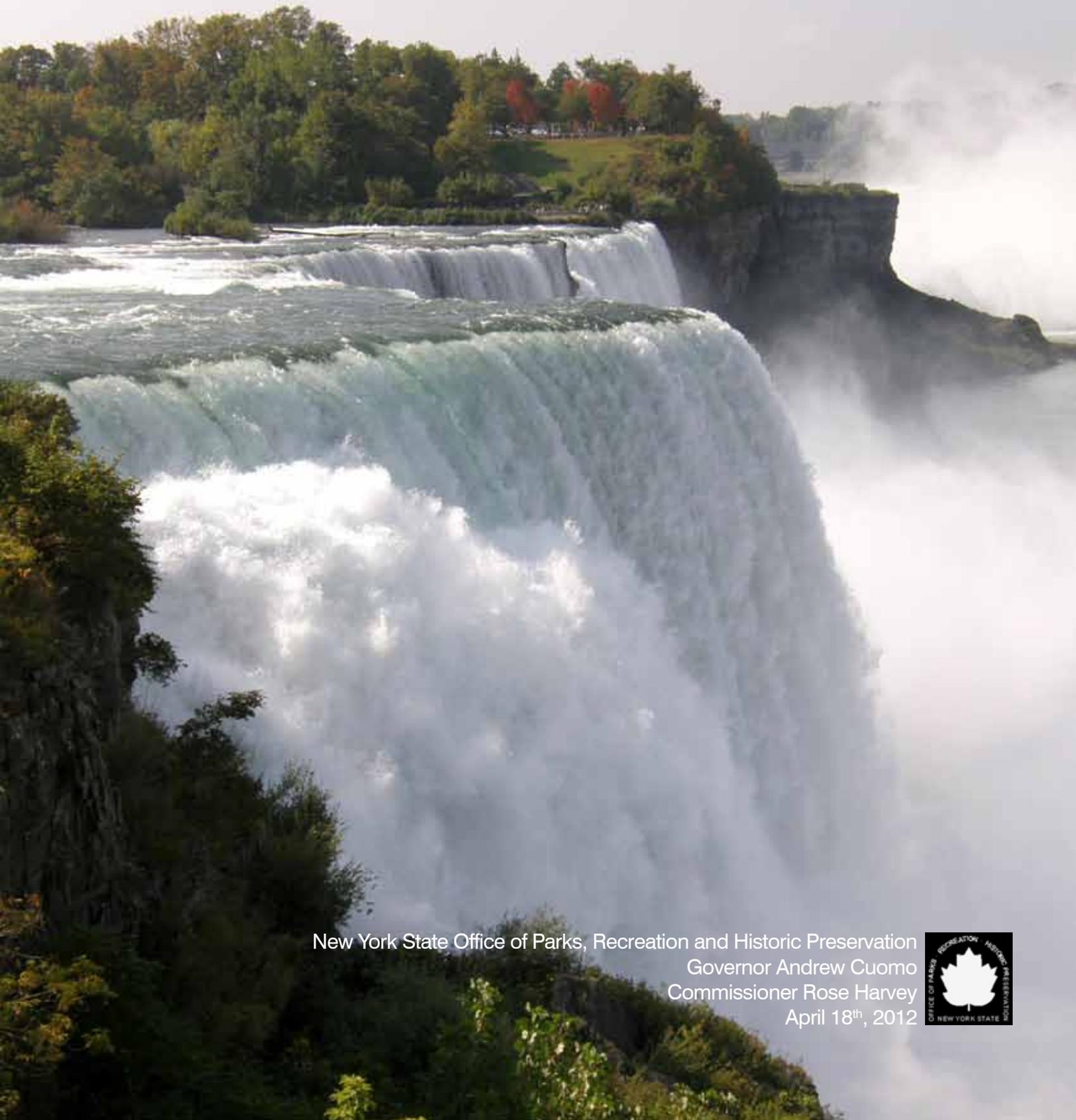


# NIAGARA FALLS STATE PARK LANDSCAPE IMPROVEMENTS PLAN



New York State Office of Parks, Recreation and Historic Preservation  
Governor Andrew Cuomo  
Commissioner Rose Harvey  
April 18<sup>th</sup>, 2012



