LIMITS OF ACCEPTABLE CHANGE

FOR

FORT SAN LORENZO
PANAMA

MAY 2001

Cover Photograph: Fort San Lorenzo.

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1. Introduction to the San Lorenzo Protected Area

Situated at the Caribbean or northeastern end of the Panama Canal, the heavily forested 12,000 hectare (30,000 acre) San Lorenzo Protected Area (SLPA) is slightly outside the limits of the Panama Canal watershed but is nonetheless an integral part of the Canal Area (Map 1). The Gatun Locks are immediately to the east, the vast Gatun Lake forms the southwestern boundary and the majestic Chagres River — which provides the freshwater for the Canal system— flows through the heart of this area. Designated a "natural protected area" by Law 21 of July 1997 as part of conservation and development of the Canal Area, it is approximately 15 miles north to south, and 10 miles wide east to west.

This entire region was under the jurisdiction of the United States government beginning with the establishment of the Panama Canal in 1903. Beginning in 1910, Fort Sherman, a U.S. Army base, protected the northern entrance to the Panama Canal. It also preserved the SLPA's natural and cultural treasures during the 20th century. In recent decades, the area was used for jungle training by the U.S. military because of its high diversity of environments and topography (beach, cliff, hills, rivers, forests, etc). Military operations ceased in March 1999 and the Fort Sherman Military Reservation reverted to Panama in mid-1999.

Currently, the area is under multiple jurisdictions including: the Interoceanic Regional Authority (ARI), the agency charged with coordinating the use of reverted lands; the Panama Canal Authority (PCA), which controls much of the area's waterways including the Chagres River; the National Environmental Authority (ANAM), managing parks and protected areas; the Panamanian Tourism Institute (IPAT); and the National Cultural Institute (INAC), which is responsible for preservation of historic monuments. Other stakeholders include the Smithsonian Tropical Research Institute (STRI), which operates a canopy-level research crane, non-governmental organizations, and representatives of the local communities.

Because of the large number of players involved and their complicated and overlapping jurisdictions, a special collaborative effort has been launched to provide for the effective protection of San Lorenzo. The Panamanian Center for Research and Social Action (CEASPA), a local NGO, has the responsibility for this project, with funding from the Global Environment Facility and the World Bank. Project objectives include: 1) development of a management plan; 2) a program for community education, identity, and economic development; 3) financial mechanisms to ensure continued financial viability for environmental protection; 4) effective project management and evaluation; and 5) an appropriate institutional framework for the management of the area (CEASPA 1999). This discussion of limits of acceptable change is in support of the first objective: a management plan being prepared by a local consulting group, Consultores Ecologicos Panameños (CEPSA).

The area is of exceptional biological and cultural importance. It provides an important link in the Panama Atlantic Mesoamerican Biological Corridor as well as the northern-most section on the north-south biological corridor between the Atlantic and Pacific Oceans. It is the most biologically diverse part of central Panama, containing 9 different forest types, from coastal mangrove swamps and Cativo forests in freshwater wetland areas, to semi-deciduous and evergreen humid tall forests in the uplands. It also has major riverine zones, tidal lakes, coastal beach and reefs, and extensive freshwater lake (reservoir) shoreline.

The SLPA also has very high bird diversity. More than 450 species have been identified, and the Panama Audubon Society counted 357 bird species here in one 24-hour period, a Western Hemisphere record. Other key species include jaguars, tapir, monkeys, sloth, and crocodiles/caiman.

The area's historic resources are also impressive. At the mouth of the Chagres River is the magnificent Fort (or "Castillo") San Lorenzo, erected during the late 1500s to defend one of Spain's principal routes to the Pacific coast and Old Panama. The fort became the target of pirates and buccaneers, including Sir Frances Drake, Sir Edward Vernon, and Henry Morgan. Together with its sister site at Portobello, it was declared a *World Heritage Site* by UNESCO in 1980. The area also contains remarkably well-preserved WWI defensive batteries designed to protect the Panama Canal, as well as remnants of France's attempt to dig a sea-level canal in the 1880s. Other historic sites include small farms and plantations along the coast and along the Chagres River, the town of Chagres near Fort San Lorenzo, and numerous banana plantations scattered throughout the interior (Weaver, Bauer and Jimenez 2001).

