

ASSESSING THE NEED FOR RECREATIONAL ACCESS AT
SHORELINE RECREATION SETTINGS IN THE KETTLE FALLS
AREA OF LAKE ROOSEVELT NATIONAL RECREATION AREA:
METHODS USED IN RECREATIONAL NEEDS ASSESSMENTS

Report Prepared for the National Park Service

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INTRODUCTION

Outdoor recreation use in Washington State is increasing overall, although trends are different for various activities and regions (Hall et al., 2009). When recreation use increases, there is the potential for adverse effects to visitor experiences, including crowding and conflict (Hall & Shelby, 1998; Manning, 2011). This can lead to a need for management responses, including additional recreation facilities to accommodate public need for access. Managers at Lake Roosevelt National Recreation Area (LARO) have committed to an adaptive management approach to “monitor and evaluate visitor use and experience of recreation facilities to provide a foundation for responding to changing resource conditions over time” (National Park Service, 2009, p. 67).

To implement this approach, the management team at LARO approached the University of Idaho to help identify public recreation need and assist with development of tools for monitoring visitor experience and future recreation demand at the northern portion of the reservoir near Kettle Falls, Washington. Such tools can be used in the future as part of a process to determine whether there is need for additional public recreation sites or facilities at LARO. As an initial step, recent recreational needs assessments at similar recreation sites, related management documents, and published literature were reviewed to understand the breadth, depth, and limitations of methods currently used to assess recreational use and experience quality at shoreline recreation sites. This report presents general conclusions and guidance from that review and begins by defining key terms related to needs and capacity. Specific tools to assess recreational visitor use and experience quality are then discussed, along with guidelines for implementing needs assessments. We present alternative approaches to monitoring public need for recreational access that can be considered for implementation at LARO.

We examined peer reviewed publications as well as project reports from studies related to visitor capacity and management issues occurring across the mainland United States, Alaska, Hawaii, and internationally (Puerto Rico, Spain, and Portugal). Needs assessments occurring on water bodies similar to Lake Roosevelt (lakes and rivers) were of primary interest; however, several studies from coastal shoreline areas were included to illustrate the popularity and robustness of measurement techniques and decision making processes across different settings. Initial identification of documents relied on combinations of the following keywords: recreation needs assessment, recreational carrying capacity, lake and/or reservoir visitor use, shoreline, lakeshore, and boating. Scores of assessments were retrieved for different recreational settings, which varied in the depth and degree of formal assessment conducted. Similarities were noted in the tools used to estimate use and overall public recreation need, and our review is organized accordingly. Several community-wide recreational needs assessments were included to ensure that a breadth of methods were covered. In addition to site-specific studies and reports, we included a selection of key sources from the scholarly literature that provide frameworks and principles to guide management decisions regarding public use.

Where the phrase “recreational needs assessment” is used in this document, it refers to a broad information gathering process (Didcoe & Saxby, 2007) that scientifically collects use and user information to identify visitor trends, issues, and recreational demand. This information is used to aid decision making related to the provision of recreation experience opportunities, monitor impacts related to use, and indicate when impacts reach levels deemed to be unacceptable.

This synthesis is an outcome of National Park Service efforts to gather information and establish the tools necessary for informed shoreline management as outlined by the LARO Shoreline Management Plan (National Park Service, 2009, p. 62). Since no previous recreational need studies have been undertaken at LARO, management currently lacks a baseline for future decisions related to long-term capacity issues. This synthesis is intended to inform development of an on-going monitoring process. As part of our overall contribution to that effort, we conducted extensive inventory activities in 2010 on the levels, types, and distribution of use (Hall & Bentley, 2011) and in 2011 on visitor experiences, perceptions, and attitudes toward management (Bentley & Hall, 2012). Both of those projects, along with this review, have informed the development of a monitoring tool to assess public need for recreation.

INTRODUCTION TO RECREATIONAL CARRYING CAPACITY

The process of defining acceptable use conditions is broadly called carrying capacity determination (Shelby & Heberlein, 1986). This concept is rooted in rangeland management, as it originally concerned the number of livestock a setting could support before animals or rangelands were no longer healthy. The LARO General Management Plan (NPS, 2000, p. 21) states that “the capacity of an area is defined as the number of visitors to a location that can be accommodated at one time without adversely impacting each other’s experiences or creating undue resource impacts.” This echoes the broad definition provided by Shelby and Heberlein (1986, p. 18) that carrying capacity concerns recreational “use beyond which impacts exceed levels specified by evaluative standards.” These standards are essentially used as marker posts that, when exceeded, suggest the conditions necessary for an expected or desired recreation experience are no longer possible. As Shelby and Heberlein thoroughly describe, creating evaluative standards requires a lengthy and in-depth process that collects descriptive information about use and visitor experience, the type of recreation experience to be provided, and important impacts or problems related to past, current, and proposed resource use. This information is used to design management alternatives that maintain user impacts within agreed-upon levels. Coming to consensus about optimum use levels and appropriate management actions requires managers to understand the values of the visiting public, stakeholder concerns, the agency mission, and many other concerns. Unfortunately, it is sometimes difficult simultaneously to please different groups with competing interests for the same resource, and decisions are needed to prioritize how different stakeholder groups’ values will be considered (Cole, 2003).

Although science is used to inform many stages of this process, including determining the benefits and costs of alternative management strategies, choosing to implement a particular course of action ultimately involves a value decision by management about what types and levels of use, management restrictions, and facilities are most appropriate (Cole, 2003; Manning, 2011). At LARO, for instance, research has documented the location, type, and intensity of use (Hall & Bentley, 2011); visitor concerns about facility, resource, and social conditions; and how support for different management options varies across segments of the user public (Bentley & Hall, 2012). Managers will ultimately need to decide what indicators of resource and experience quality to adopt, whether conditions are acceptable or unacceptable, and what (if anything) to do if conditions are unacceptable. Once a management strategy is chosen, indicators should be monitored according to clear protocols, and practices should be adjusted when use or impacts fall outside of acceptable limits (Manning, 2011).

In sum, recreational needs assessments and carrying capacity studies serve several purposes. They provide a baseline to understand visitor use when one does not already exist, or they can reveal actual levels of use for comparison to stated capacity recommendations for a site (provided such standards are in place). When they include a visitor survey component, such as that used at LARO in 2011, they may also inform the selection of indicators and standards for impacts and suggest when corrective management action may be needed to prevent conditions from deteriorating beyond acceptable levels. However, as noted above, these studies do not tell managers what level of use should be prescribed, because that is not a question that can be answered by science.

When reviewing needs assessments identified by this project, it quickly became clear that considerable variation exists in the carrying capacity specified for different outdoor recreation settings (Manning, 2011) and that this is a function of the differing physical, social, and historical management characteristics of each site. An important point is that ecological, facility, physical, and social carrying capacities may all be different. At LARO in 2010, we examined two aspects of facility capacity (vehicle use of parking areas and boat ramps), as well as social capacity. We did not address ecological or physical capacity. Our assessments are discussed in our other reports, along with recommendations for monitoring selected indicators of facility and social capacity.