NIAGARA FALLS STATE PARK  
LANDSCAPE IMPROVEMENTS PLAN

Developed under the direction of OPRHP Staff

Prepared by:





## New York State Office of Parks, Recreation and Historic Preservation

The Governor Nelson A. Rockefeller Empire State Plaza • Agency Building 1, Albany, New York 12238  
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**Andrew M. Cuomo**  
Governor

**Rose Harvey**  
Commissioner

April 18<sup>th</sup>, 2012

Fellow New Yorkers,

Niagara Falls State Park is a state and national treasure. Created in 1885, it is the oldest state park in the nation. Each year, more than 8 million visitors come from across the state, the nation, and the world to wonder at Niagara Falls awesome power and natural beauty. The park is also a huge asset to the western New York economy, contributing to the vitality of the region and serving as a top international tourism destination.

New York State Parks is launching a \$25 million initiative to revitalize Niagara Falls State Park, to assure that the park's public use facilities match the grandeur of the Niagara River, Falls, and Gorge.

This plan describes one element of the Niagara Falls State Parks revitalization initiative – restoration of heavily used park areas that bring visitors to breathtaking vantage points next to the Niagara River and the American and Horseshoe Falls. The plan establishes a long-term vision for restoring eleven major areas within the park, describing specific improvements that are needed at each area. Six of these areas will be restored under the \$25 million revitalization initiative, including Luna Island, Three Sisters Islands, Stedman's Bluff, Terrapin Point, Prospect Point, and the Cave of the Winds Pedestrian Plaza. All landscape improvement projects will be consistent with Frederick Law Olmsted's vision for the park.

In addition to the projects described in this report, State Parks is advancing other rehabilitation work at Niagara Falls under the \$25 million initiative, including way-finding and signage improvements, rehabilitation of park roadways, walking paths, and infrastructure, and designing the replacement of the American Falls Bridge.

Thank you for your interest and support for Niagara Falls State Park.

Sincerely,

Commissioner



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## EXECUTIVE SUMMARY

The New York State Office of Parks, Recreation and Historic Preservation (OPRHP) has initiated a comprehensive planning process to identify capital rehabilitation and improvement projects that should be undertaken in Niagara Falls State Park, to retain its international stature as one of the preeminent parks in the United States, and to provide a world-class experience to the eight million people that visit Niagara Falls each year.

This Landscape Improvements Plan presents a long-term vision for improvements to Niagara Falls State Park. The plan is one component of a larger planning effort that will guide state investments in revitalizing the park.

OPRHP has recently announced a \$25 million revitalization initiative for Niagara Falls State Park. Funding for this initiative will come primarily from Niagara River Greenway funds provided to OPRHP by the New York Power Authority. The \$25 million funding commitment, which will take several years to complete, includes many but not all of the improvement projects described in this Landscape Improvements Plan. The specific projects to be undertaken under the \$25 million initiative are described below. The remaining projects, which are not funded at this time, will be advanced in the future as funding becomes available.

This Landscape Improvements Plan for Niagara Falls State Park outlines specific improvement projects on the most heavily-used areas of Goat Island and the approaches to Goat Island from Prospect Point. The projects are landscape based and include walkway and pedestrian amenity improvements. A design palette of recommended furnishings is also included to facilitate a coordinated approach.

