Winter/Nocturnal Duck Survey Nantucket Sound, Massachusetts

PREPARED FOR

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Project No. E159.002.3

July 29, 2005

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NANTUCKET SOUND, MASSACHUSETTS

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TABLE OF CONTENTS

SECTION **PAGE**

FIGURES

TABLES

APPENDICES

1.0 INTRODUCTION

Cape Wind Associates, LLC conducted nighttime, winter field surveys in Nantucket Sound in March 2005. The purpose of the study was to gain a greater understanding of locations and behaviors of wintering sea ducks when they return each evening to Nantucket Sound (primarily Tuckernuck and Horseshoe Shoals). Both Cape Wind and MassAudubon have documented counts and distribution of sea ducks during the daytime, however, less is known about the nocturnal behavior and locations of the sea ducks. Large numbers of winter sea ducks (Common Eiders, scoters, and Long-tailed Ducks) congregate in rafts in Nantucket Sound at night. Common Eiders and scoters are believed to stay in Nantucket Sound during the day and night, whereas Long-tailed Ducks are known to spend winter days foraging outside Nantucket Sound and then move back into the more protected waters of Nantucket Sound at night. The locations and behavior of the Long-tailed Duck roosting habitats have not been documented. The goal of the study was to identify the nighttime roosting location and behavior of the Long-tailed Ducks (in particular any commuting movements in the Sound and if so the height of flight). While focusing on Long-tailed Ducks, nighttime observations of eiders and scoters were also to be included in this study. The survey was not meant to be a quantitative study. The field study employed a combination of airplane reconnaissance and boat-based observations, both using night vision equipment (Nightstorm Spotting Scope ATN Night Storm–first generation). The study also included evaluating night vision scopes for observing behavior of sea ducks in low light. The study originally was planned for four nights in February and March, but limited suitable field conditions, coupled with limited results, only two surveys were conducted.

1.1 Methods

The surveys were designed to utilize a low-flying (approximately 500' asl) airplane with two spotters. Each spotter was to be equipped with a night vision monocular and binoculars. The spotters in the airplane were to identify the location (using a GPS unit) of large rafts of ducks and inform spotters on a boat, which then were to move in closer to the rafts. Two spotters (also equipped with night vision equipment) on a boat observed and recorded the behavior of the sea ducks. Communication between the airplane and boat was maintained using marine VHF radio. It is important to note that the purpose of this survey was to identify large groups and their gathering locations, and not to specifically identify species, numbers, and/or distribution. However, data on individual and small flocks of ducks were noted when and where possible.

The study was dependent upon weather conditions, with airplane surveys limited to good visibility and winds less than 15 knots. Boat surveys were limited to low winds and relatively calm sea conditions. The survey team monitored marine forecasts and the decision to proceed was determined by 12:00 noon the day before (i.e.: "Go" decision by 12:00 noon Wednesday for a Thursday evening mobilization). The US Coast Guard was notified prior to each survey operation. Due to low air and sea temperatures, all staff conducting observations on the open deck of the boat was required to wear anti-exposure survival suits.

In order to optimize the effectiveness of the night vision equipment, surveys were scheduled to coincide with partial to full moon light conditions. The period spanning February 16 through March 3, and then the period from March 18 through 31 provided 50% or better fraction of the moon illumination and were targeted as the primary survey windows. However, due to inclement weather the first survey occurred on March 5, just beyond the period of optimum moonlight, due to the need to mobilize and test the survey methods.

Aerial Survey

Ambroult Aviation provided the plane (twin engine Cessna Sky Master 337) and pilot, which mobilized out of Chatham, Massachusetts. In addition to the pilot, two trained observers, each equipped with a night vision monocular, binoculars, Trimble Geo Explorer 3 GPS unit, and voice-recording devices were on board. The observers, Dr. Jeremy Hatch and Jeffrey Burm, have extensive experience in aerial survey work, having conducted the bulk of the avian field research for the Cape Wind project since 2001 (see DEIS Section 5.7 appendices). Flights were scheduled to commence at approximately 2:30 pm in order to conduct a preliminary grid survey of the entire Project Area/Nantucket Sound with the objective of locating and identifying large gatherings of sea ducks that may be present during daylight hours. The systematic grid was comparable to the survey grid flown during the previous Cape Wind aerial surveys of 2002 through 2004. However, the southern reaches of the transects were extended to better cover the area near Tuckernuck Island and near the shores of Nantucket, where anecdotal information indicated large sea duck roosts may be found. An additional short transect was added to the eastern edge of the survey grid to cover the area close to Monomoy Island. GPS locations for the turning points of the survey grid were provided to Ambroult in advance of the first flight in order for them to be input into the plane's on-board navigation system.

