORNL) staff (October 24-25, 1996), PIADC staff stipulated the need for NEPA documentation to support the development of a wind energy system to supply base demand, and that the documentation needed to be completed early enough to allow energy generation before July 1, 1999. This deadline was established to ensure tax credits for wind energy available under the Energy Policy Act of 1992 (EPACT) (Pub. L. 102-486), which assists federal agencies in developing energy-efficient or renewable energy technologies.

Additional discussions revealed other purposes of and needs for the proposed action. These included:

- reducing PIADC's reliance on high-cost electric service from the existing supplier [Long Island Lighting Company (LILCO)];
- enhancing PIADC's ability to meet necessary energy consumption reductions;
- achieving greater independence in PIADC's energy supply system; and
- perhaps most importantly, reduce the proportion of total expenditures devoted to utility and infrastructure costs and increase the proportion devoted to scientific research and development.

After these discussions and the review of notices of intent (NOI) to prepare EISs written by other federal agencies, PIADC and ARS staff proceeded, with technical assistance from staff at ORNL and the National Renewable Energy Research Laboratory (NREL), to develop an NOI that would reflect these multiple goals and objectives. This NOI, which was published in the *Federal Register* on February 14, 1997, stated that the EIS would "evaluate potential

impacts of alternate means of reducing energy consumption, meeting heating and cooling energy needs, and supplying electrical power" to PIADC (62 Fed. Reg.. 6940). The NOI also described the proposed action and alternatives to the proposed action, including no action. PIADC staff proposed implementing energy conservation measures to reduce consumption of energy by 20 percent by the year 2000 and 30 percent by the year 2005 (in compliance with EPACT) and to develop electrical and heating and cooling energy generation capabilities to substantially meet PIADC's operating demand. Through the provisions of energy savings performance contracting, PIADC staff would examine energy conservation and supply technologies capable of meeting these demand scenarios, with particular emphasis on technologies that would reduce its dependence on fossil fuel-based resources.

The NOI noted that, based on an earlier wind energy feasibility study conducted by the New York Power Authority (NYPA), the EIS would assess the health and environmental impacts and other issues associated with the use of wind energy on Plum Island. Other energy conservation and supply technologies, as well as the no action alternative, were to be evaluated in the EIS. The NOI identified the relevant health and environmental issues as: air quality; marine water quality and coastal resources; land use; transportation; plants, animals, and habitat; aesthetic and visual resources; socioeconomic resources; noise; archaeological resources; public health; and energy consumption and resource availability.

#### **DEVELOPING THE DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES**

The NOI for PIADC provided a first draft of the proposed action and alternatives to be assessed in the EIS. As noted by the Council on Environmental Quality (40 CFR 1502.14), the heart of an EIS is the comparative analysis of the proposed action and alternatives. Based on the information and analysis presented in the sections on the baseline environment (typically Section 3 of an EIS) and the impacts of the proposed action and alternatives (typically Section 4 of an EIS), the agency is to "present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public."

For this EIS, development of the proposed action and alternatives proceeded along three parallel and interdependent paths serving three somewhat distinct purposes:

- (1) cost and feasibility analyses of wind energy for Plum Island;
- (2) the NEPA analysis of wind energy for Plum Island; and
- (3) the bid package associated with the EPACT procurement.

Coordination and integration of activities along these paths were achieved through joint meetings, conference calls, and reviews of draft project documents by project participants (i.e., PIADC, ARS-North Atlantic Area, ARS Procurement and Property Division, ORNL, NREL, and other contractors and subcontractors). Although activities associated with these paths were coordinated among government and contractor staff, the paths were sufficiently distinct and required enough differences in levels of detail to make the development of a single integrated description of the proposed action and alternatives difficult.

