Technical Paper

COASTAL SERVICES CENTER
National Oceanic and Atmospheric Administration
Charleston, South Carolina
www.csc.noaa.gov

NOAA/CSC/20618-PUB **December 2006**

RAPID RECREATION ASSESSMENT: A TOOL TO ASSESS VISITOR USE AND ASSOCIATED IMPACTS AT COASTAL AND MARINE PROTECTED AREAS

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INTRODUCTION

As more people discover coastal and marine protected areas as destinations for leisure-time pursuits, the task of managing coastal resources while providing opportunities for high quality visitor experiences becomes more challenging. Many human impacts occur at these sites; some are caused by recreation and leisure activities on-site, and others by activities such as agriculture, aquaculture, or residential and economic development in surrounding areas. Coastal management professionals are continually looking for effective ways to prevent or mitigate negative impacts of visitor use.

Most coastal and marine protected area managers are challenged with balancing two competing goals—protection of natural and cultural resources and provision of opportunities for public use. In most cases, some level of compromise between the goals is necessary, where one goal constrains or "outweighs" the other. Often there is a lack of clear agreement about the priority of these competing goals. Consequently, while natural resource decisions should ultimately be science-based and objective, such decisions are frequently made under uncertainty, relying heavily upon professional judgment. These decisions are subject to a complex array of formal and informal drivers and constraints—data availability, timing, legal mandate, political will, diverse public opinion, and physical, human, and social capital. This paper highlights assessment, monitoring, and planning approaches useful to gauge existing resource and social conditions, determine feasibility of management actions, and record decision process steps to enhance defensibility. Examples are presented from pilot efforts conducted at the Rookery Bay National Estuarine Research Reserve (NERR) and Ten Thousand Islands National Wildlife Refuge (NWR) in South Florida.

BACKGROUND

Because many natural resource managers have relatively little experience dealing with tourism- and visitor-related issues, they can be unsure of how best to address problems such as wildlife disturbance, trail degradation, and crowding. As participation in nature-based recreation and tourism increases at coastal and marine protected areas, managers need assessment methods and decision-support tools that allow them to explicitly consider both ecological and social factors, engage stakeholders, and collaborate to achieve management objectives. One approach available to assist resource managers in monitoring and managing impacts caused by recreation and other visitor use is the Visitor Use Management (VUM) process. This process is currently presented as part of the "Managing Visitor Use in Coastal and Marine Protected Areas" training course offered by the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center.

The initial process and companion managers' handbook used in this course were developed by scientists at the University of Minnesota, in partnership with National Park Service managers, to "provide resource managers with a step-by-step, easy to use process for identifying and defining unacceptable impacts to biological and cultural resources and to visitor experiences, and to identify a range of strategies and tactics managers can use to

address unacceptable impacts to resources and experiences" (p. iii, Anderson, Lime, and Wang 1998). The process serves as a practical decision-support tool applicable in situations where comprehensive management plans have already been established, as well as for addressing day-to-day visitor-use-related problems in the absence of formal management plans (Wang, Anderson, and Lime 2000).

The VUM process draws heavily from established land planning and management frameworks developed in the 1970s, 80s, and 90s—such as the Recreation Opportunity Spectrum (Clark and Stankey 1979), Limits of Acceptable Change (Stankey et al. 1985), Visitor Impact Management (Graefe et al. 1990), Visitor Experience and Resource Protection (USDOI 1997a and 1997b)—and other pertinent recreation research and management guidance documents (Cole 1989; Cole, Petersen, and Lucas 1987; Lime, Anderson, and Thompson 2004). The process comprises a systematic set of separate but related steps that help managers clearly define visitor-use-related issues, identify root causes and specific impacts, select indicators for inventory and monitoring of resource conditions and visitor experiences, set standards of quality for indicators, consider a variety of management techniques to address current issues or to prevent anticipated problems, and develop implementation and monitoring plans (Figure 1). The NOAA Coastal Services Center has adopted this process as the basis for its professional development training and supported the revision of the original managers' handbook for application in coastal and marine protected areas (Coble et al. 2006).

