0023636

From:	Ted Simons
To:	Mike_Murray@nps.gov
Cc:	Darrell_Echols@nps.gov; Thayer_Broili@nps.gov; Britta_Muiznieks@nps.gov
Subject:	RE: AMOY research proposal
Date:	05/27/2009 04:20 PM
Attachments:	Simons Sample 3 and 5 year CAHA Research Budgets.xls Simons Thoughts on CAHA Disturbance Study.docx Sabine et al 2008 Human activity effects on Amer Oystercatchers Waterbirds 31 70-82.pdf CAHA OverviewFinal2.pdf McGowan and Simons 2006 AMOY Disturbance.pdf

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Hi Mike,

Here are some thoughts on possible future studies of AMOY disturbance at CAHA (Simons thoughts.... attached). I have also attached some related publications and a sample research budget. Please let me know if you would like to set up a time to talk about this in more detail. I'm happy to drive down for a visit if that would be helpful.

Regards,

Ted

Ted Simons
Professor
USGS Cooperative Research Unit
Department of Biology
Box 7617 NCSU
Raleigh, NC 27695
919-515-2689
919-515-4454 Fax
tsimons@ncsu.edu
http://www4.ncsu.edu/~simons

-----Original Message-----
From: Mike_Murray@nps.gov [mailto:Mike_Murray@nps.gov]
Sent: Friday, May 22, 2009 3:51 PM
To: tsimons@ncsu.edu
Cc: Darrell_Echols@nps.gov; Thayer_Broili@nps.gov; Britta_Muiznieks@nps.gov
Subject: AMOY research proposal

Hi Ted,

We have a possible research project we'd like to get your thoughts on.

Background: My understanding is that the recommended nest buffer of 150 meters in the USGS protocols for American oystercatcher (AMOY) nests was based, in part, on John Sabine's study at Gulf Islands NS (2005 thesis). The buffer, as recommended by USGS, applies to ALL recreational activities (i.e., ORVs and pedestrians). In reading through Sabine's thesis on American oystercatchers (particularly Chapter 4, Effects of Human Activity on Behavior of Breeding American Oystercatchers) there are a number of statements indicating a marked difference between observed pedestrian and vehicular disturbance during nest incubation (i.e., suggesting that pedestrian disturbance is much more of a concern than vehicular disturbance during incubation; while vehicular disturbance is clearly a concern when chicks are present). Sabine's study makes a strong case for the pedestrian buffer of 137 m or more during incubation, but does not seem to make the same case for completely restricting all vehicular activity within 150 m of a nest during incubation. For example:

Page 45: "During incubation, pedestrian activity ?137 m of subjects reduced the proportion of time devoted to reproductive behavior, but pedestrian activity 138-300 m had no effect. Vehicular and boat activities had minimal effects on oystercatcher behavior during incubation."

Page 88 (Management Recommendations): "Although presence of vehicular activity altered behavior during incubation, reproductive behavior was not negatively impacted, suggesting that vehicular activity at CINS in 2003 and 2004 did not negatively impact hatching success. During brood rearing, foraging behavior was lower in the presence of vehicular activity, which may alter chick provisioning and ultimately chick survival. To minimize impacts on adult foraging behavior, I recommend the prohibition of beach driving in oystercatcher territories (within 150 m) when chicks are present . At all other times, beach driving should be limited to well below the high tide line and speeds should be limited to 10 mph or less, so drivers have ample time to see and react to birds in the path of travel." (underlining added for emphasis)

The apparent contrast between pedestrian disturbance and vehicular disturbance described in Sabine 2005 does not seem to support the recommendation of an absolute 150 m buffer for ALL recreation during AMOY incubation that is found in the USGS protocols (perhaps other references provided the basis for the 150 m vehicular restriction during incubation?). In managing the beach at Cape Hatteras, there are limited occasions in which being able to allow vehicles to pass some appropriate buffer distance from an AMOY nest during incubation (i.e., NOT when chicks are present) would be beneficial, provided the buffer distance is sufficient to prevent negative impacts from disturbance. For example, if a 150 m buffer for such a nest were to block the only means of access to an important recreation site such as Cape Point and if a lesser buffer for the activity of driving past the site to reach the open area beyond the closure were adequate to

prevent disturbance during incubation (assuming that a full beach closure would occur when chicks are present), it could reduce the overall length of time that popular sites (such as Cape Point) were inaccessible to the public and could decrease public resentment about the duration and impact of the closures.