As these efforts proceeded, the scale of the proposed wind energy system being proposed was reduced from an initial maximum of 9 megawatt (MW) (18 windmill/turbine units of 500 kW nominal) to systems delivering as little as 2 to 3 MW (using windmill/turbine units with nominal ratings of 500 kW or 750 kW). The actual scale of the system to be assessed was never finalized, as economic considerations and the potential for significant adverse environmental impacts were recognized as sufficiently uncertain to make the risk unacceptable to PIADC and ARS (see Fig. 2).

#### **SITE VISIT, INTERVIEWS, AND CONSULTATION**

Management and technical staff from ORNL visited Plum Island and its environs for a period of three days (March 5 7, 1997) to attend project briefings, conduct a reconnaissance level survey and assessment of the impact region (i.e., Plum Island, the eastern tip of Long Island, and nearby waters), interview knowledgeable experts about Plum Island and the impact region, and consult with PIADC, ARS-North Atlantic Area, NREL, and other contractor staff. After the initial project briefing, the ORNL team split into two groups, one to attend and participate in meetings on the economic feasibility of wind energy on Plum Island (ORNL's EIS project manager and economist) and the other to tour the island (aquatic and terrestrial ecologists, social scientist, geologist/water resource specialist, and health scientist). After the site visit, ORNL technical staff contacted and interviewed a number of other experts in the region.

#### **SCOPING MEETINGS**

Following the site visit, PIADC and ARS staff hosted public scoping meetings in Greenport, New York, and Old Saybrook, Connecticut, on April 29 and 30, 1997, respectively. In addition to providing technical and logistical support for these meetings, ORNL presented information related to the NEPA process to meeting attendees.

Attendance at these scoping meetings was low. Two of the three persons who attended the public scoping meeting in Old Saybrook were contractors potentially interested in participating in the PIADC procurement, and the third person expressed only general interest in the project and provided no comments. Attendees of the meeting in Greenport expressed concerns about the potential for adverse noise impacts and adverse impacts to the character of their community. The sparse attendance at both meetings may have been due to limited notification through the local media regarding the meetings.

#### **NEPA Scoping of Avian Resources**

After the initial visit to Plum Island in March of 1997, area bird experts were contacted and interviewed by phone. These experts had experience with ospreys, roseate and common terns, endangered species, colonial waterbirds, migratory birds, resident and wintering birds, birds in the area (including Orient and Fisher's Island), and waterfowl. Additional data and information was gathered from literature and published reports of the New York State Department of Environmental Conservation (NYSDEC) and the Long Island Colonial Waterbirds Association (LICWA). During this time period NREL began discussion with their bird interaction people about the proposed wind turbine project on Plum Island. A conference call occurred in April, where NREL experts as well

as the ORNL bird expert discussed many potential concerns of placing wind turbines on Plum Island. These concerns are documented in the Plum Island Report (ORNL 1997).

**Reconnaissance Surveys.** As a result of concerns and questions raised during the scoping process concerning the potential impacts to bird resources on Plum Island a reconnaissance survey of bird resources was scheduled for April 30, the day after the public meeting on Long Island. These surveys were to help document bird movements and habitat use, and identify potential impacts from the proposed wind turbine project. The results of this survey are documented in the Plum Island Report (ORNL 1997).

After the reconnaissance survey ORNL provided ARS and Plum Island a summary of concerns, recommended options, and recommended mitigation measures for their consideration. Shortly after this summary and a summary of the economic comparison of alternatives was provided to ARS and Plum Island, it was decided that the project would not go forward. ARS asked ORNL to perform a complete breeding bird survey of Plum Island in July of 1997.

**Breeding Bird Survey.** Plum Island staff determined that information on bird activity would be valuable to Plum Island in future decision-making and ecological resource management. Therefore, in mid-July wetland, forest/shrub, dune, grassy, and shoreline habitats were surveyed for the presence of breeding birds. In completing the comprehensive survey of Plum Island, the following observations were made:

- roseate and common terns were noted feeding extensively in Plum Gut,
- terns, along with other species, were noted flying over the island and the area where the turbines were proposed,
- there were no piping plovers (*Charadrius melodis*) recorded using Plum Island,
- no active heron or egret colonies were recorded (however colonies are possible in any given year),
- all active osprey nests for the 1997 breeding season were identified, and
- male and female northern harriers (possible breeders) were documented using the island.