2. The Limits of Acceptable Change Framework

The Limits of Acceptable Change (LAC) framework was designed as an alternative to the traditional "carrying capacity" approach used by many wilderness managers in the USA. It is a continuous, collaborative process involving all stakeholders that leads to quantitative and qualitative measures of change rather than the arbitrary limits on numbers of visitors. It shifts the debate from "how much use is too much?" to "how much change is acceptable?" (Stankey, McCool, and Stokes 1990).

In its classic form, the full LAC methodology involves the following nine steps (Stankey, et al. 1985):

1. Identify the concerns and issues
2. Define and describe opportunity classes
3. Select indicators of resource and social conditions
4. Inventory resource and social conditions

5. Specify standards for resource and social conditions
6. Identify alternative opportunity class allocations
7. Identify management actions to respond to unacceptable change
8. Evaluate and select an alternative
9. Implement actions and monitor conditions

3. Recent Re-evaluation of Limits of Acceptable Change

Recent re-evaluations of the LAC framework by its developers have suggested certain changes and clarifications to the original approach. In general, experts agree that LAC is more a continuous and iterative *process* than a product, and can be a means of resolving conflicts between opposing goals (Cole and McCool n.d.)

They also recognize that institutional support for monitoring is always difficult and that "low precision can be acceptable if indicators and standards are written appropriately." Qualitative standards may now be used if they clearly show when standards are being violated. The general lack of attention to monitoring protocols and a concern over the reliability of most monitoring data are considered two of the most serious weaknesses of the LAC process.

The reviewers examined the application of LAC outside formally established wilderness areas and beyond recreational activities (the traditional LAC areas). They noted that there must be at least three conditions for LAC to be useful:

1. LAC is a planning system for resolving conflict. There must be at least two conflicting goals, such as maximizing use and maximizing environmental protection, and management must be willing to compromise all goals.

2. Management must be willing to consider one or more goals to ultimately constrain the others.

3. Minimum standards must be written which quantify the minimally acceptable state of the ultimately constraining goal(s).

Therefore, if there is no conflict or there is no room for compromise, then there is no need for LAC. Managers can merely state desired conditions and implement management to achieve it. If an activity, use or condition is considered "good" under any circumstance, there is no need for LAC (for example, erosion control on steep trails.) The experts also noted that the impact of recreation on wildlife "do involve conflict and compromise but the utility of LAC is limited by the apparent impossibility of writing meaningful quantitative standards" (Cole and McCool n.d.).

4. Application of Limits of Acceptable Change to Management of Fort San Lorenzo

The LAC process was developed for use in formally designated wilderness areas in the USA. These are established protected areas with well-defined boundaries, comprehensive management plans, and which are generally well funded and staffed. Yet even there, the LAC process has not always been successful, often due to a failure of the monitoring process.

The usefulness of the LAC process outside wilderness areas and where there are few competing uses, especially in developing countries, has not been extensively studied. In addition, most LAC indicators deal with the impacts of overnight camping and trail use built and maintained primarily for recreational purposes.

For the San Lorenzo Protected Area in general and Fort San Lorenzo in particular, land use planning and information is just now beginning to be developed and it may be premature to launch into a formal LAC process. However, it may be useful to apply a simplified LAC approach now, to lay the foundation for a more comprehensive process in the future. Parts of the LAC framework can be modified and then tested to see if they fit the local situation. Thus, LAC could provide some important principles and an overall structure for planning without requiring implementation of the full process.

For example, monitoring site conditions and visitor use, as a first step, could provide important data to identify concerns and issues as the beginning steps for the LAC process. Although monitoring is the final step, the process is circular and monitoring can reveal new issues and concerns and initiate a new round of planning. By beginning with basic monitoring of site conditions and visitor use, we can develop baseline information and gain experience with defining and using LAC indicators.

