

User Capacity

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INTRODUCTION

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3 General management plans for national park units are required by law to identify and
4 address implementation commitments for user capacity, also known as carrying capacity.
5 The National Park Service defines user capacity as the types and levels of visitor use that
6 can be accommodated while sustaining the quality of park resources and visitor
7 experiences consistent with the purpose of the park. Managing user capacity in national
8 parks is inherently complex and depends not only on the number of visitors, but also on
9 where the visitors go, what they do, and the “footprints” they leave behind. In managing
10 for user capacity, the park staff and partners rely on a variety of management tools and
11 strategies, rather than relying solely on regulating the number of people in a park area. In
12 addition, the ever-changing nature of visitor use in parks requires a deliberate and
13 adaptive approach to user capacity management.

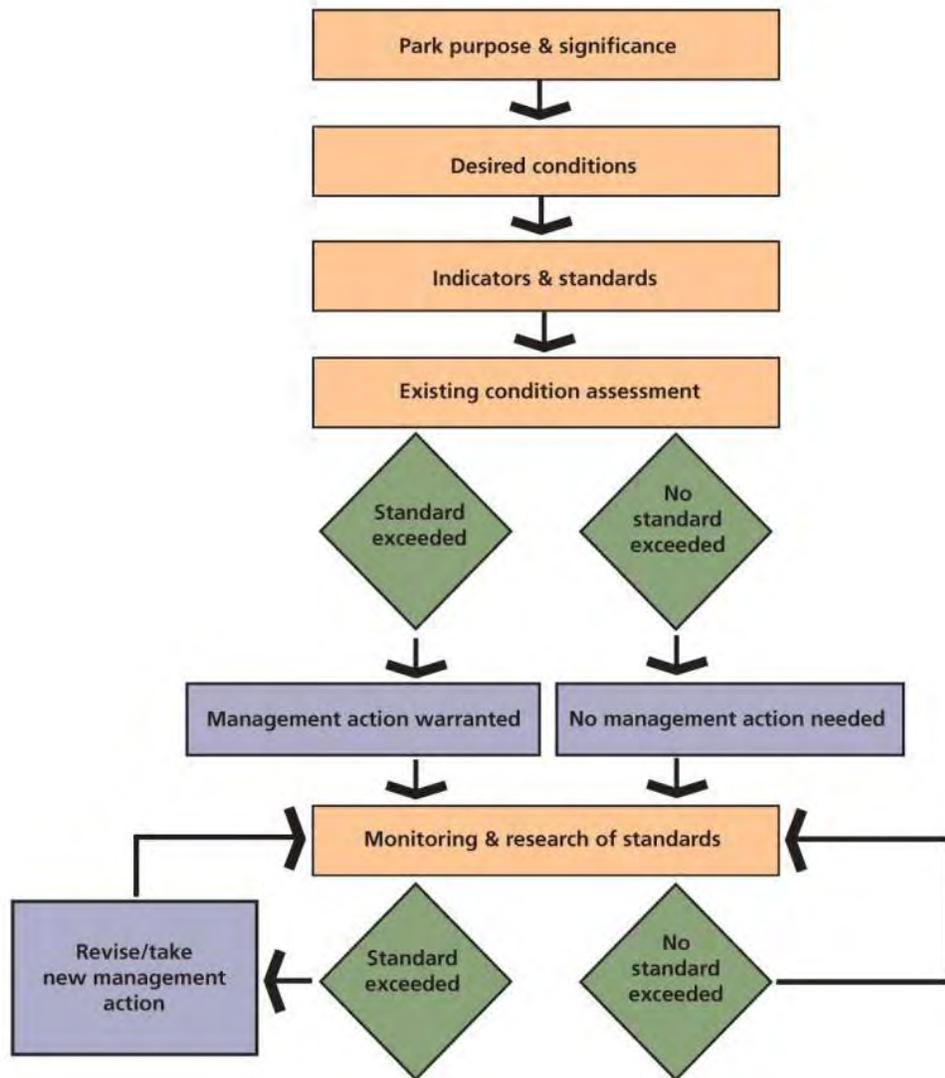
14 The foundations for making user capacity decisions in this general management plan are
15 the purpose, significance, special mandates, and management zones associated with the
16 park and monument. The purpose, significance, and special mandates define why the
17 park was established and identify the most important resources and values—including
18 visitor opportunities—that are to be protected and provided. The management zones in
19 each alternative describe the desired resource conditions and visitor experiences,
20 including appropriate types of activities and general use levels, for different locations
21 throughout the two parks, Golden Gate National Recreation Area and Muir Woods
22 National Monument. The zones, as applied in the alternatives, are consistent with, and
23 help achieve, the specific purpose, significance, and special mandates for each park. As
24 part of the National Park Service’s commitment to the implementation of user capacity,
25 the park staff will use these directives to guide the types and levels of visitor use that will
26 be accommodated while sustaining the quality of park resources and visitor experiences
27 consistent with the purposes of both parks.