A published review of seven recreational boating carrying capacity studies concluded that no carrying capacity study is exactly alike and that a wide variety of methods has been used to estimate use and determine appropriate physical, facility, and social capacity (Bosley, 2005). Shoreline capacity studies (e.g., Needham et al., 2011) similarly reveal a wide range of approaches in use, with measurement techniques varying due to the site-specific characteristics of water bodies and the physical distribution of recreational use at the sites where these studies have occurred. However, even though there are differences in sampling procedures across

studies, in general two types of data are collected in carrying capacity studies, and research has illustrated the value of a mix of methods to collect both types of data. The first type of data is observation of visitation. While such descriptive data can be cost efficient to gather, they may be insufficient for the purposes of a needs assessment, because experience quality is more strongly related to visitor perception of crowding than use density per se (Shelby & Heberlein, 1986; Vaske & Shelby, 2008). Thus, understanding experience quality requires going beyond visitor counts to obtain the second type of data, evaluative assessments, directly from visitors. To be most useful for informing potentially value-laden decisions, needs assessments should gather information on both visitation and visitor experience quality. Establishing the relationship between the two types of data can help managers determine the impact of management decisions – which affect visitor use and distribution – on visitor experiences.

In this document, therefore, we describe techniques for collecting both descriptive observational and evaluative data, focusing in more depth on those we used at Lake Roosevelt. To describe how visitor use can be measured, specific methods are detailed in the following section, along with a rationale for why some methods were considered more optimal than others for use at LARO. We discuss approaches ranging from secondary data that are easily obtained, such as boat registrations and population trends, to more direct use measures, such as vehicle, boat, and visitor counts.

VISITOR USE ESTIMATION TECHNIQUES

Indirect measurement of use via secondary data

Boat registration

Motor vehicle bureaus are occasionally contacted to obtain state- and county-wide boat registrations as a way to document boating use. For example, increasing boating registrations across Michigan State were used as an indicator of increasing use by Progressive Architecture Engineering (2001), and county-wide registration was used as an indicator of use for Kosciusko County, Indiana, which contains Lake Wawasee and Syracuse Lake (JFNew, 2007). While this metric might be helpful in determining an approximate density of boat owners living in proximity to a lake in question, it is problematic to assume that registrations translate directly into a particular use level or even a trend at a particular site; watercraft used locally might be registered in places beyond the local area, and locally registered boats are not necessarily used near home. Moreover, registration alone cannot account for variations in the frequency of use, even if all registered boats are used at a particular site. Also, use of craft such as canoes, kayaks, row boats, or wind surfers will not always be captured by this measure, due to variations in state registration requirements. At best, boat registration seems like a somewhat crude tool to track boating use on the water at any specific site, and it has been acknowledged that this should only be used as a rough guide (JFNew, 2007). Boat registration information in carrying capacity studies is perhaps most useful to indicate broader state-wide trends in recreational boating

(Bricker, 2008; Mahoney & Stynes, 1995). We did not choose to use state boat registrations as a measure of use at LARO since these data are not precise enough for the purposes of determining a specific recreational need.

Local and regional population trends

Increasing human population density is the predominant rationale for justifying lake/reservoir related recreational needs assessments (Bricker, 2008; City of Laguna Hills California, 2009; CSV Consultants, 2007; da Silva, 2002; da Silva et al., 2007; Duke Energy, 2006; Forman, 1994; JFNew, 2007; Manning et al., 2010; Nelson & Steger, 2007; Progressive Architecture Engineering, 2001; Rein, 2006; Research Network Limited, 2007). This justification rests on the assumption that increases in population will be manifested in increased demand for outdoor recreation opportunities. For example, Duke Energy (2006) argued that the combination of population projections and nationwide survey data about outdoor activity participation from the National Survey on Recreation and the Environment¹ (Interagency National Survey Consortium, 2000-2002) were useful indicators of future recreation use. Both types of data are easily and inexpensively obtained. Population trends and their possible impacts to recreation opportunities have been considered at many levels, including the city (Research Network Limited, 2007), county (Nelson & Steger, 2007), nation (Santiago et al., 2008), and world (da Silva et al., 2007).

In our studies at LARO, we chose not to use indirect measures of recreation use, because no such sources with sufficient validity and reliability were available. Moreover, we sought to assess the capacity of specific sites and facilities, which required direct measures of use, as described next.

Direct measurement of use

Direct visitation numbers are more useful than indirect measures in assessing need for public access because they can help establish whether physical and/or facility capacity of a site is being exceeded (Shelby & Heberlein, 1986). Many park and recreation organizations have established guidelines for capacities for different types of sites and facilities. For example, some recommendations for beach area are between 5 and 15 m² per person (de Ruyck et al., 1997); capacity can be established by dividing the available beach area by these numbers. Counting the number of people present at one time provides data that can then be compared to the “standard.”

In observing visitation, different things can be counted, and the choice of which to use may depend on what is the limiting factor for recreational use at a site. For example, at Colville Flats at LARO, when the water levels are down, there is extensive beach available for use, and parking is likely the limiting factor. However, at other water levels, beaches are inundated, and availability of sand for beach activities may be the limiting factor. In the first case, the decision

¹ The National Survey on Recreation and Environment is a telephone survey that has been coordinated by the United States Forest Service since 1960 and that asks a random sample of thousands of Americans about their outdoor activity participation.

might be to count vehicles present, while in the second case one might count the number of people present.

Vehicle counts

Traffic counts at boat ramps and parking areas are commonly made to estimate visitor use at shoreline recreation settings and to assess facility capacity and demand. Vehicle counts are useful to determine lot occupancy and public need for additional parking areas. Some studies use a personal observer to count vehicles at regular intervals (Bricker, 2006; EDAW Inc., 2004; Environmental Resources Management Inc., 2004; Rischbieter, 2004; Santiago et al., 2008), while others have used photos taken at different times (da Silva, 2002). Vehicle counts typically occur during peak season use and occur at specific times and days to permit generalization to specific use periods, as determined by managers.

When making traffic counts using personal observation, it is important that a systematic schedule is followed, even though this can become monotonous for the personnel involved, because reliability can be compromised if data are not consistently recorded. If broad, representative generalizations about visitation are sought, then observations will need to include weekdays, weekends, and holidays. Target sample sizes will require decisions about the necessary level of precision and the desired level of confidence in estimates. However, if the goal is simply to describe peak use to determine whether facilities are at capacity at those times, then observations can be made on as few as a handful of days, so long as the peak days can be confidently identified. For example, at Ririe Reservoir in Idaho, observers counted vehicles for only three weekend days and one holiday weekend day during the high use summer season (EDAW Inc., 2004).

Besides selection of the number of days for sampling, another decision is how long observers should be stationed at each site during each sampling period. Previous studies have varied in this regard. For example, at Deep Creek Lake, a reservoir in Maryland, vehicles and boats at launch ramps were counted for ten-hour periods over the summer high use season on three randomly selected weekdays, six weekend days, and four other holiday weekend days (Environmental Resources Management Inc., 2004). Managers must decide whether they want to describe use at different times of the day (which would require either sampling continuously or counts at different points in time during the day) or just at peak times. They also need to decide whether they want to estimate the total amount of vehicular use across the season, versus only the number of vehicles present at one time. Total use can be estimated by continuous observation or by adjusting the number of vehicles present at one time by the turnover rate.