RAPID RECREATION ASSESSMENT

While protected area managers often have a general sense of visitor use occurring within their sites, they often do not know specific use levels, spatial patterns of use, and the extent and ways visitor use might be impacting key natural or cultural heritage resources. When deciding to implement specific management actions, especially those that might displace or reduce public access or particular uses in certain areas, managers need accurate information (i.e., biophysical and social data) that (1) demonstrates clear impacts or threats to natural or cultural heritage resources or visitor experiences and (2) that is clearly linked to stated management objectives.

The ability to quickly assess current conditions and identify threats to resource or visitor experience quality can help protected area managers prioritize management efforts and focus limited resources (i.e., staff, time, equipment, funding), ultimately improving management effectiveness and efficiency.

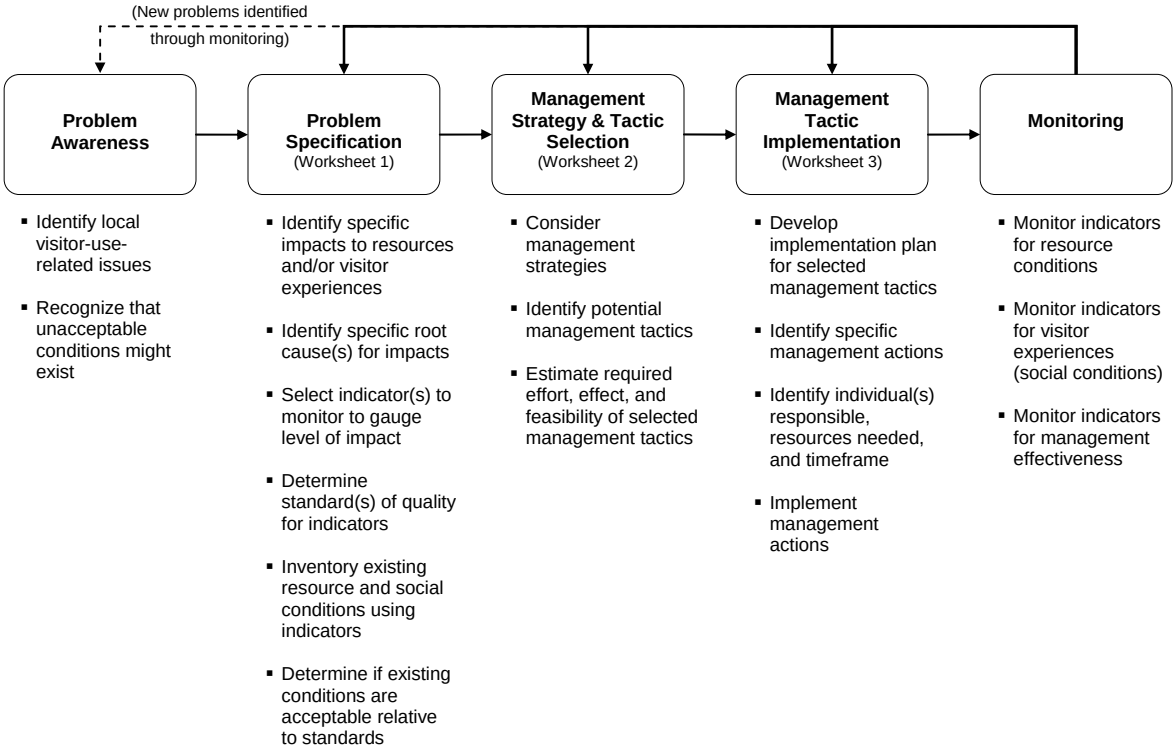

Figure 1. Visitor-use management decision-making process (adapted from Anderson, Lime, and Wang 1998).

The Rapid Recreation Assessment (RRA) was designed to be a quick yet relatively comprehensive way to help managers get an overall picture of visitor use and current or potential visitor-use-related impacts at their site. The RRA borrows from several other rapid assessment approaches used to assess natural resource and social conditions—e.g., rapid rural appraisal and participatory rural appraisal used in sustainable development (Rennie and Singh 1995), Rapid Assessment of Management Parameters for Coral Reefs (Pollnac 1998), rapid open space assessment for park and recreation planning (The Conservation Fund and Houston Parks Board 2005), and Rapid Assessment Program established by Gell-Mann and Parker at Conservation International (Abate 1992).