28 In addition to these directives, this plan also includes indicators and standards for
29 Alcatraz Island in Golden Gate National Recreation Area and for Muir Woods National
30 Monument. Indicators and standards are measurable variables that will be monitored to
31 track changes in resource conditions and visitor experiences. The indicators and standards
32 help the National Park Service ensure that desired conditions are being attained,
33 supporting the fulfillment both the park’s and the monument’s legislative and policy
34 mandates. The general management plan also identifies the types of management actions
35 that would be taken to achieve desired conditions and related legislative and policy
36 mandates.

37 Tables 11 and 12 include the indicators, standards, and potential future management
38 strategies, allocated by management zones for Alcatraz Island and Muir Woods National
39 Monument, that would be implemented as a result of this planning effort. The planning
40 team considered many potential issues and related indicators that would identify impacts
41 of concern, but those described below were considered the most salient and feasible given
42 the importance and vulnerability of the resource or visitor experience affected by visitor
43 use. Standards that represent the minimum acceptable condition for each indicator were
44 then assigned taking into consideration the qualitative descriptions of the desired

1 conditions, data on existing conditions, relevant research studies, staff management
 2 experience, and scoping on public preferences.
 3
 4 User capacity decision-making is a form of adaptive management (see figure below). It is
 5 an iterative process in which management decisions are continuously informed and
 6 improved by monitoring the indicators and standards. Adjustments are made as
 7 appropriate. As monitoring of the park’s conditions continues, managers may decide to
 8 modify or add indicators if better ways are found to measure important changes in
 9 resource and social conditions. Information on the NPS monitoring efforts, related visitor
 10 use management actions, and any changes to the indicators and standards would be
 11 available to the public.

12
 13 **Figure 21: User Capacity Framework**



14

GOLDEN GATE NATIONAL RECREATION AREA

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3 Golden Gate National Recreation Area is a popular, heavily visited national park with
4 extensive and diverse visitor opportunities that are in great demand. In addition, the park
5 contains unique resources, some of which are highly vulnerable to visitor use impacts.
6 Further, visitor use opportunities occur over an extensive area with many access points
7 and use areas that make regulating use levels, activities, and patterns complex. Managing
8 user capacity in this unique setting is highly challenging.

9 Given these challenges and limited staff and budgets, user capacity management must be
10 strategic through the efficient use of staff time and funding, targeted focus on areas of
11 most concern within the park, and creative approaches to monitoring and developing
12 management strategies. For all areas of Golden Gate National Recreation Area, the
13 management zones provide the most important implementation commitment for user
14 capacity, because they describe the desired resource conditions and visitor experiences—
15 including appropriate types and levels of use, visitor services, and development—for all
16 sites within the planning area. These management zones are consistent with and help
17 achieve Golden Gate National Recreation Area’s purpose, significance, and special
18 mandates. Further, there are many existing visitor use management strategies already in
19 use that will continue to be implemented to help the park staff achieve these desired
20 conditions. Examples of some of these existing management strategies include the
21 following:

- 22 • providing visitor education materials on low impact practices (e.g., informational
23 signs about off-trail impacts)
- 24 • establishing maximum group size limits (e.g., the number of bicyclists in a
25 group)
- 26 • site management (e.g., closure of informal trails and active restoration)
- 27 • closure of sensitive resource areas (e.g., no visitor access to the tide pools at
28 Point Bonita)
- 29 • establishing regulations on visitor activities (e.g., hiking restricted to on-trail
30 travel on the Coastal Trail)
- 31 • requiring permits (e.g., all special events require a special use permit)

32
33 The management strategies for some specific visitor use activities have recently been the
34 focus of separate public planning processes. These activities include the management of
35 beach fires at Ocean Beach, equestrian activities in the Marin Headlands, dog walking
36 throughout Golden Gate National Recreation Area, and transportation within and outside
37 park boundaries. The decisions that have been made or are being considered in these
38 efforts on appropriate visitor use management strategies for these activities are consistent
39 with desired conditions outlined in this plan, and will help the National Park Service
40 achieve these conditions.