Based on the revisions proposed by the developers of LAC and the needs of Fort San Lorenzo, the following modifications to the original LAC process are suggested:

1. Identify goals and purposes (conditions desired)
2. Identify concerns and issues
3. Define potential types of management zones
4. Select indicators of resource and social conditions (outputs and outcomes)
5. Inventory existing resource and social conditions
6. Set minimally acceptable limits for resource and social indicators
7. Allocate management zones to specific locations
8. Identify management actions to bring conditions up to minimum standards
9. Implement actions and monitor conditions
10. Repeat the process as necessary

Steps 1 and 2 will be certainly be covered in the comprehensive management planning process currently underway. Steps 3 and 4 are discussed below. The remainder of the process can be implemented after the completion of the management plan.

5. Proposed Management/Recreation Zone for the World Heritage Site

A key step in the LAC process is to identify prescriptive management zones, Step 3 above. We suggest a modified version of the Recreational Opportunity Spectrum (ROS) model used by the U.S. Forest Service, which offers a simple framework for identifying recreational opportunities and management (Cole and Stankey 1979). It is based on the premise that recreational experiences and management activities should match their settings, with sophisticated programs and a high management presence in highly developed areas, such as resorts and urban zones, and simpler programs and low management presence in more remote areas. For a detailed description of how the ROS process has been applied to the entire SLPA, see Wylie, Valenzuela and Sosadeeter (2001).

The following is a proposed definition for the 28-hectare World Heritage Site as a special recreation/management zone:

Theme: The unique theme of this zone is understanding and appreciation of Spanish Colonial history.

Desired Condition: The long-term protection and public enjoyment of the remains of early Spanish exploration and settlement in the Americas.

Visual and Recreation Classification: The visual quality objective for this zone is *Partial Retention,* which requires management activities to remain visually subordinate to the natural and cultural landscape. This is a primary use area with major visual sensitivity. The recreation opportunity classification is *Rural*.

Resource Setting and Naturalness: The entire World Heritage Site is an attractive cultural landscape, for the most part natural-appearing, with low to moderate evidence of human changes. Modifications range from the historic ruins and associated parking area and groomed landscape, to the forested roadways, to second-growth forest containing less obvious historic materials and introduced plant species from relict gardens. Future modifications at the ruins are appropriate to enhance recreational opportunities, for vistas, and to maintain proper ground cover. Outside the ruins, resource modification and utilization practices may be evident but should harmonize with the natural environment.

Access: Land access is by large tour buses and private passenger vehicles. Water access is by motorized tours on small powerboats on the Chagres River, and occasional yachts that anchor at the mouth of the river. Access from the parking lot to the ruins should be barrier-free and "easy." Access to people with disabilities throughout the rest of the site is difficult and challenging. Facilities for intense motorized use and parking are available. However, motorized vehicles should be limited to existing roads and parking areas.

Remoteness: Despite the relative easy of access, the area's feeling of remoteness is high and intensified by the lack of obvious modern intrusions along this section of the coast. Other than the STRI research crane nearly 4 miles away (and barely visible) and the small dock at the river mouth, there are no structures visible from the ruins.

Trail Construction and Maintenance: Trails within the ruins should be of high quality to emphasize accessibility and visitor safety. Handrails and barriers may be appropriate in some dangerous locations along cliff edges and slippery stairways. Raised walkways or special drainage may be needed for wet sections. Special surfacing may be required for over-used or dangerous sections. A wooden bridge over the first moat would provide barrier-free access to the top portion of the ruins. Outside the main section of the ruins, trails should be smaller and more primitive and constructed without the use of special tread. Foot bridges, if required, would be rustic.

Signage and Interpretation: Within the main ruins area, interpretation is through complex wayside exhibits, although these decrease in size and complexity from the parking area to the far end of the ruins. Interpretive facilities such as kiosks and portals may be staffed part-time; however, very sophisticated exhibits in staffed visitor centers would not be appropriate. Interpretation and signage outside the main ruins area is through simple wayside signs made of native-like rustic materials.

Administrative Facilities and Site Management: Facilities are designed for use by large numbers of people and for special activities. Some may be designed primarily for user comfort and convenience, such as toilets. Others are for site protection, for example car barriers at the edge of the parking area. Some synthetic materials (metal, concrete) may be evident, but still compatible with the site. Facility designs may range from rustic to somewhat complex and refined. Site modification may range from heavy at the parking area at the main ruins, to light in forested zones. Regular maintenance must vary to be compatible with physical and social settings. Grass and shrub cutting around the main ruins and parking should be on a set schedule. Other trails should be monitored and cleared as needed.