Research Project Concept: To follow up on specific negotiated rulemaking discussions that occurred during natural resources subcommittee meetings (which included Walker Golder among other stakeholders), I am interested in having research done at Cape Hatteras in the next few years that would evaluate the effectiveness/adequacy of having a buffer of less than 150 m for ORVs driving past AMOY nests during the incubation. My intent is to definitively determine for Cape Hatteras whether there may be limited, definable circumstances under which it may be appropriate to allow vehicles to drive past by an AMOY nest at a distance less than 150 m. Under what circumstances or conditions, if any, would a reduced buffer for vehicles driving by be effective/adequate? Under said conditions, what would be the effective/appropriate vehicular buffer size during incubation? Would restricting vehicles to traveling below the high tide line during incubation be adequate as p. 88 in Sabine's thesis suggests? Would controlling or restricting the number of vehicles per hour, or limiting travel time to limited time periods per hour, or would manipulating any other variable(s) within management control make a difference?

Underlying Management Objectives:
Ensure adequate protection of incubating AMOY nests
Determine if a reduced buffer distance (i.e., less than 150 m) for ORVs driving past an incubating AMOY nest is adequate to prevent disturbance and, if it is, determine what distance is adequate
OR
Determine that a reduced buffer is NOT adequate (and put this issue to rest)

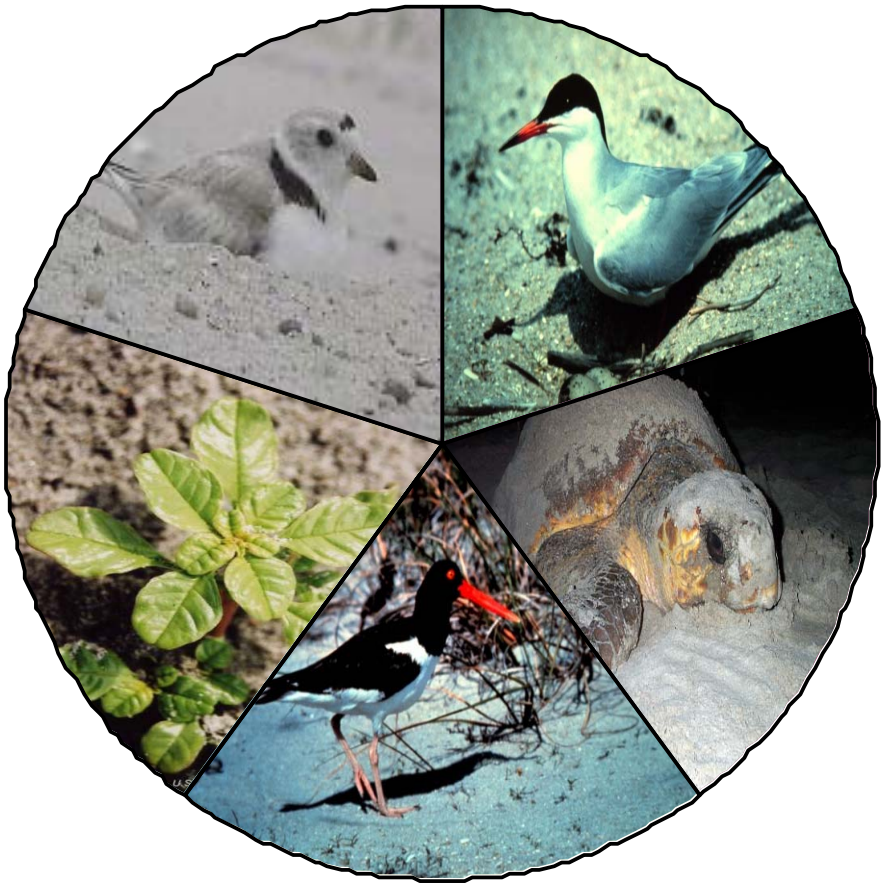
Questions:
Do you believe that such a study could produce the specific results the park would need for practical management purposes, or would it possibly only indicate that there is such variability in individual bird's reactions to ORV disturbance during incubation that the only way to prevent disturbance is to use the same conservative buffer size for all human disturbance situations?
Is there an adaptive management approach to managing these specific situations (AMOY nest buffer blocking the only access to an inlet or Cape Point, when the inlet or point itself is otherwise "open") that could be designed to determine the appropriate effective ORV "drive-by" buffer distance over time?