41 In addition to the implementation commitments for the desired conditions (identified in
42 the zone descriptions), the park staff selected user capacity indicators and standards for

1 Alcatraz Island, given the popularity of the site, the specialized visitor experience
2 objectives, and the sensitivity of some natural and cultural resources. In the future, as the
3 need presents itself and other planning opportunities arise, indicators and standards will
4 be identified for other areas within Golden Gate National Recreation Area. Some of the
5 topics for future consideration will likely include traffic congestion, parking in locations
6 not designated for parking, informal trails, invasive plants, and encounter rates on trails.
7 The park staff considered many potential resource and social indicators that would
8 represent visitor use influences on resource and social conditions at Alcatraz. The
9 indicators selected for inclusion in the general management plan were those that were
10 considered to be the most important, as well as feasible, for long-term evaluation.

11

12

13 **PRIORITY RESOURCE INDICATORS**

14 The priority resource indicators for Alcatraz are associated with the issues of disturbance
15 to birds, vandalism, and disturbance and wear on cultural resources. The conditions of
16 these resources are already being monitored in various forms, but the indicators identified
17 below will help the park staff track specific influences to these resources as a result of
18 visitor use.

19 Impacts to bird populations from visitor activities can include unintentional disturbance,
20 harassment, and feeding. These types of impacts can have significant effects on the
21 health, abundance, and diversity of targeted bird species. Alcatraz serves as one of the
22 few estuarine breeding sites for many marine birds (Saenz, et al. 2006). Disturbance to
23 Brandt's Cormorants was selected as the user capacity indicator, since the island is home
24 to San Francisco Bay's only Brandt's Cormorant colony. The populations of Brandt's
25 Cormorants on Alcatraz have been the focus of study by the Point Reyes Bird
26 Observatory since 1996, as part of their annual seabird monitoring program. The bird
27 disturbance trend data collected by the observatory, along with the long-term desired
28 conditions for marine bird habitat on Alcatraz, served as the basis for selection of the
29 standards for this indicator. Some of the existing management activities the National Park
30 Service has already been employing in relation to this issue include visitor education via
31 signs, staff, and docents; barriers in specific areas; and area and seasonal closures.

32 Visitor use impacts to cultural resources include general wear on historic structures and
33 some occurrences of unintentional disturbance and vandalism to archeological resources,
34 historic structures, and the recently restored historical gardens. Cultural resources are
35 nonrenewable, so impacts, especially those that represent depreciative behavior, must be
36 minimized to the extent possible. These impacts can disturb significant features of these
37 resources, which may cause a loss of site integrity over time. Some of the existing
38 management activities the National Park Service has already been employing in relation
39 to this issue include visitor education via signage, interpretive programs and roving
40 patrols, barriers in specific areas, and area closures.

41

42

1 **PRIORITY SOCIAL INDICATORS**

2 The priority social indicators selected for Alcatraz Island are associated with the issues of
3 crowding and congestion. Given the popularity of Alcatraz Island as a tourist destination
4 within San Francisco, the issues of crowding and congestion have been the focus of
5 management efforts. In addition, these topics have been addressed in long-term visitor
6 use studies conducted by the Park Studies Laboratory at the University of Vermont in
7 cooperation with the National Park Service (Manning et al. 2007). The visitor activities
8 within the cellhouse have been, and will continue to be, the highest priority area for some
9 of these issues. Crowding and congestion problems may affect visitors' ability to
10 experience high quality educational opportunities and could on occasion, affect visitor
11 health and safety. The importance of the indicators selected, which include people at one
12 time in the cellhouse and the wait times for the ferry, are supported by the visitor survey
13 research (Manning et al. 2007) along with on-going feedback provided to park staff by
14 the visiting public. Many of these concerns are already tracked to some degree through
15 periodic monitoring of visitor use levels in the cellhouse, tracking of wait times for the
16 ferry, the recording of visitor complaints, and law enforcement incident reporting. The
17 indicators below will increase the degree of systematic monitoring and assessment of
18 these issues. Some of the management activities the National Park Service has already
19 been employing in relation to these issues include pre-trip planning information to
20 encourage voluntary redistribution of use, reservation systems, and onsite education and
21 programming to direct the flow of visitor use once on the island.

22

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24 **MANAGING USE LEVELS**

25 Currently, Alcatraz Island receives about 4,400 visitors per day during the peak season
26 and up to 5,000 visitors per day if evening programs are being offered. This level of use
27 is—and will continue to be—closely regulated through the number of tickets that are
28 offered each day for ferry access to the island. Given the National Park Service's existing
29 knowledge of resource and social conditions on the island, this amount of use allows the
30 National Park Service and its partners to protect resources and provide high quality
31 visitor experiences, including meeting the standards outlined below. In this plan, all of
32 the alternatives for Alcatraz Island provide for new visitor opportunities that will allow
33 the National Park Service and its partners to better distribute and manage use on the
34 island. In the future, incremental increases in the levels of visitor use may be considered.
35 However, increases in use levels would be approached very carefully, and in an
36 incremental and experimental way using monitoring data and related research, to ensure
37 that the National Park Service's implementation commitments to the park's legislative
38 and policy mandates, desired conditions, and related standards are always being achieved.