Following the completion of the preliminary daylight survey (approximately 2 hours), the plane proceeded to the area around Nantucket Island to look for Long-tailed Ducks returning from their daytime foraging in the Nantucket Shoals area. Transects were flown east and west along the north shore of Nantucket, Tuckernuck and Muskeget Islands to intercept flocks returning to Nantucket Sound. If the spotters observed the Long-tailed Ducks in transit, the plane attempted to follow their flight into Nantucket Sound and locate their roosting site(s). If observed, spotters recorded the GPS point, time, approximate direction of flight and, when possible, the approximate numbers and species composition of the group. If, prior to darkness, no flocks were observed re-entering Nantucket Sound, the plane commenced flying an established grid utilizing night vision equipment, concentrating initially on the southern portion of Nantucket Sound and moving further north until roosting sites were located. Spotters also located and documented rafts of Common Eiders and scoters within Nantucket Sound and guided the boat to their locations so that behavior could be monitored.

Boat Survey

Patriot Party Boats in Falmouth, Massachusetts provided the commercial vessel and captain. In addition to the captain, a minimum of two trained observers were on board and equipped with night vision monoculars, binoculars, spotting scope, Garmin Etrex GPS, and voice-recording devices. The boat departed Falmouth in the late afternoon in order to be south of Horseshoe Shoal before sunset in order to observe any ducks returning to the Sound from their daytime foraging south of Nantucket.

Upon locating a large raft of sea ducks, the boat slowly positioned (preferably by drifting) as near as possible without flushing the ducks. Small groups of ducks were noted; however, the purpose of the exercise was to locate the large roosting groups. The GPS location, time, estimated numbers of birds and the approximate species composition of the group were recorded. The behavior of the ducks was to be observed and noted. When birds took flight, the altitude was to be estimated with simple flight height estimation as follows: ducks were to be noted as either flying below 50' or greater than 50' above the sea surface. These altitudes were to be estimated by referencing known objects such as the height of the boat and the Cape Wind meteorological data tower. After observing rafts for approximately 30 minutes, the boat proceeded to the next nearest roosting site identified by the plane and began the observation process again. As long as the plane was able to locate large rafts and communicate their position to the boat, the goal was for the spotters on the boat to attempt to establish as many observations/data points as possible in the course of the evening. In this manner, the study attempted to maximize the opportunities to identify roosting locations and observe behavior of wintering sea ducks.

2.0 RESULTS

Surveys were conducted on March 5 and March 18, 2005. Conditions were as follows (see Appendix A for more details of the field surveys):

- March 5, 2005: Sunset at 5:36 pm with moonrise at 4:04 am (on the 6th), thus there was no moon available to provide illumination. Clear sky, gentle breeze (approximately 6 knots), and calm seas.
- March 18, 2005: Sunset at 5:50 pm with moonset at 2:51 am (on the 19th), thus providing a half moon positioned high in the sky providing excellent illumination for observations. Clear sky, calm winds, and calm seas.

During the period from late afternoon until approximately one hour past sunset while residual twilight still provided some illumination, spotters in the airplane were able to locate several large rafts of eiders (with scoters) on both March 5 and 18, 2005. Once complete darkness fell it was determined that the night vision monoculars did not enhance the spotters' visual acuity enough to allow them to locate rafts from the airplane. Spotters recorded the extent of those rafts (Lat-Long) observed using onboard GPS. This information was transferred to the boat via marine radio, which then moved closer to the rafts to observe behavior.