Some assessments avoid the need for an observer by using an automated vehicle traffic counter (Duke Energy, 2006) to record vehicles passing a stationary point on an hourly, daily, weekly, or monthly basis. Various pros and cons associated with tools used for counting traffic are

highlighted by Yuan et al. (1995). Disadvantages of mechanical counters include the possibility of vandalism and poor performance in some weather conditions (Griffin et al., 2010), the inability of automatic counters to differentiate among repeat visitation (such as when a party passes through a boat launch parking area more than once while searching for available parking), failure to capture some use where entrances are dispersed, and the inability to accurately distinguish recreational use from pass-through traffic. Furthermore, if counts are to be used to estimate visitation in common metrics (such as recreational visitor days), additional information must be gathered on the number of people per vehicle, which requires either personal observation or some form of visitor registration. However, in places where vandalism is low and when functioning properly, automated traffic counters can be operated at a reasonable cost and provide data from all times of day.

Boat counts

Lake/reservoir recreational carrying capacity studies that focus on determining the appropriate number and/or type of watercraft for a particular setting often seek to establish an optimum boating density. This is typically calculated by gathering use data, dividing the number of boats at one time on a body of water by the available lake/reservoir acreage, and then comparing this density figure to established recommendations. Dearlove (2010) provides useful tables of optimal boating densities as suggested by previous authors (Ashton, 1971; EDAW Inc., 2004; Environmental Resources Management Inc., 2004; Florida Department of Environmental Protection, no date; Rischbieter, 2004; Threinen, 1964; Urban Research and Development Corporation, 1977; Wagner, 1991; Warbach et al., 1994; Warren & Rea, 1989). Recommended densities vary depending on the type of watercraft used, horsepower of the craft, or primary activity while using the watercraft.

To inform management directives related to boating capacity, estimates of boating use at lakes and reservoirs are often validated by comparing several measures, including aerial fly-overs, counts from on the water, or counts by a shoreline observer. These frequently distinguish between boats on the water and those moored at the time of the observation (JFNew, 2007; Progressive Architecture Engineering, 2001). Aerial fly-overs use a photograph taken at one moment in time during the flight (da Silva, 2002; Duke Energy, 2006, no date; Rischbieter, 2004), or an observer counts watercraft during the flight (Environmental Resources Management Inc., 2004; JFNew, 2007; Rischbieter, 2004).

The aerial fly-over technique is helpful to capture use over large or complex water bodies that would otherwise be difficult or impossible to observe. Considering the ease of identifying a boat against a backdrop of water and the ability to quickly document use, this approach can be an important tool. However, smaller units of observation such as the number of visitors may be more difficult to observe due to landscape arrangements that may shade visitors from view and prohibit accurate counts. Additionally, aerial photos are so expensive that they generally cannot

be used to obtain representative data for an entire season, but are best used to document peak use.

Visitor counts

Recreational visitor use is often measured by counting the number of individuals present at a recreation site; as Manning (2011) points out, visitor counts were among the earliest and most simple use measurements implemented in agency managed recreation areas. However, at unstaffed recreation settings or those without a mechanism to record visitation, such as fee receipts, it can be costly to commit a staff person to record visitation for long, continuous periods of time, such as was done in the needs assessment study at Deep Creek Lake, where observers were present for 10-hour periods (Environmental Resources Management Inc., 2004). As with vehicle counts by observers, sampling a representative subset of the visitation period is most common, and use is documented at specific intervals, often at one moment in time. The resulting metric is referred to as people at one time (PAOT). If one wishes to make a general statement about the average use at a recreation site, it is important to systematically record PAOT during a random sample of weekdays, weekends, and holidays, such as done by EDAW Inc. (2004), Manning and Budruk (2006), and Santiago et al. (2008). However, if the goal is to understand maximum use density, sampling can purposively focus on high-use days and times, assuming, of course, that managers are confident when those times occur. Based on observations at 46 southern California beaches, King and McGregor (2012) argue that – if counts can be made only once per day – they should occur at mid-day.

A wide range of sampling intensities has been reported in the literature. For example, Diedrich et al. (2011) collected observations on one weekend day and one weekday per week throughout the summer season, which resulted in 20 total days of data. Courtney (2007) sampled on 16 days, and only from Friday through Sunday, to evaluate beach recreation at Honolulu Bay, Hawai'i. On the other hand, De Ruyck et al. (1997) only gathered data on the two most popular days of the year at three South African beaches. Likewise, in their study of a beach in Portugal, Ribeiro et al. (2011) counted PAOT every two hours across four days in August. Thus, sampling details are a local decision.

There are several important considerations in using observers to count visitors. First, staff need to be trained in details such as how to move through the site, whether to take separate counts in different parts of a site, and what other data should be recorded (e.g., types of activities or the presence of children). Where use is very high, it can be difficult for observers to maintain accurate running counts in their heads, and “clickers” can help assure more accurate data. Despite these challenges, and the costs for personnel to travel to each site and collect data, personal observation has many advantages: it permits documentation of activities and visitor characteristics, observers can count boats and vehicles at the same time, and depreciative behavior can be documented.

Since personal observers are often costly and the repetitive nature of the work can be tedious, traffic counters are used extensively as a proxy for estimating the number of recreational visitors across National Park Service sites and other recreation settings. Vehicle traffic counts obtained from mechanical counters are then multiplied by a Persons-Per-Vehicle (PPV) multiplier to account for the number of persons in each vehicle. When reviewing specific park unit reports, it seems that there is wide variation as to how recently the PPV multiplier has been updated, with some parks using PPV multipliers that were put in place 20 or more years ago (although the LARO PPV multiplier was updated in 2009). Considering the demographic changes occurring during that time in the United States, using vehicle traffic counts and PPV to measure of visitation seems best used as a general tool, and for more precise estimates in complex settings, or to estimate PPV multipliers, personal observers are needed.

Another common tool for counting visitors is the pedestrian traffic counter. These counters work well for trails or other locations where all visitors must pass a single point. Technology has improved markedly in recent years, so unit costs have come down, counts are more reliable than in the past, and there are fewer equipment failures. However, units need to be calibrated, and, if within-site travel patterns are complex, intensive observational efforts may be needed to determine coefficients for turning count data into accurate estimates of visitation. The dispersed nature of access to individual LARO sites and the complex nature of use within the sites led to the decision not to use pedestrian traffic counters during baseline data collection at LARO, although such tools may be very helpful in the future.