39

MUIR WOODS NATIONAL MONUMENT

2 Similar to Golden Gate National Recreation Area, the management zones provide the
3 most important implementation commitment for user capacity for Muir Woods National
4 Monument because they describe the desired resource conditions and visitor
5 experiences—including appropriate types and levels of use, visitor services, and
6 development—for all sites within the monument. These zones are consistent with and
7 help achieve the monument’s purpose, significance, and special mandates. Further, there
8 are many existing visitor use management strategies already in use that will continue to
9 be implemented to help the park staff achieve these desired conditions. Examples of some
10 of these existing management strategies include visitor education on low impact practices
11 (e.g., quiet zones and quiet days); management of visitor access (e.g., dedicated park
12 shuttle access during peak season); closure of sensitive resource areas (e.g., no fishing or
13 swimming in Redwood Creek); regulations on visitor activities (e.g., hiking restricted to
14 on-trail travel on the main trail through the woods); and permit requirements (e.g., all
15 special events require a special use permit).

16 In addition to the implementation commitments for the desired conditions, the park staff
17 has selected user capacity indicators and standards for Muir Woods National Monument.
18 The park staff considered many potential resource and social indicators that would
19 represent visitor use influences on resource and social conditions within the monument.
20 Similar to Alcatraz, the indicators selected for inclusion in the general management plan
21 were those that were considered to be the most important, as well as feasible, for long-
22 term evaluation.

23

24

25 PRIORITY RESOURCE INDICATORS

26 The priority resource indicators for Muir Woods National Monument are associated with
27 the issues of informal trails (i.e., trails created by visitors leaving designated trails),
28 impacts to soundscapes from human-caused noise, evidence of visitor-caused wear or
29 disturbance to the redwood trees, and the amount and distribution of invasive species.

30 The proliferation of informal trails in Muir Woods National Monument is not currently a
31 serious problem because the NPS staff has greatly increased efforts to clearly delineate
32 designated trails and to educate visitors to stay on trails. Although conditions have
33 improved and informal trails are not a significant concern currently, any future expansion
34 of informal trails was still considered a high priority issue given the related impacts of
35 vegetation loss, soil erosion, fragmentation of wildlife habitats, and disturbance to rare
36 flora, fauna and archeological sites (Marion, 2008). The indicator for informal trails is
37 based on a modified version of a trail condition classification system developed by Jeff
38 Marion of the United States Geological Survey (Marion 2008). As mentioned, some of
39 the existing management activities the National Park Service has been employing in
40 relation to this issue include educating visitors to stay on trails and clearly marking
41 designated trails. Further, the National Park Service has placed barriers and actively
42 restored informal trails to minimize their continued use. Roving patrols and other
43 education and enforcement techniques have also been used.

1 Given the high levels of use in the woods, including use by families and groups, noise
2 levels and the frequency of human introduced sound can affect the natural soundscape,
3 disrupting wildlife and impacting visitor experiences. These changes can sometimes
4 influence normal wildlife activities, leading to altered behavior and productivity in
5 individuals, and possible modifications in the abundance and distribution of populations
6 (Knight and Gutzwiller 1995). Baseline conditions for much of the monument’s
7 soundscape were established through comprehensive noise monitoring in 2006 and 2007
8 (citation). These data, along with visitor surveys, were used to identify the best metrics
9 for the soundscape indicators and establish associated standards. There is more discussion
10 below on the studies conducted and how they were used in the planning process. Some of
11 the existing management activities the National Park Service has been employing in
12 relation to this issue have focused on education regarding low impact practices, including
13 introducing “quiet days” and “quiet zones” within the woods to encourage visitors to
14 voluntarily modify their behavior and better protect the natural soundscape.