Spotters on the boat were better able to use the night vision spotting scopes when ducks were within 500 feet. When present, ducks could clearly be seen through the night vision equipment by the spotters on the boat. The clarity of the night vision was greatly enhanced when some reflective light was available on the water surface (either ambient lights from shore, the boat's spotlight, or moonlight) providing a backlight for the ducks. However, no large aggregations of Long-tailed Ducks were encountered by plane or boat and no large evening flight of these ducks was observed around the western end of Nantucket.

Several large rafts of Common Eiders and scoters were observed by plane and boat. When the boat was able to drift towards the rafts, the ducks often did not flush. At times, the boat drifted to the very edge of the raft (within 20 feet or less of ducks sitting or paddling) without flushing it. Small groups of ducks would get up and move within the raft. The ducks flew close to the surface, traveled 50 to 100 yards, and then landed within the raft. During both surveys from the boat, the overwhelming majority of the ducks were observed flying below 50 feet. Most were observed flying within 10 feet of the sea surface. Flying close to the sea surface was noted both when ducks were moving within the rafts and when the entire rafts were flushed by the survey boat or other boat traffic. For the occurrences when ducks were observed flying about (that is, not flushed up from the water surface by the study boat), all but two birds observed were of flight height below 50 feet. These heights of flight observations are consistent with those observed by MassAudubon[1] who observed 2,286 traveling ducks with an average height of 8.5 ft (SD=7.1) and a median height of 5.0 ft.

When, due to darkness, the spotters in the plane were no longer able to locate sea ducks the plane returned to Chatham and the boat continued to transect those areas that the plane had identified as locations of rafts. Following inspection of those areas, the boat continued to conduct slow (approximately 5-10 knot) transects searching for, and observing, ducks.

The survey grid performed by the airplane is shown in Figure 1 and boat survey is shown in Figure 2. Data recorded on the boat and in the airplane from both surveys is in Appendix A.

3.0 DISCUSSION

The general plan for each aerial survey was to locate and record large rafts of sea ducks during daylight hours, enable the shipboard observers to reach these birds, and to look for evening flights of Long-tailed Ducks moving into Nantucket Sound around the western end of Nantucket (and to follow such flocks to their over night location). Thus, we hoped to encounter the "classic" roosting flights of many thousands of Long-tailed Ducks as recorded in Christmas Bird Counts and described by Davis (1997)[2].

Long-tailed Ducks were widely distributed during the two aerial surveys, but nowhere in large numbers. We did not see evidence of large nocturnal gatherings or large numbers moving into Nantucket Sound. Hundreds were seen in the southeast part of Nantucket Sound, outside the uppermost part of Nantucket

[1] Perkins, S., Sadoti, G., Allison, T., and Jones, A. May 2005. Relative Waterfowl Abundance Within Nantucket Sound, Massachusetts During the 2003-2004 Winter Season. Massachusetts Audubon Society

[2] Davis, W.E. 1997. The Nantucket Oldsquaw Flight: New England's Greatest Bird Show? Bird Observer 25: 16-22.

Harbor (an area outside our usual transects). Others were recorded along the southern part of Nantucket Sound, north of Eel Point. However, these numbers were in tens and hundreds (totaling a few thousands during the two surveys), only a tiny fraction of the numbers reported to occur in a "classic" flight. From about 4:00 pm to dark the airplane spent most of the time (when not guiding the boat) attempting to intercept flocks of Long-tailed Ducks flying into Nantucket Sound from Nantucket Shoals. The airplane flew east-to -west transects between the entrance to Nantucket Harbor and Muskeget Channel, at various distances from shore. From the airplane, spotters saw small numbers of Long-tailed Ducks flying north, but no large flocks. Totaling the observations would be of little value because it is suspected that many birds were observed on more than one occasion as the plane moved about the study area.

During the several years of aerial observations conducted by Cape Wind, only once has a large Long-tailed Ducks roost been found—December 17, 2001 south of Tuckernuck Shoal, which is northeast of Tuckernuck Island. Subsequently, during several evening visits to that area (during the winters of 2002 and 2003) only small numbers were encountered.