Request for a Proposal: If you believe that such a study could lead to a practical differentiation in buffer size for ORVs driving past an incubating nest vs. the buffer size needed to prevent disturbance from other human activities, I would appreciate it if you would develop a research proposal, with estimated costs, for such a study so that the Seashore can seek funding for it. Ideally, the project would be something that could be started in 2010 (or no later than 2011).

Thank you for your consideration. If you think it would be helpful to discuss this on the phone before responding, feel free to say so and we can set up a call to discuss it.

Mike Murray
Superintendent
Cape Hatteras NS/ Wright Brothers NMem/ Ft. Raleigh NHS
(w) 252-473-2111, ext. 148
(c) 252-216-5520
fax 252-473-2595

SYNTHESIS OF MANAGEMENT, MONITORING, AND PROTECTION PROTOCOLS FOR THREATENED AND ENDANGERED SPECIES AND SPECIES OF SPECIAL CONCERN AT CAPE HATTERAS NATIONAL SEASHORE, NORTH CAROLINA



Authors (alphabetically): Jonathan B. Cohen[a], R. Michael Erwin[b], John B. French[b], Jeffrey L. Marion[b], J. Michael Meyers[b]

[a]Virginia Tech University, Blacksburg, VA, [b]USGS Patuxent Wildlife Research Center, Laurel, MD

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Introduction

From 1985 to 2004, the breeding population of the federally threatened piping plover (*Charadrius melodus*, USFWS 1996a) and seabeach amaranth (*Amaranthus pumilis*, USFWS 1996b) declined at Cape Hatteras National Seashore (CAHA) in North Carolina. Furthermore, statewide declines were documented for common terns (*Sternus hirundo*), least terns (*Sternus antillarum*), gull-billed terns (*Sterna nilotica*), black skimmers (*Rynchops niger*), and American oystercatchers (*Haematopus palliatus*) all of which are Species of Special Concern for the North Carolina Wildlife Resources Commission (NCWRC). At the same time, the number of recreational visitors to CAHA greatly increased. In general, recreational activity has been implicated as a cause for (i) low reproductive success and declining populations of all of these species, and for (ii) disturbance or mortality of migrating and wintering piping plovers, colonial water birds and oystercatchers, and (iii) disturbance or mortality of nests, hatchlings and adults, of the three species of sea turtles that nest at CAHA [the federally threatened loggerhead (*Caretta caretta*) and the federally endangered green turtle (*Chelonia mydas*) and leatherback turtle (*Dermochelys coriacea*)] (NMFS and USFWS 1991a, NMFS and USFWS 1991b, NMFS and USFWS 1992).

Over the past decade, management of these natural resources has been inconsistent at CAHA, partially due to the lack of effective and consistent monitoring of the location, reproductive activity, mortality factors, and winter habitat use of these species. As a result, the National Park Service Southeast Region and CAHA requested assistance from the U.S. Geological Survey's Patuxent Wildlife Research Center (USGS PWRC) to develop a scientifically-based series of protocols for the Protection and

Monitoring of piping plovers, sea turtles, seabeach amaranth, American oystercatchers, and colonial waterbirds for CAHA. This overview provides a partial summary of these individual documents, as well as discussion of some overall issues that affect the management procedures recommended for all the species.

