United States Department of the Interior

NATIONAL PARK SERVICE
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October 13, 2005

Memorandum

To: Superintendent, Glacier Bay National Park and Preserve

From: Alaska Regional Science Advisor

Subject: Assessment of the September 2005 Report from the Glacier Bay Vessel Management Science Advisory Board (Board)

I have completed my initial review of the Board's report. Given the level of detail and length of the report, a more thorough reading is warranted by myself and others. However, I wanted to provide my initial thoughts for your consideration.

I am impressed with the scope and thoroughness of the Board's evaluation. The report covers the physical, marine biological, and human socio-cultural environments, and it considers multiple resources and characteristics within each of the broad categories. I do not personally know all the Board members, but I am familiar with their selection process and I am confident that they are qualified for their task through training and experience.

The report includes 1) reviews of pertinent literature (both published and unpublished reports), 2) an analysis of relevant information gaps, 3) recommendations for a research and monitoring framework to address identified information gaps, and in some cases, 4) recommendations for management actions and potential mitigation activities. Although their recommended management actions and some research recommendations appear broader than required for current decisions, the additional information could also be helpful in developing criteria for future decision making and other planning efforts (e.g., comprehensive science planning).

I had the following objectives in mind as I read the report and appendices:

- To fully understand the Board's recommendations and, where possible, the basis for their recommendations
- To distinguish between information that would be needed immediately and that which may support later decisions (see table 1)

- To consider how the recommendations could be implemented, and how they relate to other planning efforts, such as the park's comprehensive science planning process, the draft regional science strategy, and future resource stewardship planning.

Decision criteria. The Board did not explicitly prioritize studies or propose decision criteria in their report, but they clearly identified a set of resources and other park values on which to focus new research, modeling, and monitoring. Their recommendations also identified a set of resources and other values that could potentially be impacted by increased numbers of cruise ships. Starting with their lists, specific criteria (i.e., indicators and preliminary targets) could be established and refined through application of existing standards, reference to historic datasets, comparisons with control sites unaffected by increased vessel traffic, and other approaches. Examples of possible indicators include:

- Water quality (environmental levels of selected wastewater chemical indicators and hull antifouling compounds, absence of oil spills and dumping)

- Air quality (visible haze, airborne sulfur in select locations, potential impacts to sheep and other subsistence species)

- Marine mammals (frequency and effects of collisions and other disturbances, including haul-outs disturbance, avoidance behaviors, and demonstrated effects of excessive noise)

- Cultural sites (wake impacts to low-elevation coastal sites).

- Visitor satisfaction (perceived crowding, haze visibility, audibility of public address systems beyond the vessel).

- Others to be determined

Precautionary approach. The Board advocated a precautionary approach - to postpone any increase in vessel numbers pending the results of several years of new modeling, research and monitoring. There is merit to this suggestion. The research community would undoubtedly be better prepared to assess changes after additional data collection and analysis. In some cases, considerable information gaps exist, not only about Glacier Bay's resources, but on the species sensitivity to environmental stressors. Even after several years of study, the information about the status and sensitivity of some resource types could still be inconclusive. For example, given current knowledge, the population-level effects of disturbance on marine birds and mammals and economic impacts to coastal communities could be difficult to accurately model. A possible drawback to this approach is that several years of intensive research could deplete the available research funding, making it more difficult to fund studies needed later to detect change.

Adaptive management. An alternative approach for which there is a growing body of supporting literature is known as adaptive management. Adaptive management treats management decisions as experiments to be implemented, monitored, evaluated, and adjusted for continuous improvement. Cruise ship traffic in Glacier Bay produces a mix of interconnected effects on resources, visitor experience and other values, as do natural processes and other human activities. Changing the number of vessels would be expected to somewhat change the mix of effects, if all other factors remained constant. Application of an adaptive management approach, working with cruise industry partners, other Federal and state agencies and institutions, and others, could enable benefits to be maximized and potential impacts to be addressed and mitigated rapidly through voluntary operating improvements, temporary adjustments to vessel route and speed, and other measures as needed.