The RRA can be conducted independently, or as an added component to the VUM process, described above, to establish a baseline to inform subsequent monitoring and management actions. The information gathered during the RRA can also help managers explain and justify management actions to site users. The RRA process includes steps to (1) identify the site's core mission and management objectives, (2) identify motivations and benefits tied to visitor use, (3) identify existing and potential visitor use activities, (4) use existing data to inventory and map sensitive natural and cultural resource areas, and (5) assess where and how visitor use activities potentially impact or threaten key natural and cultural resources and visitor experiences.

Outputs from the RRA comprise four key pieces of information useful for protected area staffs in managing visitor use at their sites: (1) a site inventory of known visitor use and key natural and cultural resources; (2) a sensitivity analysis comparing visitor activity with visitor experience and resource sensitivity; (3) geographic information system (GIS) maps overlaying spatial visitor use and natural or cultural resource data; and (4) tables denoting relationships between different visitor uses, impact types, and the specific natural or cultural resources and locations impacted. Each of these components is described below.

Step 1. Inventory of key resources and visitor uses
A site inventory is conducted to identify current visitor uses, related impacts, and key natural and cultural resources designated as targets for conservation (e.g., listed species, historic structures). The site inventory also contains information about a number of visitor-use-management-related elements, including what activities occur, where activities occur, when activities occur, and observed and potential visitor-use-related impacts on resources and to visitor experiences (Table 1). The inventory draws upon information available at the site and does not require in-depth studies. The inventory process involves discussions with knowledgeable site staff, compilation and review of relevant existing visitor-use and resource data, and site visits to key field sites and known recreational-use areas. The inventory

Table 1. Example rapid recreation assessment site-inventory elements—Rookery Bay National Estuarine Research Reserve.

Visitor Use Characteristics
▪ Access points (e.g., roadside; boat ramp; trail; bushwhacking; private docks; hotels; marina/boat rental operators; commercial service providers)
▪ Facilities (e.g., shelters; gates; fencing; signage; kiosks; trail markers; lighting; trails)
▪ Use types (e.g., camping; shore fishing; boat fishing; hiking; camping; recreational boating; canoe/kayak; "jet skiing"; picnicking; wildlife viewing; photography)
▪ Use levels (e.g., individual; group; day-use; overnight; weekend; holiday; seasonal; year-round; concentrated; dispersed; pass through)
▪ Visitor motivations (e.g., solitude; relaxation; thrill-seeking; see wildlife; catch fish; learn about nature; explore; spend time with family; exercise)
Key Natural and Cultural Resources
▪ Wildlife resources (e.g., bird rookeries; shorebird stopover sites; shorebird nests/nesting sites; marine mammals; sea turtle nests/nesting sites; terrestrial reptiles/avifauna)
▪ Vegetation resources (e.g., submerged aquatic vegetation; salt marsh; maritime hardwood hammock; dune vegetation; coastal scrub vegetation; orchids; mangroves; restoration sites)
▪ Cultural heritage resources (e.g., prehistoric shell mounds/middens; burial sites; historic structures)
Impacts to Resources and Visitor Experiences
▪ Wildlife disturbance (e.g., bird flushing; nest trampling; vehicle/vessel–wildlife collisions; feeding wildlife; human or equipment noise)
▪ Vegetation impacts (e.g., sea grass bed scarring; vessel grounding; plant collection; firewood collection; tree cutting/trimming for access)
▪ Facility impacts (e.g., vandalism to signage or site property; property theft/removal; litter; disturbance to research sites; household/construction waste dumping)
▪ Visitor experience impacts (e.g., displacement of one user/group by another; noise; competition for sites; user-user conflict; crowding; disturbance of commercial fishing gear; safety)
▪ Impact characteristics (e.g., location and extent of impact; severity; frequency or duration of impact; importance to managers; seasonality; causes)

serves as a first look at conditions, an information resource for future decision making and for public education, and a springboard for further investigations. The remaining steps in the RRA process build on the information collected during the inventory, characterizing the relationships between visitor uses, impacts, and resources.