The USGS developed these protocols, based on the best available scientific information, to guide management, monitoring and research activity at CAHA that would result in the protection and recovery of each species. These protocols do not attempt to balance the need for protection of these species with other activities that occur at CAHA, nor was NPS management policy considered in detail. A draft of the protocols was sent to species experts for scientific review; the final draft of protocols were reviewed by NPS personnel to ensure that description of recent management at CAHA was accurately represented and that the approach was consistent with our work agreement.

Development of Management Protocols

The management of endangered and threatened species is mandated by law and should be based on the best available information, including published research, reports and the practical experience of scientists and wildlife mangers themselves. All of these sources were consulted and formed the basis of the management recommendations found in the protocols. USGS PWRC scientists searched and evaluated the literature and consulted wildife managers to form the first draft of the protocols, which was sent to species experts for scientific review. Corrections based on those comments were incorporated into the draft protocols. The protocols are the best recommendations from

USGS PWRC to the NPS for management of these species at CAHA, based on the sources noted above.

In recent years, the scientific community has formally recognized and responded to what resource managers have known for a long time, that (i) management actions are not static but must change with changing conditions, often year to year, and (ii) that the published scientific data on which management is based is often incomplete and less specific to the particular location of species under management than is desirable. Hence, a sensible approach is to incorporate into the management program itself efforts to monitor the effects of current management practice, and even, research and local experiments directed toward exploring the effect of different kinds of management practices. There are many benefits of monitoring and such focused research to the improvement of management: the ability to adapt the management program to local habitats and conditions, to adapt management over time to changing conditions, and to identify the best management actions rapidly. The data collected through monitoring form a solid basis for making any such changes, or to justify maintaining current practices. For these reasons, monitoring and focused research are integral to our recommendations.

We provided three management options for protected species, presented in order from the most conservative ("***Option A: Highest degree of protection***") to more liberal ("***Option B: Moderate protection***" and "***Option C: Minimum protection***"). These options are intended to protect habitat used by each species at some time in the last 10 years, where this can be determined. The rationale is that for populations of these species to actually increase in size, more habitat must be available to them than is currently used.

- Under Option A, no recreation is permitted in any habitat used in the previous 10 years by the species in question. This eliminates the threat of direct mortality or disturbance due to recreation, and greatly reduces indirect impacts such as attraction of wild predators to the habitat of proteced species and alteration of the beach profile by off road vehicle (ORV) traffic.
- Under Option B for birds and plants, pedestrian recreation but not ORV traffic is permitted within a corridor in historically-used habitat. For sea turtles, Option B closes all historically-used habitat to night use by ORVs and optionally pedestrians, and closes segments of the habitat completely to all recreation. Option B reduces the risk of direct mortality and disturbance over current management practices, but does not reduce indirect effects of recreation to the same extent as Option A.
- Under Option C for birds and plants, ORV and pedestrian use is permitted in a corridor in historically-used habitat. For sea turtles, night use of the habitat for recreation is only permitted in conjunction with user educational programs, and as in Option B certain segments of beach remain closed. The risk of mortality, disturbance, and indirect effects of recreation are higher than under Option A or B, but still less than under current management practices.

All three options include some degree of exclusion of recreation from a buffer zone around nests and important habitat types, trapping and removal of predators and use of predator exclosures where needed, and restrictions on pets, recreational activities that

might cross into protected zones (such as Frisbee playing or fireworks), and trash disposal and wildlife feeding. Where multiple protected species coexist, the recommendations for the most sensitive species should be employed. A summary of recommended buffer distances for each species is given in Table 1.

In general, because of the dynamic nature of the CAHA beaches and inlets, the management may change by location and time, and new sites (bars, islands) may require additional management, or recommendations may become inapplicable for certain sites, or new sites may form that provide suitable habitat.

Monitoring

Specific monitoring guidelines are provided in the individual protocols, and summarized in the final section of this Overview. We recommend that special attention be paid to the nests and young of both birds and turtles because they are so important to the survival and growth of these species. The primary addition to current CAHA monitoring that we recommend is to record potential threats, and signs of potential threats (e.g., predator trails, ghost crab burrows, and human disturbance) in relation to adults, nests, and young of protected species, as well as the response of adults and young to potential disturbances. We also recommend more frequent, standardized surveys for non-breeding birds. We provide recommendations for documenting possible legal infractions that may be observed during monitoring, and at scenes of past violations.