Determining effects generally involves comparisons, either to benchmarks (e.g., regulatory standards), or to the conditions at a specific time or place. When changes are anticipated, collecting data before the change is implemented is especially useful. However, even when such baseline data is available, natural cycles and other factors can still make it difficult or infeasible to demonstrate the causes for some observed changes. Comparisons to a control site, similar in nearly all respects except for the planned change, are a common approach. Another method could also enable comparative data collection here, would be a stepwise increase in vessel traffic, perhaps in increments of about 10% per season (while ensuring that there were still less than two cruise ships per day on many research days throughout an extended study period). Some data might also be collected during shoulder seasons when vessel numbers are increasing or decreasing.

It is important to recognize that there is no "one size fits all" study plan. Different research questions and different resource types call for different approaches. The methodology needs to be carefully tailored by subject matter experts familiar with the situation. To maximize the long-term benefits of the scientific program, management should also work with the scientific community to facilitate access to study sites, facilities and support services and to minimize administrative requirements whenever possible.

Following an appropriate period of experimentation and adaptation, perhaps four to six years following implementation, workable solutions could be codified through regulations. Research and adaptive management could also continue on newly-identified and unresolved issues as needed. Long-term monitoring of a selected set of indicators should continue - to supply information for ongoing adaptive management.

Board involvement. The Board has generously offered "to further assist Glacier Bay National Park and Preserve to develop requests for proposals, assist in establishing research protocols for work done directly by the Park, and review proposals and study products." Based on their recent contributions, I would expect this to continue to be a productive partnership. For maximum benefits, it will also be important for management needs and sideboards to be clearly defined, and for there to be two-way communication throughout the process.

Funding alternatives. Although costs were not estimated for this exercise, the total costs of a comprehensive new research and monitoring program are unlikely to be covered through current budgets. NPS passenger fee money provides some funding which would help cover some long-term program costs. Base funding increases may also be a possibility (e.g., Research Learning Center). Proposals could also be developed to seek supplemental project funding from several other sources (e.g., USGS-NRPP and USGS water quality programs, NPS Alaska marine settlement fund, OASLC, SEAN monitoring programs, Sea Grant). Some of the above mentioned funding sources may be most appropriate for a cooperative project with specific partners, as criteria for funding sources vary.

Recommendation. Subject to a firm commitment for needed funding and timely implementation of a comprehensive and appropriately sequenced program of modeling, research, and monitoring (see recommendations in table 1), an experimental and incremental increase in vessel traffic (perhaps 10%) may be feasible within one year. Continuation of the increased vessel traffic beyond a specified experimental period (perhaps four to six years) and of any subsequent incremental increases should be contingent on favorable feedback from a rigorous program of scientific study. I am available to continue to advise Glacier Bay management and staff throughout the process, subject to my other commitments.

Robert A. Winfree
Signed Original on File

cc:
Marcia Blaszak, Regional Director
Vic Knox, Deputy Regional Director
Ralph Tingey, Associate Regional Director, Operations & Resources

Table 1. DRAFT Research and Monitoring Matrix:

Information needs recommended by the Glacier Bay National Park Science Advisory Board have been abbreviated for this table. The Alaska Regional Science Advisor's (ARSA) comments are included within *[bracketed italics]*. In this table, the word "importance" refers to whether the information would be required for a decision to permanently increase the number of cruise ships allowed into Glacier Bay. "Medium" importance information would further support ongoing adaptive management. "Low" importance information could be highly important for other decision making, but is not considered critical to the current decision.
The word "urgency" reflects an estimate of how soon the research or monitoring results would be needed. "High urgency" information, for example, would be obtained before allowing increased numbers of cruise ship entries. Medium urgency information should be acquired before a permanent or long-term increase to cruise ship numbers (e.g., longer than about five years). Low urgency information includes long-term research and monitoring that could support future decision making.