Step 2. Sensitivity analysis for key site resources
The RRA sensitivity analysis uses a matrix table to characterize the sensitivity of key resources (e.g., species, plant communities, nesting areas, cultural resources). This component of the RRA draws from work established by the U.S. Department of Agriculture Forest Service in characterizing threats to Wilderness areas (Cole 1994) and similar conservation threat assessment methods (e.g., Salafsky and Margoluis 1999).

To complete a sensitivity analysis, protected area managers list key natural and cultural resources and features (i.e., conservation targets) that occur within and/or proximal to the protected area. Each of these key resources receives a numerical score based on existing field data or local knowledge estimates relative to its rarity both (1) within the protected area and (2) outside the protected area, and (3) in terms of its ability to withstand human disturbance (Table 2).

Table 2. Example resource sensitivity analysis scores—Rookery Bay National Estuarine Research Reserve.

Resources	Resource rarity status on-site[a]	Resource rarity status off-site[a]	Resource resistance to human disturbance[b]	Total
Rookeries	3	1	3	7
Turtle nesting area	3	3	2	8
Shell middens	3	3	2	8
Manatee use area	2	2	3	7
Shorebird use area	1	1	3	5
Submerged aquatic vegetation	2	2	2	6
Dune vegetation	1	1	2	4
Mangroves	1	1	1	3
Uplands	1	1	1	3

[a] scale: 1 = Low; 3 = High [b] scale: 1 = High; 3 = Low

Estimates of the rarity status for specific resources are based on combined criteria, such as element occurrence, species protection designation (e.g., endangered, threatened, species of special concern), presence of isolated populations largely extirpated in other areas because of human disturbance, naturally occurring populations or communities with restricted geographic ranges, or presence of unique cultural resources or land features not found in other areas. Human disturbance refers to impacts related to particular human activities, such as trampling, viewing (e.g., bird watching), flushing, extracting (e.g., fishing), specimen collecting, boat-caused erosion or vegetation loss, or making noise.

When combined with visitor-use data depicting location, use levels, time, duration, and frequency of use, and other known characteristics, this process provides a quick assessment of high-threat areas. The sensitivity analysis matrix plays a key role in the development of visitor impact maps where sensitivity scores are visually represented as areas or sites with high, medium, or low sensitivity relative to particular human activities.

Step 3: Visitor use and key resource maps
Maps are created using a GIS to represent relationships (e.g., potential threats) between particular visitor activities and key natural or cultural resources. The resource layer depicts the location of key resources (identified and scored in steps 1 and 2) and can be created by compiling existing geospatial data—many sites have element occurrence data, such as habitat, turtle nests, rookeries, submerged aquatic vegetation, or archaeological sites. The visitor-use layer depicts locations of recreational use (e.g., type, density, distribution). The combined layers indicate overlaps between uses and resources to identify potential threat areas.

This mapping process was piloted in 2005 at Rookery Bay National Estuarine Research Reserve in Florida using existing boat-use data as an overall indicator of visitor use. Monthly aerial survey flights were flown along transects within the Rookery Bay NERR to collect powerboat-use data. Boat position data points were spatially analyzed to create maps showing different concentration levels of use across the site according to numbers of boats present in a given location over time (i.e., high use = dark color, low use = light color). Aerial survey data on West Indian manatee (*Trichechus manatus*) habitat use within the Rookery Bay NERR (cf. Easton, Lefebvre, and Doyle 2003) were compiled to create the resource layer. The visitor-use and resource layers are combined to show where visitor use intersects with key resources. The

resulting map (Figure 2) gives a visual representation of areas where visitor use (i.e., boat use), especially heavy visitor use, is occurring near sensitive resources (i.e., manatee habitat). Overlapping areas indicate areas where boats and manatees intersect. Site managers can use this information to help focus and prioritize monitoring and management efforts.

The goal of the RRA process is to bring issues forward so that they can be identified and addressed in a timely fashion. While Rookery Bay NERR had existing GIS data available to map use levels and key resources, in the absence of geospatial data, managers must often rely on their experience and local knowledge of their sites to estimate the locations of sensitive resources or existing visitor-use levels. Knowledgeable site staff members or other partners can manually input known locations of sensitive resources and use areas by drawing them on a site map or aerial photograph. Marked-up maps can then be digitized for use in a GIS. Cursory assessments and estimates based on local knowledge can serve as a starting point by providing initial indications for further study or findings that warrant validation through additional data collection and monitoring.