15 Although visitor use is not the only or even the primary source of invasive species, these
16 species can be introduced and spread through visitor and vehicle activity within the
17 monument. The NPS Inventory and Monitoring program has been monitoring the number
18 of detections and the extent of cover of invasive species as part of the Vital Signs
19 Program. The goal of the program is to target new or expanding infestations (NPS 2006).
20 The indicators and standards included in Table 12 are consistent with those being pursued
21 by the NPS Inventory and Monitoring program. If monitoring detects a change in the
22 number or extent of invasive species, then a problem analysis would be needed to isolate
23 the causal factors. If visitor use were determined to be a contributor to the observed
24 change in conditions, then the necessary visitor use management strategies would be
25 implemented. Some of the existing management activities the National Park Service has
26 already been employing in relation to this issue include educating visitors to stay on
27 trails, clearly marking designated trails, and restricting activities that may increase the
28 introduction of invasive species.

29

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31 **PRIORITY SOCIAL INDICATORS**

32 The priority social indicators for Muir Woods National Monument are associated with the
33 issues of crowding and use conflicts. The Park Studies Laboratory at the University of
34 Vermont has conducted a program of social science research at the monument from 2003
35 to the present (Manning et al. n.d.). These studies collected baseline data on visitor use
36 and users (including detailed travel patterns throughout the park), potential indicators of
37 quality of the visitor experience, potential standards of quality for specific types of
38 crowding and use conflicts, and visitor attitudes toward alternative management
39 practices. The research resulted in recommended potential indicators that included the
40 number of visitors within a person’s view, noise impacts, and arrival delays, which
41 contributed to visitors’ perception of crowding and conflict while visiting the woods
42 (Manning et al. n.d.).

43 Additional visitor studies were targeted to collect data on visitor preference and
44 acceptability of various use densities (people per view) along trails in the woods, which

1 contributed to selection of the standards for this indicator by zone (Manning et al. n.d.).
2 In addition, visitor reactions to visitor-caused noise were studied using a series of audio
3 clips simulating a range of visitor-caused noise in the park, which contributed to the
4 standards selected for this indicator. The indicators of the percentage of time human
5 sounds are audible and sound pressure level were considered the most meaningful and
6 measurable indicators related to visitor-caused noise (Newman and McCusker 2009).
7 Finally, the visitor studies evaluated visitor perceptions on acceptable waiting times to
8 find parking and walking times from the parking area. This information in combination
9 with other national standards for wait times at high-use areas and attraction sites
10 contributed to the selection of a standard for this indicator for both auto and shuttle
11 visitors (Manning et al. n.d.; Orca Consulting 2008). Some of the existing management
12 activities the National Park Service has been employing in relation to these issues include
13 educating visitors regarding low impact practices, providing pre-trip planning
14 information to encourage voluntary redistribution of use to less busy times, and
15 employing the park shuttle system during peak periods to help modify the flow of visitor
16 use to the woods.

17

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19 **MANAGING USE LEVELS**

20 The level of use at Muir Woods National Monument is not as regulated as it is at Alcatraz
21 Island, but it is currently constrained during the peak season through the amount of
22 parking available and the frequency and size of shuttle buses. All of the alternatives for
23 Muir Woods National Monument call for visitation to be better distributed and managed.
24 However, it is uncertain at this time whether the amount of use per day, or at any one
25 time, would need to be further regulated in order to achieve the desired conditions and
26 related standards identified for the monument. In order to better assess those needs, the
27 National Park Service will conduct further analysis of current and potential visitor use
28 patterns as part of the planning for the redesign of the monument's entrance and parking
29 areas, which is proposed in this plan's action alternatives. The implementation plan will
30 closely examine the need for further regulation of the amount and timing of use as part of
31 the alternatives for reduced parking and an increased emphasis on shuttle access.

32

33

34 **MONITORING**

35 Some of the issues and related indicators noted for both Golden Gate National Recreation
36 Area and Muir Woods National Monument, such as impacts to bird populations, invasive
37 species, and wear on cultural resources, are also highly influenced by regional and global
38 threats such as pollution, disease, and climate change. Isolating visitor use impacts to
39 these resources is not easy and may seem less significant than these other serious threats.
40 However, there are visitor management actions that can help minimize these impacts and
41 reduce the stress on park resources, providing tangible resource and social benefits.

1 The park staff will continue general monitoring of use levels and patterns throughout the
2 park and monument. In addition, the park staff will monitor these user capacity
3 indicators. The rigor of monitoring the indicators (e.g., frequency of monitoring cycles,
4 amount of geographic area monitored) may vary considerably depending on how close
5 existing conditions are to the standards. If the existing conditions are far from exceeding
6 the standard, the rigor of monitoring may be less than if the existing conditions are close
7 to or trending towards the standard.

