YOSEMITE'S VISITOR USE AND IMPACTS MONITORING PROGRAM

The Organic Act established the National Park Service to "conserve the scenery and the natural and historic objects and the wild life therein" while at the same time providing for "the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (NPS Organic Act, 1916). Thus, park planners and managers are charged to protect resources while providing for their enjoyment.

Since 2004, Yosemite National Park's Division of Resources Management and Science has been developing a program focused on the assessment of impacts from public use. The current monitoring program has evolved from a framework initially focused on a single management plan (Merced River Plan), to a park-wide monitoring program working between disciplines to monitor resource and visitor experience impacts throughout Yosemite National Park. To date, the program has been incorporated in the draft Tuolumne River Plan and continues to be a key driver in the development of the Merced River Plan.

Located within Yosemite's Division of Resource Management and Science, this interdisciplinary program works closely with the Division of Planning to coordinate scientific data related to river planning efforts. The Visitor Use and Impacts Monitoring Program serves as a report for the park on how well natural, cultural and social resources (visitor experience) are being managed. As new management plans are developed, and current indicators are field tested, methods will be refined to reflect new technology and advances in scientific literature.

INDICATORS AND STANDARDS

What are Indicators?

In an adaptive management process, indicators are measurable, manageable variables that reflect the condition of park resources and the quality of visitors' experiences. Standards reflect the desired condition of these variables (Manning, 2007). Indicators that have been developed for implementation in this program share the following criteria: impacts resulting from visitor use are measurable, data can be collected through non-destructive methods, and impacts are sensitive to change (Hof et al., 1994; NPS, 1995; NPS, 1997). Indicators and standards are a concept central to protecting values of concern identified in planning documents and can be referred to as thresholds interchangeably (Cole, 2010). These processes have been outlined in capacity processes such as Limits of Acceptable Change (LAC) (Stankey et al., 1985) and Visitor Experience and Resource Protection (VERP) (NPS, 1997). The monitoring program and process is an adaptive approach that is updated with the advent of technological advances, changes in visitor behavior and the successes that management action yields.

The Visitor Use and Impact Monitoring Program originally defined a suite of selected indicators for the Merced Wild and Scenic River Plan (YOSE 2004). Many of these indicators were first monitored in 2004. With the ongoing development of Yosemite National Park's Tuolumne River Plan, additional indicators have been selected along with measureable standards. Some of these indicators overlap with current efforts in the Merced River corridor, however, some represent monitoring opportunities unique to the Tuolumne River corridor. In this document, we will present only those indicators currently in

development during 2010, and only those being pursued through Yosemite's Division of Resource Management and Science. In many cases, indicators and standards are still in the development phase and will not be presented until adequate data is available. Currently, none of the standards presented here are included in any decision documents. Draft standards for the Tuolumne River corridor are included in the upcoming draft version of the Tuolumne River Plan.

Indicator Selection Process

The indicator selection process occurs through several steps and involves a variety of people, including collaborators from cooperating academic institutions, park managers, and interagency partners. For the initial and most recent indicator selection process for the Merced River Plan, a wide-ranging group of park planners, resource managers, contractors and a cross-section of park employees throughout divisions within the park were consulted. The final selection of indicators will be made after further field testing and development by park managers and researchers.

HIGHLIGHTS FROM 2010

2010 was an important year for the Division of Resources Management and Science's continuing efforts to monitor and quantify impacts from visitor use on natural, cultural and social resources. Program-wide highlights are listed below; indicator-specific highlights from the 2010 field season are available in Table 1.

- 2010 Visitor Use and Impacts Symposium April, 2010
    - This one day symposium was well attended with academics and federal land managers as well as members of the public, gateway partners and organizations dedicated to enhancing public perceptions of the park experience.
- Across indicators, there has been a move towards long-term planning in the monitoring program. This will allow indicators to improve efficiency in monitoring applications. Additionally, this shift towards long term planning allows managers to identify the most suitable time frames from which to observe trends and track changes to resource impacts and social conditions.
- Merced River Plan indicator selection process was initiated in the summer of 2010. Further development of potential indicators and measures will be ongoing throughout 2011.
- Protocols from two program indicators were published in peer-reviewed journals during 2010: (copies of these articles are available on-line at: http://www.nps.gov/yose/naturescience/visitor-use.htm)
    - Leung, Y.; Newburger, T.; Jones, M.; Kuhn, B.; & Woiderski, B., (2010, Nov. 20). Developing a monitoring protocol for visitor-created informal trails in Yosemite National Park, USA. *Environmental Management*, ISSN: 0364-152X, doi: 10.1007/s00267-010-9581-4. pp. 1-14.
    - Pettebone, D.; Newman, P.; & Lawson, S.R. (2010, Sept. 24). Estimating visitor use at attraction sites and trailheads using automated visitor counters. *Landscape and Urban Planning*, 97, 229-238. doi: 10.1016/j.landurbplan.2010.06.006

Table 1 Indicator highlights from 2010.