More detail on the avian ecology of Plum Island, including the findings of the breeding bird survey, are summarized below.

#### AVIAN ECOLOGY

Protecting birds and wetlands is the major ecological concern associated with any new project on Plum Island. As described below, the island is important for many types of birds [for additional details on Plum Island birds see the Plum Island Report (ORNL 1997)]. Similarly, the wetlands on Plum Island are an important and uncommon local resource because they contain fresh water from water perched in the area. Most other wetlands in the area on the eastern tip of Long Island contain salt water.

## Colonial Nesting Waterbirds

A large gull colony exists in the southern beach and dune area of Plum Island (see Fig. 3). The colony is dominated by great black-backed gulls; however, a few herring gulls probably also nest in the area. When looking at Table 1 and taking into account the field observations made by ORNL in 1997, a trend of great black-backed gulls outcompeting and pushing out herring gulls from nest sites on Plum Island is apparent. Herons, egrets, and ibises have historically nested on Plum Island just north of this area, but recent disturbance or other factors have precluded their nesting in recent years. However, in July 1997, great egrets, great blue herons (*Ardea herodias*), and black-crowned night herons were observed using various areas of the island. A small (108 individuals) double-crested cormorant colony was noted on the north shore in the April 1997 survey. No breeding colonial nesting waterbird activity was noted on other parts of Plum Island in either the April or July 1997 surveys. During the July survey, spotted sandpipers (*Actitis macularia*) were observed in the southern beach area, and could have nested there in 1997. Recent trends in colonial nesting waterbird activity on Plum Island are listed in Table 1.

Although they do not currently nest on Plum Island, roseate and common terns frequently fly over Plum Island and feed in Plum Gut, which is located off the western shore of the island. These birds travel to Plum Gut from their colonies on Great Gull Island just east of Plum Island (see Fig. 3). This colony is the largest roseate tern colony in North America. During their feeding periods, the terns also loaf and preen themselves on the rocks adjacent to Plum Gut and just west of the old lighthouse (Fig. 3). The roseate tern is on the federal endangered species list. Numbers of adult roseate and common terns on Great Gull Island are provided in Table 2.

## Ospreys

Ospreys have used Plum Island for breeding for hundreds of years (Poole 1989). Recent osprey use of Plum Island is summarized in Table 3. Although the latest NYSDEC osprey survey for Plum Island documented 17 active pairs, field work by ORNL in April and July indicated that as many as 18 pairs bred in 1997. Four other nests were identified that have been used in recent years. All osprey nests are shown on Figure 3.

## Federal- and State-Listed Birds

Table 4 lists the federal- and state-listed species (i.e., endangered, threatened, or of special concern) that occur on or near Plum Island. This list includes the roseate and common terns that nest on Great Gull Island and feed in Plum Gut and migrant eagles (bald and golden) which are sighted infrequently. There is a possibility that northern harriers are nesting on Plum Island. Both male and female harriers were observed in July 1997.

## EFFECTS ON AVIAN ECOLOGY

Construction and operation of the proposed wind turbine project could effect bird migration patterns, impact on nesting and wintering birds, and result in roseate and common tern mortality. For example, birds that migrate at night

might be attracted down to project lights and the wind action of the turbines and may collide with the turbines or other obstructions (buildings, towers, power lines, etc.).