8 In addition, the initial phases of monitoring for the indicators and standards defined
9 above will help the National Park Service determine if any revisions are needed. The
10 initial testing of the indicators and standards will determine if the indicators are
11 accurately measuring the conditions of concern and if the standards truly represent the
12 minimally acceptable condition of the indicator. Park staff may decide to modify the
13 indicators or standards and revise the monitoring program if better ways are found to
14 measure changes caused by visitor use. If use levels and patterns change appreciably, the
15 park may need to initiate additional monitoring of new indicators to ensure that desired
16 conditions are protected. This iterative learning and refining process is the strength of the
17 NPS user capacity management program, in that it can be adapted and improved as
18 knowledge grows.

19

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Table 11: Alcatraz Island: User Capacity Indicators, Standards, Monitoring Strategies, and Management Strategies

Indicator	Assigned Zone/Area	Standard	Monitoring Strategy	Potential Management Strategies
TOPIC: VISITOR CAUSED BIRD DISTURBANCE				
Number of incidents of visitor disturbance to Brandt's Cormorants that result in impacts to individual birds during nesting season	Evolved Cultural Landscape Zone	No more than "X" major/moderate/minor island-based visitor induced disturbances to Brandt's Cormorants during nesting season Under Development - Possibly different standards for the north vs. south end of the Island within this zone.	Continue monitoring per PRBO protocol	<ul style="list-style-type: none"> • Increase in visitor education on low impact practices and park regulations • Increase in staff patrols and use of docents • Increase signage • Increase fencing, barricades, visual barriers, vegetative buffers • Restrict access to ranger/docent led only • Restrict visitor access to targeted areas • Relocate visitor activities • Alter gull management areas
Number of incidents of visitor disturbance to Brandt's Cormorants that result in subcolony abandonment	Evolved Cultural Landscape Zone	No visitor-induced disturbances to Brandt's Cormorants that result in subcolony abandonment	Continue monitoring per PRBO protocol	<ul style="list-style-type: none"> • Increase in visitor education on low impact practices and park regulations • Increase in staff patrols and use of docents • Increase signage • Increase fencing, barricades, visual barriers, vegetative buffers • Restrict access to ranger/docent led only • Restrict visitor access to targeted areas • Relocate visitor activities • Alter gull management areas

Indicator	Assigned Zone/Area	Standard	Monitoring Strategy	Potential Management Strategies
Number of incidents of visitor disturbance to Brandt's Cormorants that result in impacts to individual birds during nesting season	Sensitive Resource Zone (after marine-protected area is designated)	No more than "X" major/moderate/minor water-based visitor induced disturbances to Brandt's Cormorants during nesting season Under Development	Continue monitoring per PRBO protocol	<ul style="list-style-type: none"> Boat patrols in collaboration with other agencies Targeted outreach to user groups Increased signage visible from water Use of buoys Collaborate with the Seabird Protection Network for coordinated outreach, education, enforcement
Number of incidents of visitor disturbance to Brandt's Cormorants that result in subcolony abandonment	Sensitive Resource Zone (after marine-protected area is designated)	No visitor-induced disturbances to Brandt's Cormorants that result in subcolony abandonment	Continue monitoring per PRBO protocol	<ul style="list-style-type: none"> Boat patrols in collaboration with other agencies Targeted outreach to user groups Increased signage visible from water Use of buoys Collaborate with the Seabird Protection Network for coordinated outreach, education, enforcement
TOPIC: VANDALISM OF CULTURAL RESOURCES				
Number of incidents of graffiti/vandalism	Historic Immersion Zone (cellhouse tour route, areas open to public)	No more than 1 minor incident* per month No major incidents** * Minor Incident: Small, easily repairable damage (ex: new ink/paint graffiti over paintable surface) ** Major Incident: Irreparable damage resulting in major resource loss and significant recovery cost (ex: new graffiti over historic graffiti)	On-going monitoring as part of regularly scheduled staff and volunteer patrols and collection of visitor comments. More rigorous comparison of existing conditions to the baseline on a periodic basis.	<ul style="list-style-type: none"> Increase in visitor education on low impact practices and park regulations Increase staff presence Increase monitoring Temporarily close area while undergoing conservation treatment Close problem area, except under supervision