Numerous potential explanations for the apparent absence of a "classic" flight around the western end of Nantucket on March 5 and 18, 2005 include the following possibilities that are not mutually exclusive: (a) few Long-tailed Ducks use Nantucket Sound in this way (feeding offshore and roosting in Nantucket Sound), (b) the flight is seasonal, (c) feeding locations have shifted so that the flight into Nantucket Sound takes a different route (perhaps north of Nantucket into the eastern parts of Nantucket Sound). The availability of pertinent information to help reveal the roosting behavior of Long-tailed Ducks near Nantucket Sound is quite limited.

The most recent Christmas Bird Counts (CBC) on Nantucket (226,536 on Jan. 1, 2005) and Tuckernuck (21,150 on Dec. 31, 2005) recorded nearly 248,000 Long-tailed Ducks, similar to the numbers described by Davis (1997). The numbers of Long-tailed Ducks viewed in the Nantucket Christmas Bird Count have varied widely from year to year (see Table 1).

Table 1: Number of Long-tailed Ducks Observed in the Nantucket Christmas Bird Counts (10 years- 1995-2005)

CBC Count Year	Date	Numbers Observed
96	12-25-1995	251,754
97	12-25-1996	148,615
98	12-25-1997	89,046
99	01-2-1999	46,174
100	01-2-2000	183,042
101	12-31-2000	11,760
102	12-31-2001	254,302
103	12-28-2002	525,505
104	1-3-2004	83,304
105	1-1-2005	226,536
	Median	165,828
	Average	182,004

The roosting behavior of Long-tailed Ducks may also change and the variables to cause the change are unknown. Local experts on Nantucket believe that flights around the western end of the island continue throughout the winter and that no large numbers move into Nantucket Sound at the north end.

4.0 CONCLUSIONS

Large rafts of Common Eiders (with scoters) were located during late afternoon/evening surveys by the airplane and boat on March 5 and 18, 2005. No large congregations of Long-tailed Ducks were encountered and there were no large evening flights observed around the western end of Nantucket. Long-tailed Duck roosting behavior (location and routes) is likely to be variable and would require extensive sampling in order to attempt to document it. Although the American Technologies Night Storm Night Vision Scope performed satisfactorily from the boat when birds were nearby, the scope did not increase the visual acuity of the observers in the airplane enough to warrant additional night flights.

It was determined that the nightvision equipment did not increase observers' visual acuity from the plane enough to make locating rafts at night possible, and therefore the plane was unable to direct the boat after dark. Without the plane available to act as the boat's "eyes", the opportunities for the boat to encounter one or more of the large rafts was left to the chance that transects would intercept the ducks on the water. As the ducks observed after dark were in small groups only and drifting with the current, it is not possible to predict where they may occur throughout the night. Based on this limitation the proposed survey was discontinued after the March 18, 2005 survey.

Although the results did not provide confirmation of night roosts for Long-tailed Ducks or their flight route between the ocean and Nantucket Sound, information regarding flight height and behavior of sea ducks

was obtained that verifies earlier observations and adds to the existing body of knowledge on winter sea ducks in Nantucket Sound.

The flight height of those sea ducks observed (day and night) was in nearly all cases below 50 feet asl, with the great majority flying very close to the water (approximately 10 feet asl). This was true for ducks flushed from the surface by the study boat and for ducks that were initially seen flying about. This is consistent with MassAudubon observations as noted earlier.

Although nearly all (with the exception of two) sea ducks were observed near the water, spotters on the boat periodically checked overhead skies to look for passing ducks. None were seen after dark even though there were clear skies and sufficient moonlight for such sightings. Visibility was such that the top of the Cape Wind met tower could be clearly seen for a distance of at least two miles.

The reaction of the ducks to the presence of the boat varied according to the speed of the boat. When drifting or making headway speed, those ducks on the water either stayed on the water and moved slowly away from the boat, dove, or lifted off the water and moved a short distance (50-100') away and returned to the water. When the boat was underway at greater speeds, the ducks were more likely to lift off the water and fly some distance away (usually 50–100'—but in some instances beyond the limits of the observer's field of night vision). In most, cases the height of flight observed was well below 50 feet. When flying Long-tailed Ducks were observed returning to Nantucket Sound from the plane, they usually diverted their flight path away from the plane making it more difficult to ascertain where they were headed.