To develop a baseline for understanding visitor use in the Kettle Falls area of LARO, in 2010, visitors were counted by personal observation according to a predetermined schedule. Visitor counts occurred twice per day (15-minute interval each time) during a randomly selected nine-day period for each month of the summer high use season, from May through August (see Appendix A for an example of the schedule). This allowed for observations to commence on a Saturday of one weekend and continued through Sunday of the following weekend. At shoreline recreation sites, it is not unreasonable to expect fluctuations in visitor use due to seasonal and daily weather patterns (Environmental Resources Management Inc., 2004). Therefore, this approach of visiting each location for only short periods of time, but many times over a nine-day period, allowed a reasonable use of staff time to gather a large amount of visitor use data.

In our baseline study, University of Idaho staff visited 16 recreation sites in the Kettle Falls area 72 times for 15 minutes each during the summer of 2010 (Hall & Bentley, 2011). At each location, counts of vehicles, boats, and people were recorded. While obtaining this level of detail required considerable time and resources, we deemed it necessary due to the lack of any previous use data and the need to capture use that was thought to be spatially and temporally variable. This sampling allowed us to estimate mean weekday vs. weekend use, identify peak hours of use,

and understand the relationship between use and other variables, such as weather. Personal observers were used rather than automated counters due to the characteristics of recreation sites observed. For example, some sites – like Kettle Falls Marina— have multiple access points, and some sites have complex patterns of vehicles coming and going multiple times. Additionally, we desired to collect other data, such as the number of boat trailers and the number of people present at one time in different use areas of each site. Personal observation also allowed us to document problematic vehicle parking patterns when designated areas became full, such as during high use times at Kettle Falls Marina.

For the needs assessment study at LARO, it was presumed that the total water surface area was not a limiting factor for recreational use, so counts of boats on the water were not made during the 2010 visitor use observations. However, since moored boats might limit visitor access to lakeshore, watercraft moored at lakeshore recreation sites were recorded at the same times as traffic counts were made.

It is tempting to assume a direct correlation between increasing population, demand for opportunities, and need for recreation infrastructure. The actual relationship is less clear. For instance, even where population increases correspond to increased visitation, it is often found that satisfaction is independent of trends in use levels (Manning, 2011; Shelby & Heberlein, 1986; Vaske & Shelby, 2008). Therefore, recreational planning efforts pertaining to long-range demand forecasts should also address the public acceptability of current and possible future use conditions and management actions. Techniques for monitoring public opinion regarding these topics are discussed further in the next section.

PERCEPTIONS OF VISITOR EXPERIENCE

Efforts to determine visitor numbers at recreation sites have used many creative approaches to collect the types of data described above. However, counts of visitors or vehicles do not necessarily inform managers about the quality of the visitor experience, because visitors' perceptions of problems, crowding, and conflict vary based on many factors, only one of which is use density. Since visitors differ in the levels use they consider acceptable, a mandate to provide high quality recreation experiences has led many researchers to explore variables related to visitor satisfaction and crowding (Manning, 2011; National Park Service, 2009; Shelby & Heberlein, 1986; Vaske & Shelby, 2008). Coupled with use counts, assessments of visitor experience help equip managers to understand and provide the conditions necessary for quality recreation experiences.

Social research methods can collect two types of information from visitors: (1) in-depth qualitative data that provide rich understandings of experiences; and (2) broader, more representative quantitative data that can be used to generalize to a study population and compare managerially important sub-groups of users. We discuss each of these in turn.

Techniques to collect qualitative data

Qualitative data are often gathered from recreation visitors and other constituents, particularly in exploratory investigations where specific issues of concern are unknown. Techniques range from in-person or telephone interviews with individual participants to focus groups with multiple participants (Bricker, 2008; City of Laguna Hills California, 2009; CSV Consultants, 2007; Environmental Resources Management Inc., 2004; Forman, 1994; Roca et al., 2008).

Focus groups

Focus groups used in resource management involve a structured group interview where individuals known for their particular recreation behaviors or knowledge are invited to discuss management settings and related issues. Common in marketing research, focus group sessions can quickly produce data by placing individuals in groups arranged by common interests. These groups generally use an outside facilitator who leads the meeting through problem solving and prioritization activities to foster creativity and/or seek consensus. The back and forth that occurs between a moderator and group members is a pivotal component of focus groups that helps spur more spontaneous thought than what might otherwise be possible with other data collection formats (Berg, 2004). For example, Bell et al. (2011) used three focus groups (with commercial tour operators, community and environmental groups, and agency representatives) to identify conditions of concern and primary measures for use in subsequent survey-based studies.

Our review of needs assessments related to shoreline recreation found that focus groups were not commonly used to document perceptions of visitor use. They were, however, occasionally used as a tool to help develop management strategies to deal with crowding and conflict. For example, five focus groups were formed to recommend strategies for managing and improving recreational visitor conflict at ocean beach sites on four islands of Hawai'i (CSV Consultants, 2007). Participants included a wide range of interests, from agency officials, private land developers, and commercial recreation providers, to the concerned public. Elsewhere, stakeholders and departmental staff members were organized into small groups as part of a recreation facilities needs assessment for Laguna Hills, California (City of Laguna Hills, 2009). These focus groups allowed quick identification of key issues of importance to group members such as quality and maintenance of recreational facilities.

While focus groups can quickly obtain data to identify key points for future research, productivity might be derailed if there is not an explicit agenda or objective, the moderator is not prepared for comments that might be tangential, or if the environment is not emotionally safe for participants to share openly (Berg, 2004). Moreover, focus groups are not appropriate where fully representative data are needed.

The University of Idaho did not use focus groups as a data collection method at LARO because key topics of visitor concern had been previously established during public scoping sessions for the development of the recent Shoreline Management Plan/Environmental Assessment, and representative data were needed (National Park Service, 2009).

Interviews

The term “interview” in recreational needs assessments and related studies is sometimes used loosely to describe virtually any interaction occurring between the public and a researcher, including where a written questionnaire is read verbatim to a visitor on-site, as done in the case of recreational riverbank users at two rivers in Puerto Rico (Santiago et al., 2008) and visitors at Lake Mead National Recreation Area (Forman, 1994). In these instances, participants were asked to answer questions where the response format and answer choices were pre-defined by the researcher (sometimes referred to as close-ended or forced-choice questions). We consider this form of data collection to be a structured survey, not an interview.

Few recreational needs assessments that we reviewed used qualitative interview questions that were open-ended, that is, where researchers solicit verbal responses and participants choose the content of their response regarding their personal opinions, perceptions, and reactions to the condition of recreation facilities and services. Interviews are time intensive for both the participant and the researcher, so it might be more reasonable to restrict the use of interviews to supplement or verify the findings of other techniques in a needs assessment. While selecting participants to complete a structured questionnaire often involves an attempt to sample a population of visitors broadly, choosing interview participants is done purposively to highlight or draw out the opinion of particularly information-rich cases (Patton, 2002). For example, along with collecting 590 written questionnaires from beach visitors, 40 interviews with local community members were used to further describe satisfaction with beaches at six locations (Roca et al., 2008).

One advantage of collecting data with such open-ended questions in interviews is that participants are not bound to use only the researcher’s language as with structured questionnaires, and responses are preserved in the participant’s own words. Interviews are often recorded using digital technology and then later transcribed to written format. Transcripts are then analyzed by searching for and organizing the text according to major themes and subthemes, and then organizing this information in hierarchies to express how participants describe and evaluate their recreation experience or management conditions (Ryan & Bernard, 2003).