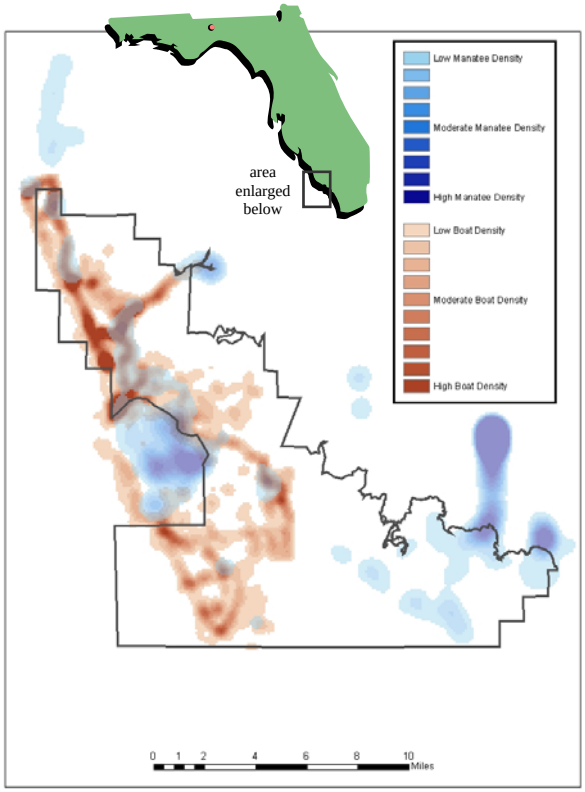

Figure 2. Boat densities (red) and manatee densities (blue) at the Rookery Bay National Estuarine Research Reserve. Manatee data collected 1991-2004 by Florida Fish and Wildlife Commission; boat use data collected 1996-2004 by Rookery Bay NERR.

Step 4: Visitor use impact tables

The final RRA outputs are tables depicting types of impacts related to specific visitor uses and recreational activities and the particular natural or cultural resources or locations that are likely to be affected by these impacts. The information for these tables stems from the development of the site inventory in Step 1, with input from site staff members and site visits. The tables are designed to illustrate linkages between specific uses, impacts, and resources to help inform management decisions that target specific problem areas that presently do or potentially could affect visitors or be affected by visitor use. Table 3 includes combined data that depicts visitor uses, current or potential impacts, and affected resources for the Rookery Bay NERR and adjacent Ten Thousand Islands NWR. This information can help focus limited management resources on high-priority areas and can help make sure managers do not overlook visitor-use impacts that may be occurring at their sites.

At the Rookery Bay NERR and Ten Thousand Islands NWR, activities such as camping, canoeing and kayaking, fishing from the shore, fishing from boats, waterskiing, recreational boating, and hunting were associated with impacts to resources in the form of bird flushing and other animal disturbance. Personal watercraft (e.g., jet skis) and canoes and kayaks are often used in remote areas where they have been associated with known wildlife disturbance impacts to bird rookeries. Impacts from improper disposal of trash or human waste are associated with many of the visitor uses that occur at these two sites and affect nearly all the resources and locations identified by site staff members. This information can be used together with the GIS maps to identify key areas to target management efforts or to implement monitoring to assess levels of impact to key resources and conservation targets.

IMPLICATIONS FOR MANAGEMENT

The RRA is meant to be a method for quickly assessing resources and visitor use across a site to identify where impacts may be occurring and to prioritize visitor-use management efforts. The RRA can help managers identify areas that may require immediate attention, as well as determine where biological or social monitoring and research are needed to better understand visitor use and associated impacts. The RRA information can be incorporated into existing or future management plans, and used in education and outreach efforts. By creating an overall picture of visitor use and current or potential impacts, the RRA positions managers to effectively manage use at their sites.

Table 3. Association of (a) current or potential impacts with (b) particular visitor uses and recreational activities and (c) specific natural and cultural resources and locations at the Rookery Bay National Estuarine Research Reserve and the Ten Thousand Islands National Wildlife Refuge (Florida).