Data Management

Recommendations for raw data collection, data management and entry, metadata format, data storage and analysis, and reporting are the same for all protected species. Guidelines can be found in the individual protocols.

Education and Outreach

While the protections recommended in these protocols are necessary, the ultimate fate of protected species at CAHA depends on knowledge and skill of the staff at CAHA and the values and attitudes of the public that uses CAHA. In each protocol, we provide suggestions for basic skills and knowledge that should be provided to all staff working in the habitat of protected species, and methods to educate the public and involve all stakeholders at CAHA in the management process.

Management-Directed Monitoring and Research

Federal and state agencies now widely recognize the importance of adopting an adaptive resource management (ARM) approach whenever possible. That is, management, monitoring, and research are all integral to effective resource management. Past are the days when "monitoring programs" were set up simply in an attempt to capture changes in environmental parameters or wildlife populations. Determining causation usually requires some type of management experiment. As noted above, monitoring and research focused on local management options are integral to effective management of species. This section is a general description of that approach and an

outline of relevant monitoring and focused research questions to improve management at CAHA over time.

Management of rare flora and fauna over large landscapes can be improved by incorporating three components:

1. monitoring various characteristics of the species in question to determine the magnitude, duration, and latency of effects associated with management actions
2. management experiments designed to evaluate management alternatives,
3. research aimed at critical gaps in knowledge,

The results of monitoring provide a solid basis for a manager to either continue the current management practice or technique, or modify it until the desired effects are achieved. Focused, applied research or management experiments may be required because species behaviors, habitat use, and community relationships often differ from region to region.

Since all of the species in question are state or federally-listed or "of special concern", the goal of management is to increase populations of these species at CAHA, and, more generally, to contribute to the recovery of the listed species. Protocols for adaptive management are provided for each species or group of species in individual documents. The questions to be addressed for all of the protected species can be generalized as follows:

1) What is the distribution and abundance of the organism at CAHA?
2) What are the vital rates of the population at CAHA, and how do these compare to populations elsewhere?

3) What is the contribution of the population at CAHA to state and regional populations?

4) What are the threats to survival and reproduction at CAHA? For all species at CAHA, an important (and obvious) management question is, "What is the effect of human recreation (ORV and pedestrian traffic) on distribution, abundance, and reproduction?"

This question can and should be addressed through closure or partial restriction of habitat to recreation and measurement of demographic, behavioral, and habitat variables enumerated in the protocols for each species, specific to CAHA.

Additionally, we recommended investigating at CAHA the necessary buffer distance to prevent disturbance to protected species, the effects of predator exclosure on nest success of piping plovers and colonial nesting water birds, and the effects of artificial lighting management on sea-finding behavior by sea turtle hatchlings.

We identified several additional questions that would benefit from local research order to fine tune the management recommendations for each species. These include:

1) Determining the current level of pedestrian and ORV traffic in the habitat of protected species, and how this differs between day and night and among different management treatments,

2) Estimating the carrying capacity of CAHA for the species in question, with and without the presence of recreation,

3) Estimating the survival rates and site tenacity of adult and fledgling birds,

4) Monitoring the rate of predation by birds, mammals, and ghost crabs on nests and young,

5) Monitoring the presence of mammalian and avian predators and evaluating the effectiveness and costs of various trapping methods,
6) Monitoring the success of relocated sea turtle nests, and
7) Determining the effect of recreation on detectability of turtle crawls.

Acknowledgement

Funding for this Protocol was provided by the National Park Service to US Geological Survey, Patuxent Wildlife Research Center. Administrative review was conducted by the following National Park Service personnel: Sherri Fields and Steve Harrison

Table 1. Recommended buffer distances for habitat closures to protect nests and seabeach amaranth plants from injury and disturbance at Cape Hatteras National Seashore, NC.