Because of the use of purposeful (non-random) sampling techniques in interviews, the data are considered highly contextually bound, and often a participant’s own phrasing is used to summarize important themes. While this technique provides rich detail about a phenomenon, in

our studies at LARO we wished to draw broad conclusions about visitors to support management recommendations that could apply across the Kettle Falls area of LARO. Consequently, we chose not to use interviews as a data collection tool.

Techniques to collect quantitative data: Structured surveys

When remarking about managing recreational carrying capacity, various authorities have noted that questionnaires are important tools for generating data to shape decisions (Doshi, 2006; Manning, 2011). Structured surveys can obtain consistent data from representative samples of visitors. The two primary approaches are mail (or mail/internet hybrids) and on-site surveys distributed by research staff. The needs analyses, research studies, and other management documents consulted for this report indicate a preference for on-site, written questionnaires to document visitor perception of crowding and satisfaction (Bricker, 2008; Duke Energy, 2006; EDAW Inc., 2004; Manning & Budruk, 2006; Manning et al., 2010; Rischbieter, 2004; Roca et al., 2008; Santiago et al., 2008; Tetra Tech Inc., 2001). Mail surveys were used in a few instances (Duke Energy, 2006; EDAW Inc., 2004; Forman, 1994; Tetra Tech Inc., 2001). We found no internet based surveys used in the materials we reviewed, but this is not surprising considering the nature of recreational settings, where access to electronic equipment and the internet may be limited.

Mail surveys

Mail (or internet) surveys obviously require having contact information from visitors. If such information is available from secondary sources, such as fee receipts or permits, mail surveys can be more cost effective than on-site surveys, because they don't require staff time to obtain addresses. However, at most recreation sites, visitor contact information is not available, so data collection expenses will include both personnel time and postage. Despite this disadvantage, mail surveys can be useful to help capture the views of visitors or other important stakeholders who might otherwise go unsampled. They can be used in addition to an on-site survey, or when a longer questionnaire instrument might not be acceptable on-site.

Although it was not always clear in the studies we reviewed how participants were selected for a mail survey, study participants are often easily identifiable individuals such as visitors, key stakeholders, resource managers, marina operators, or local residents (Duke Energy, 2006). For the non-visitor public, mailing lists might be secured from available public data such as property ownership records, purchased from private research firms, or obtained from stakeholder groups. For example, a local foundation maintains a list of lakeshore property owners, nearby businesses, and other constituents near Wawasee and Syracuse Lakes, Indiana. These individuals were sent a mail survey as part of a recreational carrying capacity study concerning perceptions of crowding, visitor services, and facilities (JFNew, 2007). Elsewhere, local tax records were used to identify all residents living within one mile of Greers Ferry Lake, Arkansas (Tetra Tech Inc., 2001). From this list, a questionnaire was distributed via mail to randomly selected local residents and

also selected slip renters at three marinas. A follow-up post card was sent as a reminder about the survey in hopes of increasing participation (Tetra Tech Inc., 2001). When lists are not available, survey participants in recreational needs assessments are sometimes identified on-site and then asked to complete a questionnaire that they complete and mail back at their leisure (Bricker, 2006; Forman, 1994). This variation allows researchers to keep the initial public burden on visitors quite low, as visitors only need to listen to an appeal to accept the survey, then complete it and mail it back at another time.

A major limitation to mail surveys is the low response rate, resulting in additional expenditures needed to obtain the target number of completed surveys. Even when following recommended best practices, which involve an initial survey, a postcard reminder, and a follow-up survey to non-respondents, recent mail surveys of visitors to recreation sites have obtained low response rates. For example, Oh et al. (2010) obtained a 46% response rate from tourists contacted at South Carolina beaches and 28% among a random sample of residents from those counties contacted via mail.

Another limitation is the likelihood of non-response bias. For example, respondents tend to be more engaged and interested in the issues than non-respondents. Therefore, when response rates are low (e.g., below 75%), it is important to conduct non-response checks, to determine whether and what type of systematic differences might exist between study participants and people who refused to complete the survey.

Mail surveys were not used at LARO because contact information for visitors to the Kettle Falls area of the reservoir was not available. Furthermore, certain questions asked about visitor perceptions of conditions at the specific site where the questionnaire was distributed. If visitors had completed a mail survey later, as opposed to while they were at the actual site in question, they may have had difficulty differentiating between conditions at various sites, and their recall could have been faulty, jeopardizing the validity of the data.

On-site questionnaires

Written questionnaires are often administered on-site and require that staff approach visitors to solicit survey participation. This method captures visitor experience most closely to its occurrence and when it is most cognitively accessible to the participant. It also results in higher response rates than mail surveys. For example, Needham et al. (2008) obtained an 85% response rate among visitors contacted at Kailua Beach Park, while 97% of Great Barrier Reef visitors approached on tour boats by Shafer and Inglis (2000) completed questionnaires.

Since it is nearly impossible and not cost efficient to survey every visitor to recreation areas, a representative subset or sample of the visitor population is usually surveyed. To ensure the representativeness of the sample – that is, no one group is over- or under-sampled – procedures

are used to select participants so that each visitor present during survey distribution has an equal chance of being selected. The importance of obtaining a representative sample should be taken seriously, as it provides the basis for making broad statements about visitor profiles, opinions, and perceptions of park experiences that will ultimately inform management decisions. Given the capital, personnel, and time required to obtain sufficiently large, representative samples, cost can be a limitation of on-site surveys, especially at low-use or dispersed sites.

At recreation sites it is generally not possible to obtain a sample frame (a list of all visitors), so researchers typically randomize the days and times of survey distribution, and then randomly select participants from among those present during each sampling session. For example, Diedrich et al. (2011) surveyed visitors at a coastal area in Spain on one weekday and one weekend day each week, for a total of 20 days. They computed a minimum target sample size per day, and approached every n^{th} boat until they achieved the daily target.

If a research goal is to ensure adequately large samples to profile managerially important subgroups or places, an extension of the simple random sample is to use stratified random sampling, wherein random samples are selected from within each predetermined stratum. Lankford et al. (2005) adopted this approach at Hanauma Bay, Hawaii, sampling on 40 randomly chosen days within randomly selected months. In a more complex design, Shafer and Inglis (2000) surveyed passengers on vessels transporting visitors to the Great Barrier Reef on 111 days, across 18 months, stratified by season, time of week, and tide. Additionally, they used a different sampling interval for large versus small vessels.

Several decisions must be made about selecting participants during a sampling session. At most sites, particularly high use sites, it is inefficient and unnecessary to invite all visitors to participate in the survey. Instead, it is common to establish a target sample size, estimate likely response rates, decide how many days will be sampled, and estimate the number of eligible people likely to be present on the typical day. These figures can be used to establish a sampling interval. For instance, consider the case where one desires to obtain 200 completed surveys and one estimates that the response rate will be 80%. This means that 250 people must be approached ($200/0.8 = 250$). Further, assume that in this case the desire is to survey on 20 days (randomly selected from the summer months), to capture the range of visitation that occurs. This generates a target of approximately 12 visitors to be approached each day ($250/20 = 12.5$). If the site is estimated to have 100 eligible visitors present, on average, during a sample period, then every eighth visitor should be approached ($100/12.5 = 8$). (Note that it is important to consider the criteria for eligibility; for instance, in many studies, only visitors 18 years of age and older are included.)