High importance and high urgency (important, immediate need)	**Medium importance and high urgency**	**Low importance and high urgency**
SC-2. Effect of Stack Emissions on Subsistence Resources. The possible effect of stack emissions on subsistence resources should be examined. *[Initiate a dialog on this issue early, to determine what information is available and determine a logical course of future action.]* SC-4. Cultural and Spiritual Concerns with Cruise Ship Traffic. A field study be undertaken to verify and better understand the cultural and spiritual concerns with cruise ship vessel traffic in Glacier Bay. *[Initiate a dialog on this issue early, to determine what information is available and determine a logical course of future action.]*		
High importance and medium urgency	**Medium importance and medium urgency**	**Low importance and medium urgency**
P-2a. Sound Level Data. Further develop the cruise ship acoustic knowledge base by establishing sound levels for cruise ship thrusters, and ships equipped with Azipod propulsion and other new propulsion types. *[Information about new vessel propulsion systems would ideally be acquired before vessels using that technology begin regular operations within Glacier Bay.]* P-2b. Sound Level Data. Determine acoustic differences between single cruise ship and two cruise ship days through acoustic monitoring and modeling. P-4. Acoustic Monitoring. Continue acoustic monitoring in lower Glacier Bay so that data are available to assess soundscape trends, if vessel use levels change. P-8. Opacity. Collect *[and analyze existing]* cruise ship air emission opacity data. MB-1a. Effects of Changes in Underwater Soundscape. Establish a catalog of *[available]* hearing sensitivity data (behavioral and physiological) for marine species common to Glacier Bay. MB-1b. Effects of Changes in Underwater Soundscape. Compare cruise ship sound exposure levels to levels that are known to cause physiological effects or behavioral responses in marine species. Focus on high priority species and on areas frequented by cruise ships. MB-3. Modeling to Determine Effects on Populations and Densities of Marine Species. To inform and guide the design of later research related to potential impacts on marine species. MB-2. Assess Potential for Disturbance for Marine Species. By assessing the degree of their interaction with cruise ships.	P-5. Baseline Contaminant Data. Collect baseline data for contaminants in Glacier Bay's marine waters, benthic sediments, and organisms. P-6. Air Quality Monitoring in Sensitive Locations. Monitor ambient air quality conditions in the upper fjords (e.g., near Margerie Glacier) where cruises ships congregate. SC-5. Visitor Experiences and Acceptability of Park Conditions. Determine visitor motivations and expectations, as well as the effects of various park features and conditions on the quality of the visitor experience. Establish the limits of acceptable changes. SC-6. Study of Visibility and Noise Quality in Wilderness and non-Wilderness Areas. Study how visitors perceive both noise effects from cruise ships and haze in the park.	

High importance and low urgency (important, long-term need)	Medium importance and low urgency (long-term information need)	Low importance and low urgency
P-3. Sound Exposure Assessment. Conduct a study of separation distances between cruise ships and marine species. Establish sound exposure level and duration estimates for common cruise ship types and separation distances. MB-1d. Effects of Changes in Underwater Soundscape. Meaningful acoustic exposure thresholds are needed to assess potential impacts due to changes in the Glacier Bay soundscape. MB-4. Monitoring of Populations. Routinely monitor marine mammal and bird populations, focusing on species most likely to use areas frequented by cruise ships. SC-3. Ethnography of Huna Tlingit. Support an in-depth ethnographic description focused on the Huna Tlingit and their relationship with Glacier Bay.	P-1. Ambient Underwater Sound. Monitor and document ambient underwater sound for relevant areas in mid- and upper-Glacier Bay. These results will be used in acoustic models for these areas. MB-1c. Effects of Changes in Underwater Soundscape. Perform acoustic cue and acoustic communication masking analyses for species and conditions specific to Glacier Bay. SC-7. Monitoring of Visitor Experience. To understand how changes in cruise ship volumes affect aspects of the visitor experience, monitor: visitor satisfaction, cruise ship sightings, visibility standards, noise effects, wildlife sightings, backcountry permit applications, and backcountry user patterns.	P-7. Representative Air Emission Stack Testing. Conduct stack testing for representative cruise ships operating within Glacier Bay. *[Would likely be beneficial, but essential data might be obtained in other ways.]* SC-1. Archaeological Sites and Traditional Cultural Properties. Identify all archeological sites and potential TCPs and examine their sensitivity to disturbance. *[Use of the word "all" would make this practically impossible to complete. However, existing data coupled with targeted inventories and monitoring could accomplish much over the long-term.]* SC-8. Economic Model of Cruise Ship Travel in Alaska. An economic model of cruise ship travel patterns and the potential shifts in itineraries is needed to understand how a change in cruise ship entries will affect the regional economy *[The information could be important to future EIS's by NPS and other agencies, but it also may not be possible to accurately predict human decisions in this highly dynamic and competitive industry.]* SC-9. Analysis of Competition Economic Welfare among Alaska Tourism Operators. A study is needed to predict the economic effects of cruise ship entry increases on other tour operators in Alaska. *[The information could be important to future EIS's by NPS and other agencies, but it also may not be possible to accurately predict human decisions in this highly dynamic and competitive industry.]*