During daylight and into dusk period, ducks were observed being flushed up to approximately a mile away when the boat was approaching at cruising speed (approximately 12-15 knots). When approaching ducks at slower speeds (i.e. less than 10 knots) or drifting, ducks tended to stay sitting on the water surface even when the boat approached within 20 feet of the raft. This reaction may be due more to the noise of the diesel engines of the boat at higher speeds rather than the movement of the vessel itself.

Figures

Location: G:\GIS-Projects\E159\Nantucket Sound\Figure A-1.apr Layout: Landscape

3/5/2005		3/18/2005	
GPS	Time	GPS	Time
1	6:40 PM	1	5:45 PM
2	7:45 PM	2	5:54 PM
3	8:10 PM	3	7:25 PM
4	8:25 PM	4	7:30 PM
5	8:45 PM	5	8:30 PM

15,000 Common Eider Raft

Boat Survey 3/5/05

Boat Survey 3/18/05

ESS Group, Inc.
Engineers
Scientists
Consultants

CAPE WIND ASSOCIATES
BOAT SURVEY ROUTE MAP

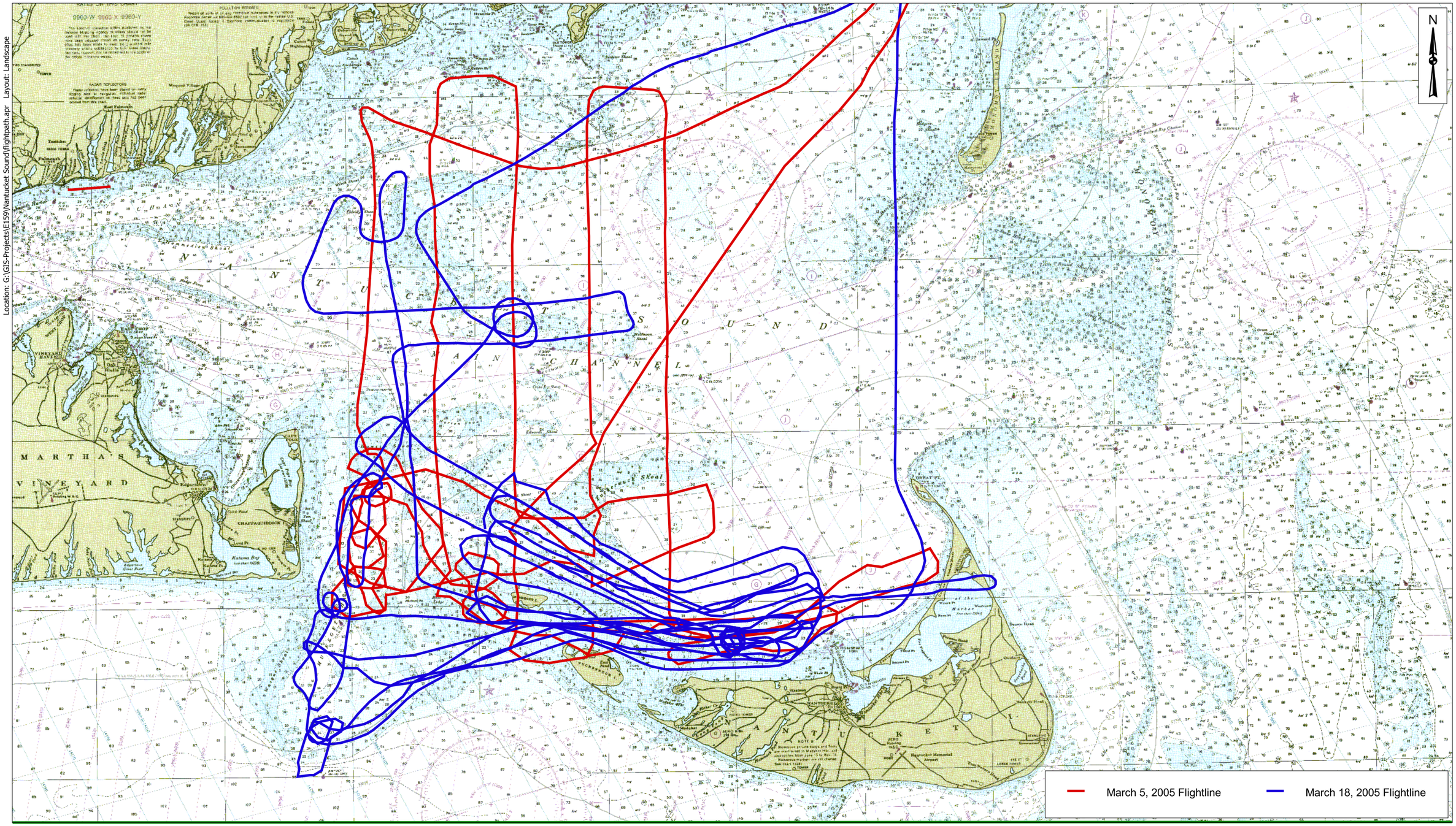
Nantucket Sound

Scale: 1" = 12,500'
Source: 1) Nantucket Sound and Approaches
2) ESS Group, Inc. Survey, 2005

Boat Survey Route Map with GPS Observation Points

Figure 1

Location: G:\GIS-Projects\E159\Nantucket Sound\flightpath.apr Layout: Landscape



ESS Group, Inc.
Engineers
Scientists
Consultants

CAPE WIND ASSOCIATES
AERIAL SURVEY ROUTE MAP

Nantucket Sound

Scale: 1" = 16,500'
Source: 1) Nantucket Sound and Approaches
2) ESS Group, Inc. Survey, 2005

Aerial Survey Route Map

Figure 2

Appendix A

Data From the Airplane and Boat Surveys

Notes From the Aerial and Boat Surveys on March 5 and 18, 2005

Aerial Survey

March 5, 2005

Spotters: Jeremy Hatch and Jeffrey Burm

Sunset 1736, moonrise 0404 (on 6th). Thus, no moon for observations at night. Clear sky, gentle breeze (6 knots from W at one point).

We first flew N-S transects to locate rafts of ducks and then from about 1700 h flew several E-W transects around sunset between Muskeget and Nantucket in search of returning Long-tailed Ducks.