Indicator	Assigned Zone/Area	Standard	Monitoring Strategy	Potential Management Strategies
Topic: Visitor Caused Disturbance to Cultural Resources				
Number of trampled/removed plants in restored gardens	All zones with restored gardens	No more than a 20% loss/major disturbance to the plants in areas that are open to the public	On-going monitoring as part of regularly scheduled staff and volunteer patrols and collection of visitor comments. More rigorous comparison of existing conditions to the baseline on a periodic basis.	<ul style="list-style-type: none"> • Increase in visitor education on low impact practices and park regulations • Increase fences and barriers • Increase staff presence • Regulate or restrict access • Increase monitoring
Disturbance of rock walls, brickwork, exposed cultural resources	All zones	No more than a 5% loss/major disturbance of the feature (rock wall, brickwork, exposed cultural resources)	On-going monitoring as part of regularly scheduled staff and volunteer patrols and collection of visitor comments. More rigorous comparison of existing conditions to the baseline on a periodic basis.	<ul style="list-style-type: none"> • Increase in visitor education on low impact practices and park regulations • Increase fences or barriers • Increase staff presence • Regulate or restrict access • Increase monitoring
Disturbance/loss of ground cover on known archeological sites	All unpaved areas	No trampling on known archeological sites, as evidenced by footprints and compaction of soil compared to similar and immediately adjacent soils	On-going monitoring as part of regularly scheduled staff and volunteer patrols and collection of visitor comments. More rigorous comparison of existing conditions to the baseline on a periodic basis.	<ul style="list-style-type: none"> • Increase in visitor education on low impact practices and park regulations • Create or widen existing paths • Install temporary or permanent signs • Increase fences/barriers
Topic: Visitor Caused Wear on Cultural Resources				
Number of incidents regarding wear, tear, or damage on cultural resources from special events	Historic Immersion Zone (cellhouse, VIP tours, SPUG)	<p>No more than 2 minor incidents per event</p> <p>No major incidents</p>	Continue existing assessment protocols of conditions after each special event.	<ul style="list-style-type: none"> • Revise Standard Operating Procedure for VIPs/SPUG events • Increase in visitor education on low impact practices and park regulations • Increase staffing ratio • Increase physical barriers • Restrict or reduce access

Indicator	Assigned Zone/Area	Standard	Monitoring Strategy	Potential Management Strategies
Topic: Crowding and Congestion				
People at one time (PAOT) on Michigan Avenue	Historic Immersion Zone	No more than 90* people at one time on Michigan Avenue *Standard will be evaluated upon completion of summer 2009 data collection effort	Periodic photo monitoring and/or observations and visitor surveys	<ul style="list-style-type: none"> Adjust flow of visitors (for example: timed audio tickets, reconfiguration of tour flow, or scheduling dockside programming) Adjust boat ticket distribution (for example: more in the AM or PM) Reduce the number of visitors to the island Increase monitoring to determine and readjust to standard
Number of times a vessel departs Alcatraz leaving visitors in line for more than 15 minutes	Evolved Cultural Landscape Zone	No more than 2 times per month or 12 times annually, excluding emergencies	Continue existing monitoring and documentation of wait times and visitor comments regarding ferry access	<ul style="list-style-type: none"> Increase education on the timing of ferries Add more boats and/or higher capacity boats Adjust programming (for example: close facilities early or cancel programs at certain times) Limit the number of island visitors (limit tickets sold)

Table 12: Muir Woods National Monument: User Capacity Indicators, Standards, Monitoring Strategies, and Management Strategies

Indicator	Assigned Zone/Area	Standard	Monitoring Strategy	Potential Management Strategies
Topic: Visitor-Created Informal Trails				
<p>Increase in the number of informal trails and change in the condition class of existing informal trails in the redwood forest*</p> <p>*Problem analysis would be needed to isolate visitor-caused impacts</p>	<p>Interpretive Corridor Zone – surrounding Redwood Creek</p> <p>Sensitive Resources Zone – the upper slopes</p> <p>Natural Zone – western end of the monument at Mount Tamalpais State Park</p>	<p>No increase in the number of informal trails, and no increase in the condition class* of existing informal trails from the previously monitored baseline. No Class III trails.</p> <p>* Trail Condition Classification System: <i>Adapted from descriptive system by Jeff Marion, USGS</i></p> <p>Class I Trail is barely visible. Minimal disturbance of organic litter or vegetation. Very little bare soil is evident along the tread.</p> <p>Class II Trail is obvious. Organic litter is disturbed or diminished in places. Slight loss or damage to vegetation. Bare soil is evident along the center of the tread.</p>	<p>Periodic assessments would be conducted inside the monument boundaries and possibly beyond if they are critical to forest health, e.g. areas in Mount Tamalpais State Park adjacent to Redwood Creek. Assessments would take place at the point where the informal trail begins; where it departs from an existing authorized trail.</p>	<ul style="list-style-type: none"> • Formal review of possible causes (including determining whether the informal trail is visitor use or animal related) and to determine most appropriate management response • Increase in visitor education on low impact practices and park regulations • Place border logs or other barriers along formal trails at the junction with informal trails • Restore informal trails by decompacting soils and moving organic debris onto the visible portion of the informal trails to hide them (for Class II and III trails, natural topography would be restored prior to any addition of organic matter/litter) • Add formal trail trailhead signs explaining the problem and asking visitors to remain on formal trails • Enhance marking of the official trail and/or improve adjacent designated trails