In general, the presence of migratory, wintering, and breeding bird populations on and around Plum Island makes the island undesirable for wind power generation. However, if the proposed project were developed, there would be several mitigation measures that could have helped alleviate impacts to birds:

- decrease the number of turbines needed by using more diesel fuel, thereby allowing more flexibility in turbine siting;
- conduct a siting study to ensure that turbines are located in the best sites to avoid bird interactions;
- construct the turbines near the existing water tower to reduce impacts to many bird species, including ospreys and cormorants;
- use only tubular-type wind turbine towers;
- put black striping on the turbines to increase their visibility;
- relocate osprey nest platforms and perch poles near the easternmost turbines and place more osprey nesting platforms on the west side of the island to reduce impacts to osprey;
- complete a utilization study for the spring and fall migrations;
- with input from local experts, establish time periods when the turbines would not be operated (e.g., during the spring and fall migrations) to reduce impacts to migratory birds;
- remove all existing overhead power lines when new buried power lines are in operation; and
- complete a post-operational study to document bird kills and develop additional mitigation, as needed, based on the study.

As an additional measure to protect birds and other wildlife, consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to comply with Section 7 of the Endangered Species Act would have occurred prior to project construction.

The avian mitigation measures did not necessitate ruling out the wind turbine project. However, they posed potential mitigation costs that would have had a negative affect on the project economics.

#### **ECONOMIC ANALYSIS FOR WIND GENERATION ON PLUM ISLAND**

The economic feasibility study of the wind turbine project (Global Energy Concepts 1997) seemed to indicate an economically attractive alternative to purchasing power from LILCO. Because of favorable wind conditions, the average cost for generating wind power on Plum Island was projected to be about 5 cents per kWh while the average cost of power purchased from LILCO was over 12 cents per kWh. However, a key problem was that power generated from wind would be a poor match with power required by Plum Island. PIADC's highest demand period was in the summer months--exactly the time period when average wind speed and, therefore, generation would be lowest. Therefore, because the wind turbines would be operating at below the average annual capacity factor, to supply enough power during the peak demand period would require much more capacity than was required for meeting demand during most of the year.



Besides, even a very large wind system would not be sufficient to meet demand during calm periods. The proposed system was sized to optimize economics which was found to be six megawatts. The projected effect of a wind generation project on PIADC energy use and sales to LILCO is presented in Table 5. It is clear from Table 5 that even a 9 megawatt wind system (4.5 times peak demand) would not be able to supply all of Plum Island's demand.

To deal with the mismatch between island demand and wind energy supply, it was proposed that Plum Island's electrical "system" would rely on an arrangement whereby during periods when wind generation could not supply all the power required, supplemental power would be purchased from LILCO. Conversely, when wind generation was in excess of needs, power would be sold to LILCO. However, the terms of this power interchange set by state utility regulations, were not attractive. Power purchased by Plum Island from LILCO would be at a much higher cost than the power sold to LILCO (see Table 6). Still, the results of the feasibility study suggested that the economics would be marginally favorable and would be more attractive if the cost of LILCO power continued to escalate as it had in the past.

As part of assessing the proposed action and developing alternatives, ORNL reviewed the project economics of the proposed action--six megawatts of wind generation. The review resulted in questioning several key assumptions in the feasibility study. First, the feasibility study had not considered as much as \$500,000 in costs necessary to integrate the wind system into the LILCO electric grid. This cost could easily have reduced the project's net benefits by more than 50% making the project even more marginal. Secondly, the base case assumption had been that in inflation-adjusted dollars, current electric rates available from LILCO to Plum Island would continue to hold in the future. The sensitivity analysis of the feasibility study presented cases in which future electric rates were even higher when adjusted for inflation. The base case assumption was questioned by ORNL because the electric industry is in the process of deregulation which many analysts believe is likely to reduce electric rates, especially in high-rate areas like the LILCO service area. If inflation adjusted electric rates in the LILCO service area are reduced in the future, this would result in the possibility that the proposed wind project would be "locking in" electric costs at a time when rates were decreasing. In other words, the wind project's net benefits could become negative if future electric rates were to decrease. This possibility had not been considered in the economic feasibility study.