We located at least four large rafts of eiders with many scoters and saw small numbers of Long-tailed Ducks (LTDU), including several small flocks (max 100) flying north (NNE – NNW) close to water surface. These flocks were near Tuckernuck, as expected. We were unable to follow these flocks to their landing points. We considered it possible that large movements of LTDU could have occurred earlier in the day and concluded that systematic transects should start earlier. After dark, we revisited the locations of large rafts of eiders but could not find them with the nightscopes. We could see waves, but no ducks.

Guiding the boat Quickwater to the rafts worked out quite well until it was too dark to see the birds.

March 18, 2005

Spotters: Jeremy Hatch and Jeffrey Burm

Sunset 1750; moonrise 1037, moonset 0251 on 19th; thus high half-moon for observations at night. Clear sky, near calm wind; conditions for observation appeared to be excellent.

We met observers from MAS at the Chatham airport just after they landed from a survey of the Sound, using transects much like ours. They reported that the only large concentrations of ducks were in the northeast and southwest of the Sound and showed these locations on a chart. Accordingly we visited these areas and found a large but diffuse aggregation along the northern part of transect 16 (northeastern corner of customary survey area) and several dense rafts at the southwest edge of the Sound of which the largest was near Wasque Shoal, outside our customary survey area. We recorded locations but did not attempt to enumerate these rafts, which certainly contained tens of thousands of eiders and smaller numbers of scoters. In the prevailing calm conditions, the rafts were visible from 500 feet at distances of two miles or more. After dark, we revisited locations of some rafts, using precise latitude and longitude recorded by the pilot, and could faintly see the ducks (male eiders) in the moonlight with unaided eyes. The nightscopes slightly improved these views but were not adequate for surveys. We successfully guided the Quickwater to some rafts prior to darkness.