Indicator	Assigned Zone/Area	Standard	Monitoring Strategy	Potential Management Strategies
		<p>Class III Serious erosion is obvious. Nearly complete loss of organic litter and/or vegetative cover. Bare soil is widespread in a widening tread.</p>		<ul style="list-style-type: none"> • Formalize an informal trail, possibly on a new alignment, to accommodate visitor interest • Install temporary or permanent signs • Consider more substantial restoration work (after all foot traffic has been removed from the informal trail) • Increase enforcement or presence of rangers or volunteers • Area closures • Reduce use levels
TOPIC: IMPACTS TO SOUNDSCAPE FROM HUMAN NOISE				
<p>Sound pressure level</p> <p>Percent time human sounds are audible</p>	<p>Interpretive Corridor Zone</p>	<p>Daytime (0700-1900) L50 dBA: 34 (note: L50 is the sound level that is exceeded 50% of the time)</p> <p>% time human sounds audible: 45%</p>	<p>Monitoring would be conducted on a periodic basis using digital recordings and/or on-site listening protocol as appropriate. If a standard is exceeded, the type and location of each contributing noise source would be identified.</p>	<ul style="list-style-type: none"> • Increase in visitor education on low impact practices and park regulations • Designate more quiet zones and days • Redistribute visitor flow and/or reduce use levels • Increased education for organized groups • Change in the regulations of organized groups (e.g., group size limits)

Indicator	Assigned Zone/Area	Standard	Monitoring Strategy	Potential Management Strategies
Difference between Lnat and existing ambient L50	Natural and Sensitive Resources Zones	Difference between Lnat (Add definition) and existing ambient (L50) is 2 dBA or less during the daytime (0700-1900)	Monitoring would be conducted on a periodic basis using digital recordings and/or on-site listening protocol as appropriate. If a standard is exceeded, the type and location of each contributing noise source would be identified.	<ul style="list-style-type: none"> • Increase in visitor education on low impact practices and park regulations • Designate more quiet zones and days • Redistribute visitor flow and/or reduce use levels
TOPIC: INVASIVE PLANT SPECIES				
<p>Number of priority invasive plant species detections*</p> <p>Extent of invasive plant cover*</p> <p>*Problem analysis would be needed to isolate visitor-caused impacts.</p>	All zones	<p>No increase in the number of new priority invasive plant species*</p> <p>No increase in the % cover*</p>	Continue monitoring per the Inventory and Monitoring Program	<ul style="list-style-type: none"> • Increase in visitor education on low impact practices and park regulations • Require the cleaning of gear that is capable of transferring plant material • Temporarily or permanently close areas • Reduce use levels • Removal of invasives and restoration of disturbed areas
Topic: Crowding and Congestion				
People within a person's view	Interpretive Corridor Zone	Under Development	Under Development	<ul style="list-style-type: none"> • Encourage voluntary redistribution of use • Change the timing and amount of shuttle access • Redistribute visitor flow and/or reduce use levels
People within a person's view	Natural Zone	Under Development	Under Development	<ul style="list-style-type: none"> • Encourage voluntary redistribution of use

Indicator	Assigned Zone/Area	Standard	Monitoring Strategy	Potential Management Strategies
				<ul style="list-style-type: none"> • Change the timing and amount of shuttle access • Redistribute visitor flow and/or reduce use levels
People within a person's view	Sensitive Resources Zone	Under Development	Under Development	<ul style="list-style-type: none"> • Encourage voluntary redistribution of use • Change the timing and amount of shuttle access • Redistribute visitor flow and/or reduce use levels
<p>Approximate arrival experience time (from arrival* to entrance fee purchase)</p> <p>*Arrival for auto visitors begins when vehicles turn off Muir Woods Road and into a parking lot at the monument</p> <p>*Arrival for shuttle visitors begins when the shuttle bus pulls into the designated bus loading/unloading zone at the monument</p>	Diverse Opportunities Zone	Maximum arrival time 20-30 minutes per individual or group	Regular observations of the arrival experience time would be conducted. This indicator and standard will be further tested and adjusted as part of implementation planning for increased shuttle access and the redesigned entrance to the monument.	<ul style="list-style-type: none"> • Encourage voluntary redistribution of use • Redesign the arrival experience • Institutionalize Intelligent Transportation Systems with Caltrans • Increase efficiencies at fee station • Improve shuttle service