ORNL's review also considered various project configurations that had not been considered in the economic feasibility study. Preliminary ORNL results indicated that several alternatives could be significantly more attractive than a stand-alone six megawatt wind system. The ORNL review focused on overcoming the unattractive exchange (see Tables 5 and 6) between Plum Island and LILCO. The unfavorable exchange could be mitigated in either of two ways that had not been considered in the feasibility analysis. One possibility was to reduce the wind generation on Plum Island to only the amount that could be used on the Island. In this case the wind generation would meet a lower fraction of on-island demand, however, capital costs of the project would be significantly reduced and the generation costs would be covered by high value on-island demand as opposed to low-value sales to the LILCO grid.

Another alternative was to supplement the wind generation with on-island

diesel generation. The on-island diesel generation would be used during peak demand periods to supplement the wind generation and avoid the need for the highest cost supplemental power. Preliminary analysis, presented in Table 7, indicated that the project's net benefits could be increased by more than a factor of 3 by reducing wind generation to 4 megawatts with on-island diesel generation to supplement wind-power during peak periods. PIADC already had diesel generators for backup power. ORNL's analysis indicated that even purchasing new generators for supplemental peak generation would be economically attractive.

A third alternative was to provide all or part of Plum Island demand with diesel generation. This could potentially achieve the project's stated goals of reducing the Island's electric cost and providing a more dependable supply. PIADC could still rely on LILCO to supplement power supply during periods when electric rates were relatively low or they could attempt to cover all of the demand and utilize LILCO as a backup. No additional equipment costs associated with supplying power to the LILCO grid would be incurred.

Ultimately, the ORNL economic analysis had raised serious questions about the economic justification of a wind project. The analysis pointed to several feasible alternatives that preliminary analysis indicated were significantly more attractive than the proposed 6 megawatt wind system. These alternatives included wind combined with diesel generation, diesel only, and the no-action alternative which could prove attractive relative to on-island generation if deregulation resulted in falling electric prices.

#### **CANCELLATION OF THE PROJECT**

In May 1997, PIADC and ARS staff determined that the uncertainties associated with the proposed action's cost and economic feasibility and the high potential for significant adverse environmental impacts to birds were sufficient to cancel the project. PIADC and ARS staff further determined that there may be some other actions that could be taken to achieve some, if not all, of their initial objectives (e.g., reduced energy consumption and cheaper utility costs) without constructing any new generating capacity that would require the preparation of NEPA documentation. These included, for example, the use of existing emergency diesel-fired generators (or even their replacement with more modern and more efficient units) for peak shaving and the continuation of other energy conservation measures. Implementation of these measures would be considered routine maintenance activities and likely would be categorically excluded from the requirements of NEPA documentation.

#### **CONCLUSIONS**

Because NEPA scoping was applied early in the decision process, NEPA provided a framework by which the ARS was able to receive important information concerning the economic viability and the potential impacts to the ecological resources of Plum Island. Given this information, the ARS was able to make an informed decision before a one million dollar design contract for the wind farm was awarded and prior to the expenditure of time and dollars for a full EIS. This decision turned out to be the best economically for the Plum Island facility because it saved financial resources in the short- and long-term. The decision also benefited the ecological resources of Plum Island because it helped ensure the future protection of the migratory and resident bird

populations of the Plum Island area.

This project demonstrates that the NEPA process can be an important element of project planning and contributes far more than simply the final documentation of environmental impacts. Many times the process is criticized because of the focus on producing a document. The process can accomplish the goals of identifying potential significant environmental impacts early on as well as helping to find alternative solutions to complicated problems. This example illustrates clearly the importance of using NEPA early in the overall planning process.

#### REFERENCES

Global Energy Concepts. 1997. *Presentation concerning the economic feasibility study of the Plum Island wind turbine project*. March.