Long-tailed Ducks were widely distributed but nowhere in large numbers: at no point did we see any evidence of a huge nocturnal gathering, nor of large numbers moving into the Sound. Some hundreds were seen in southeast part of the Sound, approximately outside of the uppermost part of Nantucket Harbor, an area outside our usual transects, and others were recorded along the southern part of the Sound, notably north of Eel Point. However, these numbers were in tens and hundreds (totaling a few

thousands during the survey), only a tiny fraction of the numbers reported to occur in a "classic" flight. From about 1600 to dark, we spent most of the time (when not guiding the Quickwater) attempting to intercept flocks of Long-tailed Ducks flying into the Sound from Nantucket Shoals. We flew east—west transects between the entrance to Nantucket harbor and Muskeget, at various distances from shore. We saw small numbers flying north but no large flocks. Totaling the observations would be of little value because many birds were recorded on more than one occasion. Our conclusion is that no "classic" flight occurred; our flights were sufficient to have encountered large numbers if the flight followed the usual pattern.

Boat Survey

March 5, 2005

Spotters: Terry Orr, Chris Rein, Heather Heater, and Darrell Oakley

Transcribed from audio tape–Chris Rein voice recording

6:00 pm Sun just went down. Large flock of Common Eiders was flying up off the water near Hawes shoals. Plane estimated approximately 15,000 birds in the flock. All moved, flying clearly less than 50 feet above sea level (asl) mostly less than 10 feet asl and we did not see them put down again. Headed south of Hawes Shoal to see if we can pick them up again. Flying south from Hawes Shoal.

6:40 pm Observed 20 Common Eiders, in groups of 3 to 4, flying roughly 10 feet asl (certainly less than 50 feet ASL). (Position: Muskeget channel heading south near Mutton Shoal)

6:40 pm Observed approximately thirty Common Eiders near Mutton Shoals near Muskeget channel. Position: GPS–001

Two Common Eiders in vicinity of the SMDS tower. Took off and flew less than 50 feet asl.

Vicinity of the SMDS tower (north of it). Have seen several Common Eiders –not a large flock, but we have spotted small groups on the water. A couple take off and fly less than 50 fifty asl. Did not see them touch down again.

7:45 pm Another group, just ahead of the boat (still in vicinity north of the Met Tower). Approximately six birds took off and flew below fifty feet ASL corrected position – slightly west of the met tower. Approximately one mile northwest of the Met Tower. Position: GPS–002

8:00 pm Two Common Eiders were approximately 0.2 mile from the Met Tower took off flying well below fifty feet asl.

8:10 pm Two Common Eiders were approximately one mile north of Met tower. They took off when approached by the boat and the height was less than 50 feet asl. Put down again some short distance from the boat. Position GPS 003. Continuing the current transects until approximately two miles north of SMDS and then will head approximately 0.5 mile west and then southerly transect back to the vicinity of the Met Tower.

8:45 pm Two Common Eiders at GPS 005. Spotted on the water, took off and flew at less than 50 feet asl.

8:50 pm A single duck–unsure of species took off flying below 50 feet asl. Quite a lot of white on it. Confirmed as Long-tailed Duck from the cabin.

8:50 pm Two more Long-tailed Ducks took off from the water—less than fifty feet south heading from the turn around point—due west of met tower

9:00 pm Heading back from the channel from the Met Tower. Will continue to cruise slowly and observe on the way back.

(end of tape approximately #180 counter)

March 18, 2005

Spotters: Chris Rein, Terry Orr, and Heather Heater

Transcribed from audio tape –Chris Rein voice recording

5:20 pm Large raft eider and scoters reported from plane. Drifting southeast of Cape Poge Light House. Boat is facing south trying to get closer to ducks.

Seas are flat and sun still relative high in horizon.

Observing large raft. Raft is several miles long 0.25—0.33 mile off bow.

Boat heading southeast from Cape Poge Light House.

5:28 pm Still observing large raft that is now 0.25 mile away to the south.

Large Raft is 0.25 mile SE Marker 4004.