Species	Buffer Distance (m)[a]
Piping Plover	50
Least Tern	100
Other Colonial Waterbirds	200
American Oystercatcher	150
Sea Turtles	50
Seabeach Amaranth	10

[a]The buffer distance for the most sensitive species in an area should be used. If disturbance occurs with a given buffer distance, the buffer zone should be expanded according to the recommendations in the individual protocols.

Mike,

I will embed some comments below in response to your email. I would be happy to discuss this in greater detail if you like or come down and meet with you all.

Hi Ted,

We have a possible research project we'd like to get your thoughts on.

Background: My understanding is that the recommended nest buffer of 150 meters in the USGS protocols for American oystercatcher (AMOY) nests was based, in part, on John Sabine's study at ~~Gulf Islands~~Cumberland Island NS (2005 thesis).
The buffer, as recommended by USGS, applies to ALL recreational activities (i.e., ORVs and pedestrians). In reading through Sabine's thesis on American oystercatchers (particularly Chapter 4, Effects of Human Activity on Behavior of Breeding American Oystercatchers) there are a number of statements indicating a marked difference between observed pedestrian and vehicular disturbance during nest incubation (i.e., suggesting that pedestrian disturbance is much more of a concern than vehicular disturbance during incubation; while vehicular disturbance is clearly a concern when chicks are present). Sabine's study makes a strong case for the pedestrian buffer of 137 m or more during incubation, but does not seem to make the same case for completely restricting all vehicular activity within 150 m of a nest during incubation. For example:

Page 45: "During incubation, pedestrian activity ≤137 m of subjects reduced the proportion of time devoted to reproductive behavior, but pedestrian activity 138-300 m had no effect. Vehicular and boat activities had minimal effects on oystercatcher behavior during incubation."

From Sabine et al. 2008……

"Disturbance experiments were conducted on eleven oystercatcher pairs during the 2004 season, but because of nest locations and nest failure, all treatments could not be applied to all nests (Table 4). Oystercatcher displacement occurred during all trials of the 20-m pedestrian disturbance treatment. During 40- and 60-m disturbances, displacement occurred during 78% of trials. The mean distance for displacement of pooled nest means (all three treatments) was 113 m (N = 11, 95% CI = 90-137 m). No vehicle disturbance trials resulted in displacement from nests and only one pair displaced from an ATV disturbance trial. The upper value of the 95% CI (137 m) was used as a conservative threshold of tolerance of nesting American Oystercatchers on CINS."

If you look at Table 4 in Sabine et al. 2008 you will see that Sabine had people walk past 11 nests along transects parallel to the shoreline 20m below the nest, 10 nests along a line 40m below the nests, and 9 nests along a line 60 m below the nest, and he drove a vehicle past 9 nests along lines 50m below the nests and an ATV past 8 nests along a line 50m below the nests. He measured the proportion of nests where incubating birds flushed in response to the disturbance and he measured the distance from the disturbing person/vehicle to the nest. Birds did not respond to vehicles passing 50 m from their nests and 1 of 8 birds (0.13) responded to an ATV at 169.5m. The 137m figure comes from the upper 95% confidence limit of the disturbance distances of the pooled pedestrian data from 20, 40, and 60m.

So, as he states below, he found little evidence in this small sample of trials that birds are disturbed by vehicles driving along a line 50m below their nests (0/10 nests disturbed by vehicles, 1/8 nests disturbed by an ATV).

I am not aware of other empirical data on Oystercatcher flushing distances and do not know how the 150 m buffer in the consent decree was derived.