(a) Current or potential impacts	(b) Visitor Uses and Recreational Activities — Symbols: ⊙ = Impact ○ = No Impact																					
	Camping		Canoeing/ kayaking		Shore fishing		Boat fishing		Water skiing		Jet skiing		Air boating		Day use/ hiking		Recreational boating		Visitor center		Hunting	
Animal harassment	⊙	▣	⊙	▣	⊙	▣	⊙	▣	⊙	▣	⊙	□	⊙	▣	⊙	□	⊙	□	○	--	⊙	--
Benthic impacts	○	□	○	□	○	□	○	□	○	□	⊙	□	⊙	□	○	▣	⊙	□	○	--	○	--
Bird flushing	⊙	▣	⊙	▣	⊙	▣	⊙	▣	⊙	□	⊙	□	⊙	▣	⊙	□	⊙	▣	○	--	⊙	--
Boat wake impacts	○	▣	○	▣	○	▣	○	▣	⊙	□	⊙	▣	⊙	▣	○	□	⊙	□	○	--	○	--
Boat-wildlife collisions	○	□	○	□	○	□	⊙	□	⊙	□	⊙	□	⊙	▣	○	□	⊙	□	○	--	○	--
Clearing sites	⊙	▣	○	▣	○	▣	○	▣	○	□	○	▣	○	□	○	□	○	▣	○	--	○	--
Cutting firewood	⊙	□	○	□	○	□	○	□	○	□	○	□	○	▣	○	□	○	▣	○	--	○	--
Exotic species dispersal	⊙	▣	○	▣	⊙	▣	⊙	▣	○	▣	○	▣	○	▣	○	▣	⊙	▣	⊙	--	○	--
Human waste	⊙	▣	○	▣	⊙	▣	○	▣	○	▣	○	▣	○	▣	⊙	□	○	▣	○	--	○	--
Nest disturbance	○	▣	○	▣	○	▣	○	□	○	□	○	▣	○	□	⊙	□	○	□	○	--	○	--
Noise	⊙	▣	○	▣	○	□	○	□	⊙	▣	⊙	□	⊙	□	⊙	□	⊙	▣	○	--	⊙	--
Sea grass propeller scarring	○	□	○	□	○	□	⊙	□	⊙	▣	⊙	□	⊙	□	○	▣	⊙	□	○	--	○	--
Trampling	⊙	▣	○	▣	⊙	▣	○	▣	○	□	○	▣	○	▣	⊙	▣	○	▣	⊙	--	⊙	--
Trash	⊙	▣	⊙	▣	⊙	▣	○	▣	○	▣	○	▣	○	▣	○	□	⊙	▣	○	--	○	--
Vegetation disturbance (terrestrial)	⊙	▣	○	▣	⊙	▣	○	▣	○	□	○	▣	○	▣	⊙	□	○	▣	⊙	--	○	--
	Bird rookeries		Shorebird stopover areas		Dune vegetation		Shell middens		Marine mammals		Turtle nesting areas		Mangroves		Submerged aquatic vegetation		Upland areas		--		--	
	(c) Natural and Cultural Resources and Locations Impacted — Symbols: ▣ = Impact □ = No Impact																					

Adoption of systematic processes that identify problems and threats, establish suitable indicators and standards for monitoring, and management actions to employ to address visitor-use-related issues can aid decision making and decision defensibility, as well as provide a framework for long-term monitoring of impacts in support of adaptive management. The visitor use management handbook (Coble et al. 2006) provides information about the entire visitor use management decision process and has detailed information about the intended purposes, relative costs to visitors and managers, implementation needs, and effectiveness of numerous management tactics. This systematic process can be applied at sites for day-to-day problem solving and management of visitor use or for long-term visitor-use management planning. The RRA process can be implemented at other coastal and marine protected areas using existing data and knowledge to provide a quick overview of visitor use management priorities. Both processes can be used for documenting information involved in the decision-making process and to inform more long-range site-based planning.

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[1] The Rapid Recreation Assessment (RRA) project was conducted by Pandion Systems, Inc. (*www.pandionsystems.com*) in collaboration with the NOAA Coastal Services Center under NOAA contract number EA133C-04-SE-1223. Additional information and details about the RRA project conducted in Florida and Maine are included in the project documentation submitted by Pandion Systems. This documentation is available upon request by contacting the authors.