Another important choice is whether to sample individuals from within each visiting party or to treat all visitors equally. Some studies (e.g., Needham et al., 2011) invite one visitor per party to

participate in the study. This approach can be justified if one believes that all group members are similar in their views, and it can be more practical to implement than asking several group members to complete surveys. However, it has the drawback that the views of people in small groups will be over-represented compared to views of people in large groups; in other words, simple aggregate findings based on sampling one person per group will not be representative of all visitors, unless a process of weighting for group size is implemented. Therefore, it is usually more defensible to adopt a consistent sampling interval, ignoring group boundaries. In our example above, where we specified an interval of eight, this would mean that, in a group of 16, two people would be surveyed, whereas – if all groups had only two members – only one person would be surveyed from every four groups encountered.

Since it may be difficult to obtain visitor compliance for time consuming surveys, on-site questionnaires are relatively short (a few minutes) compared to methods such as focus groups or personal interviews. Question items relate to a variety of topic areas, but due to the imposition on visitors' time during their visit and attrition from survey fatigue, it is advisable to restrict questions to the most pressing issues or those that are mandated. At sites where use levels are sufficiently high, it is possible to divide questions among different survey versions, to reduce the burden on individual respondents (Needham et al., 2011). The Social Science Division of the National Park Service provides a list of common topics and specific question items for use in park visitor studies that cover background information about respondents, trip planning activities, trip behaviors, preferences/motives/attitudes, crowding and visitor experiences, and evaluations of services, facilities, and management (National Park Service, Social Science Division, 2006).

In studies seeking to assess visitor experience, some items are commonly used to help understand use conditions where crowding (a negative evaluation of use density) is considered a detraction from the recreation experience (Shelby & Heberlein, 1986; Vaske & Shelby, 2008). When used in concert with items about site conditions such as access to shoreline, wait times at launch ramps, inappropriate behavior by other visitors, and satisfaction with these and other conditions, crowding can be used as one indicator for public recreation need. The 9-point scale developed by Heberlein and Vaske (1977) has gained widespread acceptance. According to Manning (2011), it has been used in nearly 200 recreation research studies, from highly developed recreation sites, to wildlife management units, remote wilderness settings, and – as is pertinent to this document – shoreline recreation sites. For example, as one part of a recreational visitor capacity study at Ririe Reservoir in southern Idaho, on-site questionnaires were used to ascertain crowding perceptions (using the 9-point scale), attitudes about management issues, visitor conflicts, and other baseline data (EDAW Inc., 2004).

Other versions of crowding questions have also been used. A three-point scale (-1 = overcrowded; +1 = the beach can accommodate more use) was used in an on-site questionnaire

by da Silva (2002) to survey visitors to five coastal beaches within a natural park area along the coast of southern Portugal. In a study at Deep Creek Lake, Maryland (Environmental Resources Management Inc., 2004), shoreline visitors were given written questionnaires where perception of crowding was measured using a 5-point scale (crowded to not crowded); visitors were also asked to state how many people were on the lake that day and to evaluate this number (too many, just right, or too few). This additional information is critical if managers are to be able to link visitors' subjective experiences (crowding) to conditions that are under managerial control (use levels).

According to Manning (2011), another technique that is gaining prominence is the use of normative frameworks for determining the acceptability of various crowding levels. Originally, these approaches asked visitors to state what number of encounters or people present was "acceptable." However, subsequent research has found that this type of questioning can be challenging at high use sites, and the anchors used on response scales can impact visitors' opinions (Hall & Roggenbuck, 2002). Therefore, Manning and his colleagues pioneered a refined approach that uses visual images. Researchers ask study participants to indicate how (un)acceptable they find various levels of use as depicted in a sequence of photographs of a recreation site that have been digitally manipulated to show increasing numbers of visitors from one photograph to the next (Manning et al., 1996, 1999; Needham et al., 2011). The first photograph typically depicts no or very few visitors, and the last photograph generally shows a very large number of visitors that one might expect on the busiest day of the year; thus, the full range of conditions is captured. Participants are sometimes asked to choose the photograph that depicts the number of people that would be so unacceptable that they would no longer visit, so managers might be provided with a gauge of what visitors consider to be the outer limits of acceptable use. Beyond its cognitive advantage, another benefit of this visual technique is it allows researchers to ask visitors for their reactions to a range of use levels independent of the actual level of use on the survey day. An example of this approach is presented by Manning et al. (2010); in addition to asking about the acceptability of use conditions, researchers asked visitors to Lake Umbagog National Wildlife Refuge in New Hampshire and Maine to indicate which photograph depicted the amount of use they actually experienced during their visit. Besides determining the acceptability of the numbers of visitors present, this technique has been extended to depict and determine the acceptability of varying degrees of litter, trail impacts, campsite impacts, and graffiti at recreation sites (Manning & Budruk, 2006).

Because different types of management strategies can be adopted to resolve various problems, and visitors may express divergent views about the different actions, it may be important to elicit visitor reactions to potential management actions via surveys. Possibilities include actions that indirectly or directly affect the carrying capacity of a recreation site – such as increasing or decreasing the number or size of parking areas – implementing use limits, decreasing/increasing

services, or providing alternative recreation sites for visitors. For such items, it is recommended to use a 5-point or 7-point scale, with a “neutral” or “don’t know” option.

At LARO, the University of Idaho distributed on-site questionnaires to more than 600 randomly selected participants at eight sites during the summer of 2011. Selection of participants was based on an interval that considered the average number of visitors at each chosen recreation site (using PAOT counts made by the University of Idaho in 2010), so that an adequate number of visitors at each site would be contacted to reach the sample size needed for certain statistical procedures and to compare across recreation sites. For example, at the high use site, Bradbury Beach, an interval of every 3rd adult was adopted to select participants for the survey. The times and days of data collection were also randomly selected, with representation of both weekdays and weekend days, to account for the extreme variation in weekday/weekend use as noted from our 2010 observations. Hall and Bentley (2011) describe these methods in detail.

CONCLUSIONS ABOUT DATA COLLECTION METHODS

We have described various methods to assess visitor experience quality at shoreline recreation settings. This information, along with estimates of visitor use, can inform determinations of public need for recreation by identifying instances where visitor experience is judged to be negatively impacted by factors under managerial control. If visitors indicate low levels of satisfaction due to crowding or other conditions, this is a signal that recreational need may be unmet. When negative reactions are correlated with visitation levels, reports of substantial problems at recreation sites, or other concerns, this may justify management action to improve conditions. These types of assessments can be both broad in terms of the the number of recreation sites included and extensive in level of detail provided about each site, such as Bricker’s (2008) analysis of recreational need near Wells Dam on the Columbia River in north central Washington State. Typically reports provide an overall description of visitor satisfaction with experience quality and then provide further detail about responses to specific shoreline recreation site conditions. Then management recommendations are made that consider agency mandates and the observed recreation experience as described through questionnaire data, written and other visitor comments, and researcher observation of the study site.