ORNL. 1997. *Plum Island Summary Report*. Prepared for the United States Department of Agricultural Plum Island Animal Disease Center. November.

**Table 1. Numbers of adult colonial nesting waterbirds on Plum Island**

Species	1988	1989	1995	1997
Great egret ( <i>Casmerodius albus</i> )	35	14	18	N/A
Snowy egret ( <i>Egretta thula</i> )	50	0	5	N/A
Little blue heron ( <i>Egretta caerulea</i> )	4	0	0	N/A
Black-crowned night heron ( <i>Nycticorax nycticorax</i> )	115	108	14	N/A
Glossy ibis ( <i>Plegadis falcinellus</i> )	3	0	0	N/A
Herring gull ( <i>Larus argentatus</i> )	3,400	2,675	2,608	N/A
Great black-backed gull ( <i>Larus marinus</i> )	920	1,010	1,691	N/A
American oystercatcher ( <i>Haematopus palliatus</i> )	10	6	5	N/A
Double-crested cormorant ( <i>Phalacrocorax auritus</i> )	0	0	27	108*

\*These individuals were noted on nests in April 1997.

Source: New York State Department of Environmental Conservation Long Island Colonial Waterbirds Association Reports for 1988, 1989, and 1995 (the next Department of Environmental Conservation survey of Plum Island is scheduled for 1998).

**Table 2. Numbers of adult roseate and common terns on Great Gull Island**

	1988	1989	1994	1995	1996
Common terns ( <i>Sterna hirundo</i> )	12,000	6,000	7,750	8,000	9,000
Roseate terns ( <i>Sterna dougallii</i> )	2,400	1,200	1,500	1,460	1,500

Sources: New York State Department of Environmental Conservation Long Island Colonial Waterbirds Association Reports for 1988, 1989, 1994, and 1995; Helen Hays, Great Gull Island Project, provided the 1996 numbers.

**Table 3. Numbers of osprey on Plum Island**

Year	1992	1993	1995	1997
Active pairs	15	16	18	17
Young fledged	18	26	17	13

Source: New York State Department of Environmental Conservation Osprey Reports for 1992, 1993, 1995, and 1997.

**Table 4. Federal- and state-listed bird species on or near Plum Island**

Species	Notes	Protected status <sup>1</sup>
Black rail ( <i>Laterallus jamaicensis</i> )	Possible nester	SSC
Roseate tern ( <i>Sterna dougallii</i> )	Use Plum Island area for feeding and loafing	FE and SE
Common tern ( <i>Sterna hirundo</i> )	Use Plum Island area for feeding and loafing	STH
Golden eagle ( <i>Aquila chrysaetos</i> )	Migrant	SE
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	Migrant	FTH and SE
Northern harrier ( <i>Circus cyaneus</i> )	Possible nester	STH
Osprey ( <i>Pandion haliaetus</i> )	Nests on Plum Island	STH
Eastern bluebird ( <i>Sialia sialis</i> )	Possible nester	SSC

<sup>1</sup>FE (federally endangered), FTH (federally threatened), SE (state endangered), STH (state threatened), SSC (state special concern).

**Table 5. Projected effect of wind generation project on Plum Island's energy use and sales**

Project Scale for Wind Turbines	Annual Kilowatt Hours			
	9 MW	6 MW	4 MW	2 MW
Plum Island's total annual demand	10,349,770	10,349,770	10,349,770	10,349,770
Total wind generation	26,078,879	17,386,529	11,590,613	5,795,306
Wind energy used by PIADC	7,799,926	5,199,951	3,466,634	1,733,317
Wind energy sold to LILCO	18,278,953	12,186,578	8,123,979	4,061,990
Supplemental energy bought from LILCO	2,549,844	5,149,819	6,883,136	8,616,453
Percent of Plum Island's on-peak energy supplied by wind	63%	42%	28%	14%
Wind energy sold to LILCO as a percent of Plum Island's total demand	177%	118%	78%	39%