INDICATOR	2010 HIGHLIGHTS	APPLICATION
Water Quality	Various parameters collected monthly along the Merced and Tuolumne River corridors	Draft EIS for Tuolumne Wild and Scenic River
Riverbank Condition	24 randomly selected vegetation plots sampled; avian point counts taken at all sites; 4 sites sampled for visitor use counts	In development as a potential indicator for the Merced River corridor
Extent and Condition of Visitor-Created (Informal) Trails	Seven valley meadows sampled; main Tuolumne meadow complex sampled; standards in development through cooperative agreement with North Carolina State University	Draft EIS for Tuolumne Wild and Scenic River; Merced River corridor
Natural Soundscapes	Second year of monitoring in Tuolumne meadows; new sites deployed in Yosemite valley	Draft EIS for Tuolumne Wild and Scenic River ; Merced River corridor
Archeological Site Conditions, Stability and Integrity	Of the 87 sites visited in 2010, only two sites, each within the low vulnerability category, showed unallowable effects.	Draft EIS for Tuolumne Wild and Scenic River; Merced river corridor
Extent of Visitor Use Variables	Automated counters applied for study of parking availability in Yosemite Valley; collaboration with outside researchers examining crowding/ congestions conditions at destinations sites in Yosemite Valley and Wawona.	Studies ongoing in Merced River corridor
Encounters in Wilderness	Six trail segments observed, three each in the Merced and Tuolumne River corridors; actual observations and infrared trail counts made at all locations.	Draft EIS for Tuolumne Wild and Scenic River ; Merced River corridor
Wildlife Exposure to Human Food	At ten locations, a total of 598 inspections were conducted, which included 72,474 vehicles and 51,326 campsites.	Studies ongoing in Merced River corridor

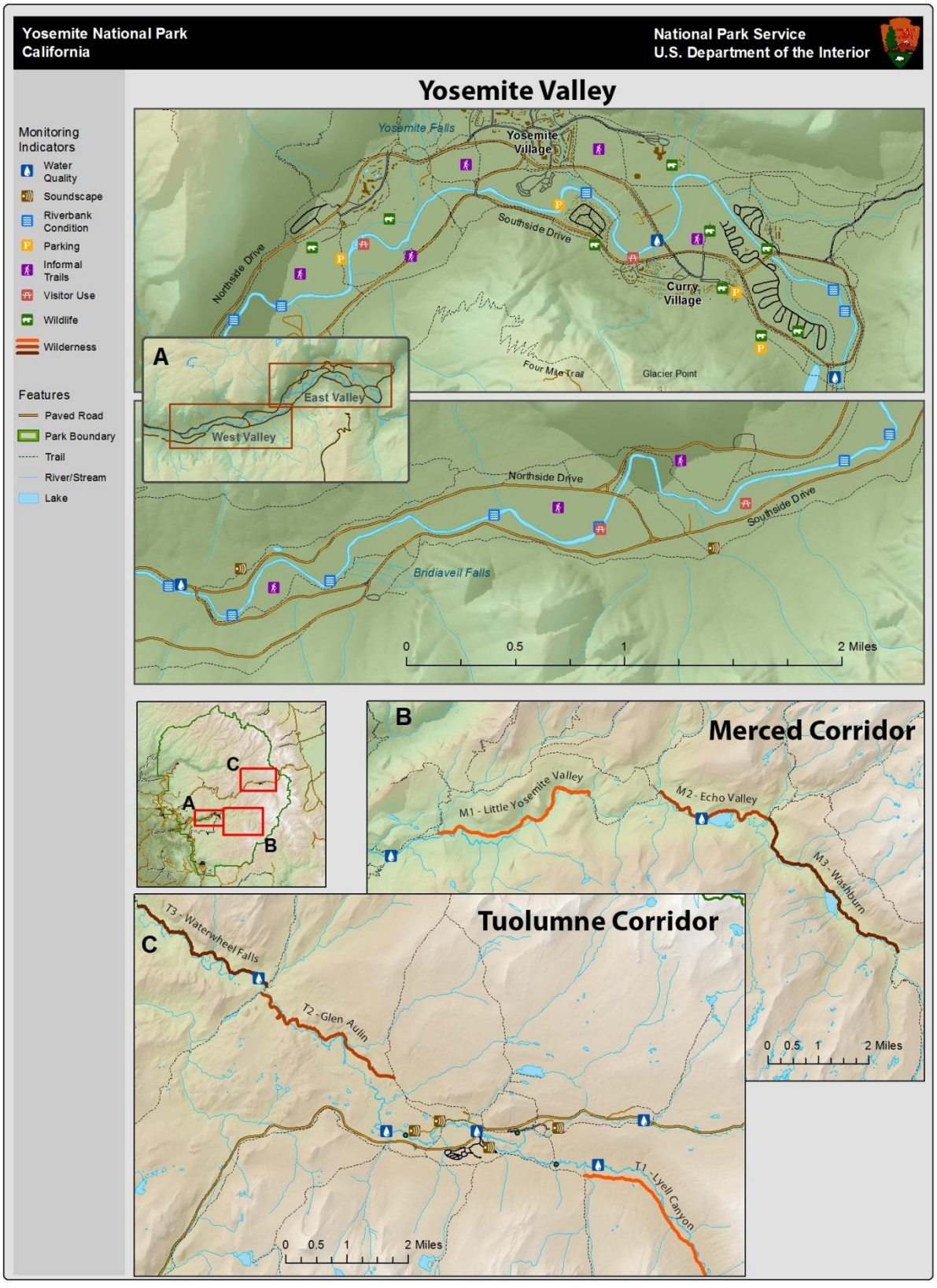

Figure 0 Monitoring sites throughout Yosemite.