Physical Risk and Challenge: Opportunities for wildland challenges, risk-taking, and testing of outdoors skills are low.

Social Encounters: The probability of encountering individuals and groups is high and social interaction may be an important factor for some visitors (e.g., family outings). Special events, such as concerts and weddings, may or may not be appropriate.

Visitor Impacts and Visitor Management: Site hardening may be needed for some high-use areas, such as the parking lot and main trails. The degree and visibility of managerial presence and regulations constraining users and promoting safety are obvious and numerous at the main ruins area, and low elsewhere. For example, posted regulations may be needed for inappropriate recreational activities and loud music. Some type of a security presence might play an important role in providing a satisfactory recreation experience.

6. Potential Issues, Indicators of Change, and Management Remedies

The next step (#4) in the proposed LAC process involves identification of specific *indicators* of resource and social conditions. The following are some examples of possible indicators for site (Table 1). These should be carefully considered by all the stakeholders before baseline inventories are conducted or acceptable levels for each indicator are set.

The "remedies" shown here in the third column illustrate the kinds of managerial responses which could be developed for each issue. They should be specific actions agreed to in advance which are ready and waiting "on-the-shelf" to be automatically triggered once the indicators reach a pre-determined unacceptable level. The ones shown here are not actual recommendations; that should be left to the stakeholders as part of the formal LAC process (Step #8). They are listed in order of increasing intensity to suggest how responses could be gradually phased to adjust to more difficult situations.

For example, if the number of pieces of loose trash (or gross weight or clean up costs… whichever you wish to measure) exceeded the acceptable limit, management would respond by first adding more trash cans. If that did not work, signs could be installed to encourage visitors to properly dispose of their trash, and as a last resort, eating and drinking could be prohibited or limited to certain areas.

Crowding is another key issue. Once the unacceptable level of crowding and visitor conflict is reached, various remedies can be applied. Perhaps the easiest solution would be to redirect visitors to minimize delays, disperse use to underutilized areas, or simply change the direction of recommended traffic flow so that everyone is going the same direction. A well designed tour route could go a long way to increase visitor satisfaction, reduce wasted time, and minimize inter-party conflicts. Later, if problems return or persist, various guidelines or limits could be placed on group size, time spent,

or on the number of vehicles allowed to park at any one time. The last management option might be to impose an entrance or parking fee.

Table 1. Suggested Indicators and Remedies.

Issues	LAC Indicators	Remedies (in increasing intensity)
Trash	Pieces/weight Removal cost	Trash cans Sign messages ("please…") Regulations/prohibitions
Visitor Safety	Accidents	Caution signs Trail redesign Install barriers
Visitor Satisfaction	Complaints	Change management as needed
Crowding	Complaints Numbers of visitors Size of groups Parked vehicles Waiting time	Redesign trails/directional flow Limit parking Limit group size Time guidelines Time limits Charge entrance fees
Vandalism	Graffiti Looting Damage	Sign messages Offer alternatives (visitor book) Law enforcement
Scenic Overflights	Flights Complaints	Recommended guidelines Legal regulations Permit system
Human Waste	Complaints Toilet use Costs to maintain	Inform visitors in advance Add signage Increase number of toilets Remove/change toilets

7. Recommendations

7.1 Apply the principles of LAC to the planning process for the SLPA. Identify general goals and purposes (conditions desired), and key concerns and issues that may affect the site (e.g., overcrowding). Also establish the site as a separate management zone in the planning process.

7.2 With stakeholders, implement a simplified version of LAC:

- Select indicators of resource and social conditions
- Develop baseline (current) data for all indicators
- Establish minimally acceptable levels for each indicator
- Identify management actions to bring conditions up to minimum standards

7.3 Implement management actions to bring conditions up to minimum standards.

7.4 Monitor conditions and implement management actions to respond to conditions which slip below acceptable levels.

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Map 1. Location of the San Lorenzo Protected Area.