5:34 pm Turned off boat motor. Raft is spread north and southeast of boat. Ducks are not taking off—remaining on sea.

From time to time groups of ducks set up and move 50–100 yards within raft. Ducks flying at less than 50 feet asl—more like 10 feet asl.

5:40 pm Started motor heading south to go to next raft reported by airplane.

Passing southern edge of large raft near Marker 4004.

Boat is less than ¼ mile away. Birds are not flying away. Some small group flying within rafts. Birds still flying within 10 feet of the sea surface.

5:45 pm Another raft—appears to be scoters. Boat is raising the birds up we pass them. Flying less than 50 feet asl.

Continue heading south. Boat kicking up hundreds of ducks on the south and east side of the boat. Ducks appear to be mostly scoters flying below 50 feet asl.

Some small groups seen flying above 50 feet.

Position: GPS–001

5:53 pm Sun is sinking. Heading south along Muskegat Channel towards next large raft of ducks reported by the plane.

Boat is just past Mutton Shoals channel marker.

5:54 pm Sun is below horizon. Boat is 0.5 mile south of Mutton Shoals channel marker.

Heading towards large raft of ducks just south of the boat. Raft is approximately one mile off the bow of the boat.

In Muskeget Channel, coming on large raft on the water within 1/4 mile. Drifting and the boat engine is off.

Raft extends 0.5 mile in length—50-yard strip south.

Position: GPS 002.

6:02 pm Drifting alongside ducks

Boat is less than 0.25 mile from ducks. Can see with naked eye and hear them. Lots of contact calls.

Raft is mostly Common Eiders and scoters.

Small groups get up and fly to new areas within raft. Flying less than 50 feet asl mostly within 10 feet asl. Raft is near buoy #1 and Skiff Island.

6:10 pm Boat started and slowly moving towards buoy #1 near Muskeget Channel. Slowly approach raft so we can observe them in flight.

Buoy #1 also known as marker #006.

As boat moves near raft, the majority is still sitting within 200 yards to one hundred yards from the boat. Many are remaining on the water. A few are beginning to take off—all flying below fifty feet asl. All ducks flying within 10 feet of surface.

Ducks are not being spooked by boat. They are slowly paddling away.
Buoy #1 off starboard

Common Eiders and scoters are not moving much and staying on surface. Ducks are within 50 feet of boat.

6:15 pm Heading north from Buoy #1. Birds are still flying about 10 feet asl.

Leaving raft and heading north and then east towards Tuckernuck in search of Long-tailed Ducks.

7:25 pm Cruising area 1—2 miles north of Tuckernuck, west of Nantucket. No ducks. No Long-tailed Ducks.

Position GPS 003

Cut engines, drifting in area that plane had seen some Long-tailed Ducks

Position GPS 004

Did not observe any ducks. Boat captain saw several individuals in distance – unknown species.

Moving to new location.

7:55 pm Cruising in easterly direction north of Tuckernuck in general vicinity of Madaket Harbor. Trying to find flock observed by plane earlier—no luck.

8:30 pm Arriving at Met Tower. Cruising past within 1,000 west of Met Tower and slowing down. Have not seen any ducks on trip from Madaket Harbor to Met Tower. No Ducks.

Position GPS 005

Cruising at slow speed north of Met Tower—10 minutes north of tower— no ducks.

9:00 pm Four miles north of Met Tower kicked up 3 single Long-tailed Ducks.

9:03 pm Saw a few single Long-tailed Ducks. Ducks dove under the surface as boat approached. Several then flew at less than 10 feet asl.

9:10 pm Turning westward 1.5 miles northwest of "Wreck." Buoy at Horseshoe Shoals. Going another 0.5 mile and then start a north–south transect.

9:15 pm 3 Long-tailed Ducks on southward transect. Kicked up and flew away. Flew less than 20 feet asl

9:25 pm Stopped southerly transect towards Met Tower. Heading in west–northwest towards Waquoit Bay to look for ducks in shallow waters.

Did not see many ducks in transects in Horseshoe Shoals. Mostly two to three ducks. No rafts in area north of Met Tower.

(end of tape approximately #298 counter)