In my experience birds show a wide range of responses to different types of disturbance. I have attached a paper Conor McGowan and I published in the Wilson Bulletin in 2006. As you can see our results were quite different from John Sabine's. I think these types of findings are quite context dependant, a function of what the birds

Comment [TS1]: It is still not clear to me how the 150 m buffer was derived. I have a copy of the overview document by Cohen et al. and Sabine's 2008 paper in Waterbirds (both attached) that was derived from his 2005 thesis. The Cohen overview simply provides a recommended buffer of 150m, while Sabine uses 137 m based on the rationale below. If there are reasons for the current 150 m buffer I have not seen them.

experience on a regular basis, and differences in habitat and predation risk. At CALO, where birds associate ATV's with researchers/park staff arriving to check their nests, they will often flush when and ATV is 200-300m from their nest. In general birds are much more tolerant of other vehicles, especially if the vehicles are >50 from their nests and if the vehicles are simply passing by at a moderate speed. CALO is implementing a new strategy this season by posting partial closures 100m on either side of active AMOY nests. The signs and symbolic fencing to the high tide line instruct visitors to drive through the closure without stopping. Birds seem to acclimate to this fairly well but we will have to see if it results in improved nest survival this year.

Page 88 (Management Recommendations): "Although presence of vehicular activity altered behavior during incubation, reproductive behavior was not negatively impacted, suggesting that vehicular activity at CINS in 2003 and
2004 did not negatively impact hatching success. During brood rearing, foraging behavior was lower in the presence of vehicular activity, which may alter chick provisioning and ultimately chick survival. To minimize impacts on adult foraging behavior, I recommend the prohibition of beach driving in oystercatcher territories (within 150 m) when chicks are present . At all other times, beach driving should be limited to well below the high tide line and speeds should be limited to 10 mph or less, so drivers have ample time to see and react to birds in the path of travel." (underlining added for emphasis) I agree that Sabine's data do not show a strong effect of vehicles during incubation. In general, as long as nests are not run over, most birds will acclimate to low levels of vehicle traffic adjacent to their nests. If traffic is not continuous, so that birds have access to foraging areas in front of their nests day and night, there is some likelihood their eggs will hatch. The challenge from a research standpoint is not documenting the distances at which birds will leave their nests in response to different forms of disturbance, but in documenting the consequences of disturbance on nest establishment, reproductive success, juvenile survival, and adult survival. It is very hard to do this in a setting like CAHA because of limited sample sizes and the difficulty of isolating an effect like vehicle traffic from confounding factors like variations in predator abundance, or habitat quality. Even so there are certainly things we can learn about disturbance that can inform management policies. See comments about research objectives below….

The apparent contrast between pedestrian disturbance and vehicular disturbance described in Sabine 2005 does not seem to support the recommendation of an absolute 150 m buffer for ALL recreation during AMOY incubation that is found in the USGS protocols (perhaps other references provided the basis for the 150 m vehicular restriction during incubation?).
In managing the beach at Cape Hatteras, there are limited occasions in which being able to allow vehicles to pass some appropriate buffer distance from an AMOY nest during incubation (i.e., NOT when chicks are present) would be beneficial, provided the buffer distance is sufficient to prevent negative impacts from disturbance. For example, if a 150 m buffer for such a nest were to block the only means of access to an important recreation site such as Cape Point and if a lesser buffer for the activity of driving past the site to reach the open area beyond the closure were adequate to prevent disturbance during incubation (assuming that a full beach closure would occur when chicks are present), it could reduce the overall length of time that popular sites (such as Cape Point) were inaccessible to the public and could decrease public resentment about the duration and impact of the closures.

Comment [TS2]: Yes, the vulnerability of chicks to vehicles can't be overstated. So, with closures related to Piping Plover and other species you are really talking about a 4-6 week period where modifications to AMOY closures might make a difference in how you manage vehicles.

This is an important strategic decision that deserves some careful thought. There are two possible approaches as I see it. They come down to managing at the population level or at the level of individual breeding pairs. You could manage at the level of individual birds and try to develop a standard for disturbance that is applicable to all birds in all habitats, or you could manage at the population level and set targets for population levels and nesting success for the entire Seashore. I think there is a case to be made that trading off some additional disturbance in very high demand visitor areas like Cape Point and Bodie Island Spit for greater protection in other areas (via closures, predator control) if the net effect is getting the Seashore moving in the direction of restoring the declines we have seen in AMOY populations over the past 15 years. Of course these trade-offs would have to be balanced with objectives for Piping Plover, Terns and other species who may rely more heavily on these popular recreational sites. In any event, there is no question that better information about disturbance and birds will improve your management decisions and I am happy to work with you to define some research objectives.