**Table 6. Rates applicable to Plum Island for purchase of supplemental power and sale of power to the Long Island Lighting Company (LILCO).**

Type of Rate	Rates paid by LILCO	Rates Received by LILCO
Off-peak Rate	6.98 cents per kWh	2.22 cents per kWh
On-Peak Rate	45.13 cents per kWh	3.36 cents per kWh
Mid-Peak Rate	10.18 cents per kWh	3.12 cents per kWh

**Table 7. Incremental net benefits of reducing wind capacity from 6 MW to 4 MW and adding 2 MW of diesel capacity.**

Item	Cost or benefit	Rate	Quantity
Wind cost O&M savings (\$15,000 per MW annual)	\$30,000	\$15,000 per MW	2 MW
Annual Capital Savings for reducing Wind Project from 6 MW to 4 MW	\$220,000	0.11*	\$2,000,000**
Annual On-Peak Savings from Diesel Operation	\$488,923	0.4513	1,083,366 kWh
Avoided Capital Costs at \$2.34 per kW for June through September	\$18,720	\$2.35/kW per month	4 months
Total Annual Savings Attributed to Diesel/Wind	\$757,643		
Annual Diesel Cost Including Capital	\$134,164	0.124	1,083,366 kWh
Lost revenue and increased supplemental payments from reduced wind generation	\$351,315		
Total annual cost and lost revenue attributed to Diesel/Wind	\$485,479		
Net annual benefits of 4 MW Wind/2 MW Diesel	\$272,164		

\* Annual Fixed Charge Rate

\*\*Reduced Investment at \$1,000 per kW

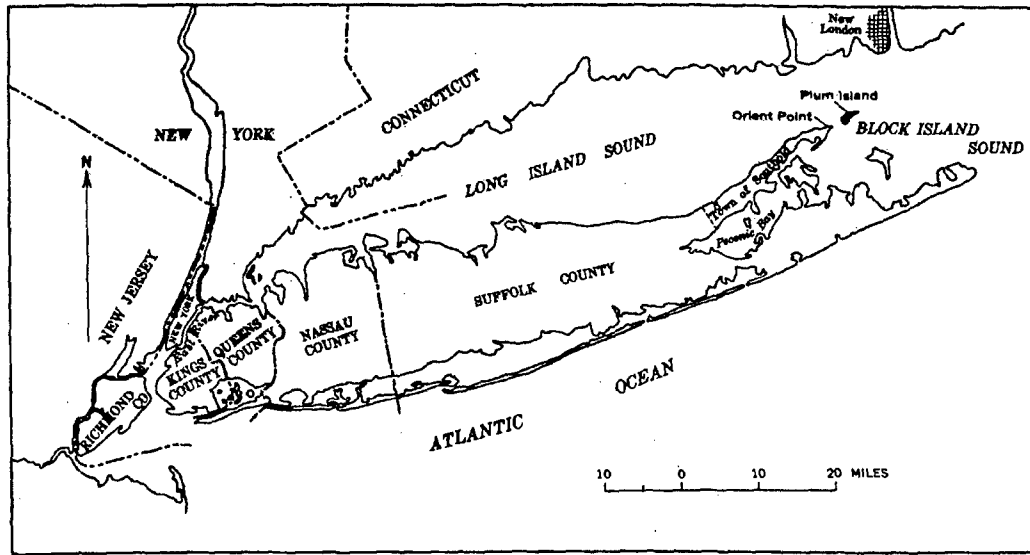


Fig. 1. Location Map for Plum Island.