The approach taken by EDAW Inc. at Ririe Reservoir provides one example of how such data are used. EDAW compared the results of a 2003 capacity study with the goals and objectives identified in the Ririe Reservoir Resource Management Plan (United States Bureau of Reclamation, 2001). Specific objectives associated with management goals were listed, along with researcher comments about how each objective might best be met, based on the needs assessment findings (EDAW Inc., 2004, pp. 53-67). For example, one management objective at Ririe Reservoir was to design and construct additional parking and day use facilities as needed; based on visitor use estimates and responses about experience quality, EDAW Inc. listed specific sites in need of more parking.

To obtain unbiased data for determining public need, implementing the various tools described above requires thoughtful consideration about the specific characteristics of the recreation site(s) in question. Several additional guidelines to consider are presented in the next section.

IMPLEMENTING TOOLS TO ASSESS PUBLIC NEED

An important conclusion from this synthesis is that many tools exist to assess public recreational need and they work well across a wide variety of shoreline recreation environments. When implementing these measures, caution should be exercised to develop a proper sampling plan, choose appropriate assessment tools, provide the oversight needed for a quality data collection effort, and ensure appropriate data analysis and understanding of the implications of the data. While concerns related to these points have been mentioned previously, we offer here a general overview of important considerations for implementing needs assessments. This discussion would be remiss if it did not highlight the publication by Yuan et al. (1995), *Techniques and equipment for gathering visitor use data on recreation sites*. This document is written for the manager rather than the researcher and is easy to read, with little academic jargon. While Yuan et al.'s document does not necessarily substitute for working with social science researchers, familiarity with the terms covered will help the manager to better understand the research process, whether working with social scientists or not. Yuan et al. begin by discussing the development of a proper sampling plan that should include the following steps:

- Determine the objectives of data collection (i.e., why collect data in the first place?) and decide what data will be the most helpful for planning or management purposes.
- If gathering data from visitors, determine early on if study approval will be needed from the White House Office of Management and Budget². If so, work through the appropriate agency staff, and begin the approval process 18 months prior to the time of data collection.
- Identify recreation sites where data will and will not be collected, and justify these decisions in writing.
- Define the first, second, and third (and so forth) most important priorities, since not every question can be studied each year.

² The White House Office of Management and Budget oversees approval to conduct research on visitors to federal lands, when the research involves the expenditure of federal funds, and is responsible for limiting associated burden of participation incurred by the public.

- Decide on the sample frame, or the population from which cases for study will be drawn. (For example, will only visitors to dispersed sites be surveyed, or will selection include every possible visitor to the shoreline?).
- Decide how individuals will be chosen for participation in surveys. (Will they be chosen randomly or purposively?). How will you handle refusals?
- Compute the number of observations or surveys needed for later statistical analysis.
- Using knowledge of use levels, decide the number of days needed to collect the required number of observations or cases. Then determine the sampling interval. (Will everyone be sampled, or only every nth visitor?)
- Early on, identify the skills and available time of current staff to analyze the results of a needs analysis, or identify players who can assist with the process (e.g., academic social scientists or private research firms).

It is a major initial accomplishment to determine why a needs analysis is justified, how it will be funded, where it will take place, on whom it will focus, the appropriate temporal and spatial extent, how many responses are needed, and how participants will be selected. A carefully crafted statement that incorporates the rationale for a needs analysis and its specific objectives will help drive the choice of tools for measuring use and experience quality, as more complex management issues will require more detailed and robust assessments. Several useful decision trees to guide one through the process of determining appropriate assessment tools are provided by Yuan et al. (1995). In addition to the issues listed above, further questions related to choosing appropriate tools include:

- Are there documents or data already available that can be used within a public need assessment (e.g., fee receipts, permit systems, campground host records, or use reports from other agencies)?
- What are the site characteristics and how do these impact the ability to document use and/or survey visitors? (For example, is it developed or dispersed, restricted or multiple access, and how do visitors access the site?)
- Different techniques for measuring use and collecting data require different procedures. How much time and resources are available for training staff to administer these tools?
- What level of funding is available to support the initial and ongoing costs of particular methods, staff training, and related analysis?

- Will visitors be directly or unobtrusively observed? If visitors are directly approached to provide input, what type of visitor burden (length of interaction) is appropriate to the management setting?

The day-to-day tasks of implementing a visitor capacity study present their own unique set of challenges that may require patience and tenacity to overcome. Based on our data collection efforts at LARO in 2010 and 2011, we have assembled questions that will be useful to consider when planning for future studies both at LARO and elsewhere:

- Is special equipment required to access recreation sites, and if so, what provisions or alternatives are available? For example, some recreation sites at LARO are more easily accessed by boat than by road, and this affected sampling decisions.
- In the event that scheduled data collection events do not occur (due to inclement weather, high refusal rates, field assistant illness, equipment malfunction, or other reasons), how will additional observations be collected? It might be advisable to build in extra sampling days and have a process in place for replacement of sampling days that are missed.
- What staff safety concerns have been identified (e.g., irate visitors, wildlife encounters, or inclement weather) and have staff been briefed on appropriate emergency procedures?
- How familiar is staff with data collection procedures? Consider practicing with tools at the study sites in advance of the actual study, so particular site characteristics are understood prior to study implementation.
- Incorporate regular breaks in the daily and weekly data collection process to prevent staff burn out. If services (laundry, groceries) are not available near the field site, consider the time needed for staff to take care of personal needs during regular business hours.

Finally, once data have been collected it will be necessary to convert data into a format useful for agency decision making. This is the process of cleaning, analyzing and presenting data to highlight key findings and draw broader conclusions. Data will need to be in electronic format to use statistical software and write study summaries. Important guidelines for analyzing data include:

- Determine how field observations in raw, handwritten format will be entered into spreadsheets. For example, what rules will data entry specialists follow when respondents leave a questionnaire item blank or circle more than one response to a single-choice item?

- Decide if data entry will occur simultaneously with data collection, or afterward. Entering and/or analyzing data concurrently with collection may help identify editing mistakes in written questionnaire items that can be changed.
- As written observations are converted to electronic form, do not assume they were correctly transcribed. Regularly check a sample of the written surveys against their analogous electronic entries. Be sure to use easily interpretable names for variables, and meaningful codes for responses; document these decisions on a master codebook.
- Completed surveys have been lost and computers have crashed. Determine how data protection will be ensured as data are moved from written observations to electronic form, and then create back-up electronic copies.
- Document all decisions made and attach this documentation to the dataset (e.g., in a separate worksheet).

Recreational needs assessments are much more than just simple visitor studies. While the considerations and guidelines we have presented are far from exhaustive, it should be clear that much time and effort is required to identify the need for, plan, implement, and analyze the results of these studies. Because the findings of these decisions may ultimately impact visitors through management decisions, care should be taken at each step of the needs assessment process, from the choice of recreation sites studied and tools used to make observations, to the detail and breadth of recommendations made.