Research Project Concept: To follow up on specific negotiated rulemaking

discussions that occurred during natural resources subcommittee meetings (which included Walker Golder among other stakeholders), I am interested in having research done at Cape Hatteras in the next few years that would evaluate the effectiveness/adequacy of having a buffer of less than 150 m for ORVs driving past AMOY nests during the incubation. My intent is to definitively determine for Cape Hatteras whether there may be limited, definable circumstances under which it may be appropriate to allow vehicles to drive past by an AMOY nest at a distance less than 150 m. Under what circumstances or conditions, if any, would a reduced buffer for vehicles driving by be effective/adequate? Under said conditions, what would be the effective/appropriate vehicular buffer size during incubation? Would restricting vehicles to traveling below the high tide line during incubation be adequate as p. 88 in Sabine's thesis suggests? Would controlling or restricting the number of vehicles per hour, or limiting travel time to limited time periods per hour, or would manipulating any other variable(s) within management control make a difference?

Underlying Management Objectives:

Ensure adequate protection of incubating AMOY nests Agree. Question is how to measure disturbance and protection. We can measure flushing distance and show how flushing distance changes with distance and the type of disturbance. The question then becomes one of picking a meaningful management threshold.

Determine if a reduced buffer distance (i.e., less than 150 m) for ORVs driving past an incubating AMOY nest is adequate to prevent disturbance and, if it is, determine what distance is adequate OR

Determine that a reduced buffer is NOT adequate (and put this issue to rest) Again, this depends on operational definition of disturbance. In the absence of measurable outcomes like hatching success these definitions can become very subjective.

Questions:

Do you believe that such a study could produce the specific results the park would need for practical management purposes, or would it possibly only indicate that there is such variability in individual bird's reactions to ORV disturbance during incubation that the only way to prevent disturbance is to use the same conservative buffer size for all human disturbance situations? In the specific cases of Cape Point and Bodie Island Spit this is almost impossible to determine because reducing the buffer results in such a massive change to the nesting environment. It would be hard to compare the effects of a 100m versus a 150m buffer for those nests when the 50m difference means the difference between essentially no people and thousands of people on the same section of beach.

Is there an adaptive management approach to managing these specific situations (AMOY nest buffer blocking the only access to an inlet or Cape Point, when the inlet or point itself is otherwise "open") that could be designed to determine the appropriate effective ORV "drive-by" buffer distance over time? Yes, an adaptive management approach would, almost by definition, focus on population level objectives. It would provide the flexibility to apply different management policies in different locations in order to minimize both the political and the economic cost of management and find the most efficient path to your management objective (in this case some population, productivity, and survival targets).

Request for a Proposal: If you believe that such a study could lead to a practical differentiation in buffer size for ORVs driving past an incubating nest vs. the buffer size needed to prevent disturbance from other human activities, I would appreciate it if you would develop a research proposal, with estimated costs, for such a study so that the Seashore can seek funding for it. Ideally, the project would be something that could be started in 2010 (or no later than 2011).

I would appreciate the opportunity to continue working with you and your staff on these issues and would be happy to develop a detailed research proposal over the next few months. I have attached a generic budget to give you a rough idea of the costs I would envision for this research. A focused 3-year MS level study of incubating adult time activity budgets and response to various types of vehicle/pedestrian disturbance would cost about

$180K, and more ambitious 5-year PhD level study to develop an adaptive approach to AMOY management would cost about $300K.

Thank you for your consideration. If you think it would be helpful to discuss this on the phone before responding, feel free to say so and we can set up a call to discuss it.

Yes, if you want to pursue this I think it would be very helpful to meet and discuss possible approaches. Please let me know if you would like to set up a time for a conference call or a visit.

Sincerely,

Ted

Ted Simons
Professor
USGS Cooperative Research Unit
Department of Biology
Box 7617 NCSU
Raleigh, NC 27695
919-515-2689
919-515-4454 Fax
tsimons@ncsu.edu
http://www4.ncsu.edu/~simons