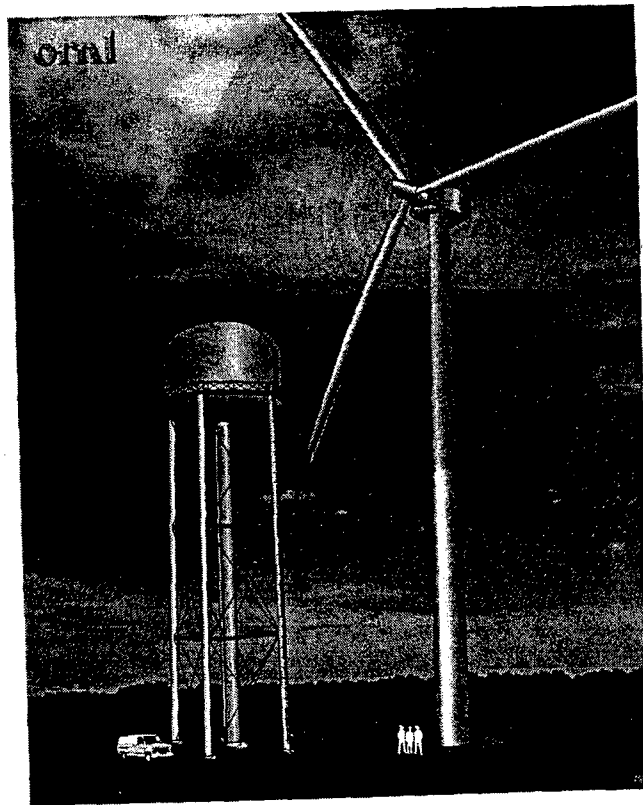


Fig. 2. Conceptual picture of the Plum Island Water Tower next to a 750 kW Wind turbine

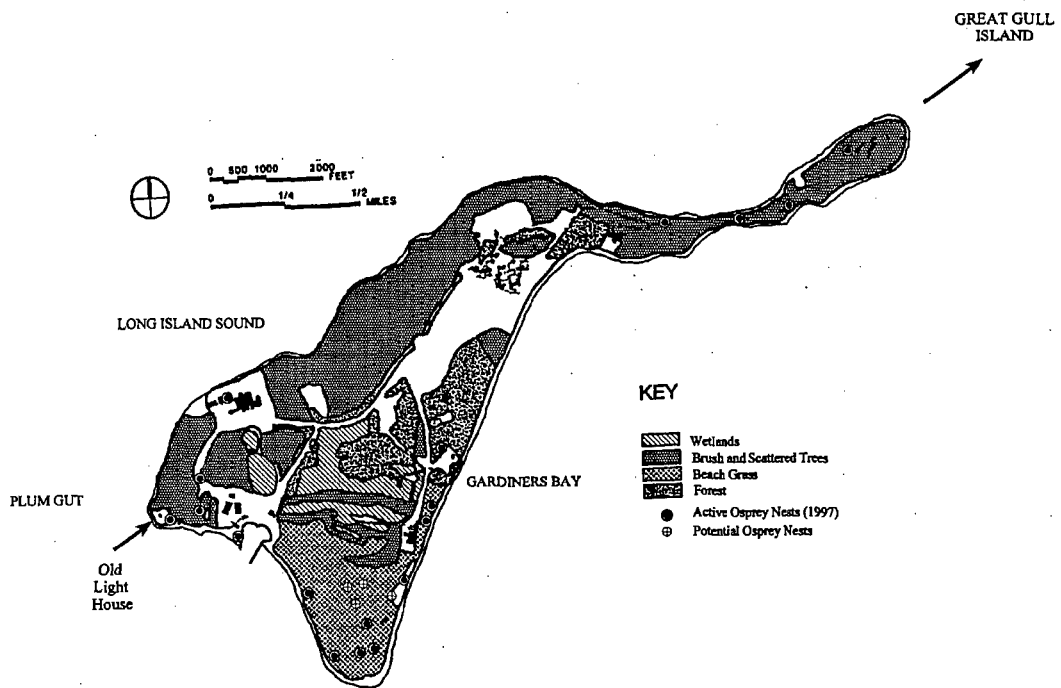


Fig. 3. Habitat Map of Plum Island.



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