CONCLUSION

The recreational needs assessments for public lakeshore or shoreline recreation sites reviewed in this summary have often been part of a process of updating agency general management plans, Federal Energy Commission Relicensing processes, or responses to calls from nonprofit groups or community groups. Many of these assessments either explicitly state or indirectly imply that increasing local and regional populations pose a concern regarding recreational experience quality, due to increased demand. These assessments, therefore, are aimed at providing managers and others the relevant background information needed to make decisions related to optimizing visitor capacity. Due to the many differences between public recreation settings, there is no one correct recipe for determining public need.

While varying methods are used from assessment to assessment, the best, most defensible studies use a systematic, well documented process to collect credible information for estimating visitor use and describing experience quality at recreation settings. Measurements tend to fall into one of two types: observation-based estimates of visitor use or assessments of visitor experience quality obtained via interacting with visitors. The most extensive and useful studies incorporate

both. Measures used to estimate visitor use include counts of boats on the water at one time for determining an optimum boating capacity; PAOT at shore, launch ramps, day use areas, beaches or campgrounds for determining social capacity; and vehicles present at one time in parking areas or at boat ramps for determining facility capacity. These methods are unobtrusive to visitors and typically quick to administer. Measures for evaluating visitor experience quality include on-site or mail survey questionnaires, interviews, and/or focus groups. Employing these techniques might require a high degree of capital and personnel, depending on the extent of the study and size of the recreation area, and there is no one-size-fits-all approach. Assessing experience quality places the most demand on visitor time, but this information is highly useful for understanding visitor experience in a way that simply counting watercraft or visitors alone is not.

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Appendix A: Example of Observational Data Collection Schedule

Randomized Start Observation Schedule (w/o replacement)- Aug 14-22, 2010									
TIME	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
830	Colville Flats	Harters	Lion's Is	Break	Swim Beach	return drive	Mrcs/Ping	Barryman's	Evans
845	Ricky Point	Kettle Marina	Swim Beach	Break	Colville River	return drive	Leos/TP	Bradbury	Mrcs/Ping
900	Barryman's	Kettle Marina	Colville River	Lion's Is	Colville Flats	return drive	Harters	Bradbury	Leos/TP
915	Bradbury	Break	Colville Flats	Swim Beach	Ricky Point	Evans	Kettle Marina	return drive	Harters
930	Bradbury	Break	Ricky Point	Colville River	Barryman's	Mrcs/Ping	Kettle Marina	return drive	Kettle Marina
945	return drive	Lion's Is	Barryman's	Colville Flats	Bradbury	Leos/TP	Break	return drive	Kettle Marina
1000	return drive	Swim Beach	Bradbury	Ricky Point	Bradbury	Harters	Break	Evans	Break
1015	return drive	Colville River	Bradbury	Barryman's	return drive	Kettle Marina	Lion's Is	Mrcs/Ping	Break
1030	Evans	Colville Flats	return drive	Bradbury	return drive	Kettle Marina	Swim Beach	Leos/TP	Lion's Is
1045	Mrcs/Ping	Ricky Point	return drive	Bradbury	return drive	Break	Colville River	Harters	Swim Beach
1100	Leos/TP	Barryman's	return drive	return drive	Evans	Break	Colville Flats	Kettle Marina	Colville River
1115	Harters	Bradbury	Evans	return drive	Mrcs/Ping	Lion's Is	Ricky Point	Kettle Marina	Colville Flats
1130	Kettle Marina	Bradbury	Mrcs/Ping	return drive	Leos/TP	Swim Beach	Barryman's	Break	Ricky Point
1145	Kettle Marina	return drive	Leos/TP	Evans	Harters	Colville River	Bradbury	Break	Barryman's
1200	Break	return drive	Harters	Mrcs/Ping	Kettle Marina	Colville Flats	Bradbury	Lion's Is	Bradbury
1215	Break	return drive	Kettle Marina	Leos/TP	Kettle Marina	Ricky Point	return drive	Swim Beach	Bradbury
1230	Lion's Is	Evans	Kettle Marina	Harters	Break	Barryman's	return drive	Colville River	return drive
1245	Swim Beach	Mrcs/Ping	Break	Kettle Marina	Break	Bradbury	return drive	Colville Flats	return drive
100	Colville River	Leos/TP	Break	Kettle Marina	Lion's Is	Bradbury	Evans	Ricky Point	return drive
115	Colville Flats	Harters	Lion's Is	Break	Swim Beach	return drive	Mrcs/Ping	Barryman's	Evans
130	Ricky Point	Kettle Marina	Swim Beach	Break	Colville River	return drive	Leos/TP	Bradbury	Mrcs/Ping
145	Barryman's	Kettle Marina	Colville River	Lion's Is	Colville Flats	return drive	Harters	Bradbury	Leos/TP
200	Bradbury	Break	Colville Flats	Swim Beach	Ricky Point	Evans	Kettle Marina	return drive	Harters
215	Bradbury	Break	Ricky Point	Colville River	Barryman's	Mrcs/Ping	Kettle Marina	return drive	Kettle Marina
230	return drive	Lion's Is	Barryman's	Colville Flats	Bradbury	Leos/TP	Break	return drive	Kettle Marina
245	return drive	Swim Beach	Bradbury	Ricky Point	Bradbury	Harters	Break	Evans	Break
300	return drive	Colville River	Bradbury	Barryman's	return drive	Kettle Marina	Lion's Is	Mrcs/Ping	Break
315	Evans	Colville Flats	return drive	Bradbury	return drive	Kettle Marina	Swim Beach	Leos/TP	Lion's Is
330	Mrcs/Ping	Ricky Point	return drive	Bradbury	return drive	Break	Colville River	Harters	Swim Beach
345	Leos/TP	Barryman's	return drive	return drive	Evans	Break	Colville Flats	Kettle Marina	Colville River
400	Harters	Bradbury	Evans	return drive	Mrcs/Ping	Lion's Is	Ricky Point	Kettle Marina	Colville Flats
415	Kettle Marina	Bradbury	Mrcs/Ping	return drive	Leos/TP	Swim Beach	Barryman's	Break	Ricky Point
430	Kettle Marina	return drive	Leos/TP	Evans	Harters	Colville River	Bradbury	Break	Barryman's
445	Break	return drive	Harters	Mrcs/Ping	Kettle Marina	Colville Flats	Bradbury	Lion's Is	Bradbury
500	Break	return drive	Kettle Marina	Leos/TP	Kettle Marina	Ricky Point	return drive	Swim Beach	Bradbury
515	Lion's Is	Evans	Kettle Marina	Harters	Break	Barryman's	return drive	Colville River	return drive
530	Swim Beach	Mrcs/Ping	Break	Kettle Marina	Break	Bradbury	return drive	Colville Flats	return drive
545	Colville River	Leos/TP	Break	Kettle Marina	Lion's Is	Bradbury	Evans	Ricky Point	return drive