Chapter 1: Introduction provides an overview of the park and the goals and objectives of the study. Chapter 2: The Olmsted Vision and the 1887 Plan for the Niagara Reservation describes

the historic aspects of the park as designed by Frederick Law Olmsted. Chapter 3: Project Areas/Landscape Improvement Concept Plans outlines twelve specific project areas and associated recommended improvements. Chapter 4: Design Palette illustrates recommended pavements, furnishings and design guidelines for small structures in the park. Appendix 1: Relation of this Plan to Other Plans outlines other relevant studies. Appendix 2: Sustainability describes the Sustainable Sites Initiative (SITES) and outlines sustainability strategies that can be considered at the project areas. Appendix 3: Accessibility outlines site initiatives currently planned to expand universal access to the park. It also includes an excerpt from the Draft Final Accessibility Guidelines for Outdoor Developed Areas specific to requirements for accessible routes and facilities in parks. Appendix 4: Site Lighting outlines lighting recommendations for the park.

In total, this plan identifies which public facilities on Goat Island and Prospect Point need rehabilitation and summarizes how approximately \$25 million in capital investments will be divided into twelve discrete projects. Order of magnitude costs are provided for most of the projects. The estimated costs are preliminary estimates, and represent construction costs only. They do not include engineering, survey, geotechnical, or design costs. Nor do they include utilities, site lighting, buildings or other architectural features. The estimates are based on present day costs and may require escalation for future years.

Cost estimates presented in this report will be refined as project designs are completed. As always, the final cost of each project will be determined via New York State's competitive bidding process for capital projects. Because these are preliminary estimates, the actual cost of completing each project could vary.

As mentioned previously, this \$25 million rehabilitation initiative involves twelve projects. OPRHP has divided these projects into two categories. The first set (listed below) will be funded under this initiative and are projected to cost approximately \$16 million. The second set (also listed below) will be initiated in future years, as funding becomes available.

### **Projects Included in the \$25 Million Niagara Falls Initiative**

Funding is currently available for the following projects and will be advanced over the next four years, with construction of at least two projects to commence in 2012.

- Area 1a: Prospect Point (\$1.8 million)
- Area 1b: Lower Grove / American Rapids Trail (\$2.7 million)
- Area 1c: American Falls Pedestrian Bridges (TBD)
- Area 2: North Shoreline Trails (\$1.3 million)
- Area 3: Luna Island (\$1.4 million)
- Area 3a: Luna Island Pedestrian Bridge (TBD)
- Area 4: Stedman's Bluff (\$1.8 million)
- Area 5: Cave of the Winds Pedestrian Plaza\* (\$2.1 million)
- Area 7: Terrapin Point (\$2.6 million)
- Area 9a: Three Sisters Islands – (\$2.5 million)

\*The cost estimate for the Cave of the Winds Pedestrian Plaza only includes outdoor hardscape and landscape improvements. Renovation of the Cave of the Winds building and elevator are separate projects, not included in this cost estimate.

### **Projects Not Funded at this Time**

The projects listed below are projected to cost approximately \$9 million.

- Area 6: Gorge Rim Trails (\$2.4 million)
- Area 8: South Shoreline Trails (\$1.0 million)
- Area 10: Three Sisters Islands Restroom (\$1.0 million)
- Area 11: Central Woodlands (\$1.8 million)
- Area 12: East End Woodland Grove and Shoreline (\$2.8 million)

OPRHP has initiated parallel planning efforts to identify additional priority capital projects in other areas of Niagara Falls State Park, including: a) replacement of the American Falls bridge, which has been spanned by a temporary steel truss to address significant deterioration; b) capital investments to rehabilitate public facilities in other areas of the park, such as the Visitor Center, Discovery Center, Gorge trails, the public trolley system, park signage and lighting, and automobile, bus and pedestrian entrances to the park; and c) rehabilitation projects to modernize the park's utilities and infrastructure including roadways, parking areas, and water, electric, and wastewater systems.

## CHAPTER 1: INTRODUCTION

### Project Overview

The primary purpose of this study is to identify landscape improvement projects and provide design guidelines for park furnishings and materials with the aim of achieving a greater visual consistency and cohesiveness in the park. Design concepts and associated cost estimates have been developed for specific park areas. The proposed site improvements in this study have been influenced by the original Olmsted and Vaux plan for the park, and the “Olmstedian Principles of Design” compiled by notable Olmsted scholar Charles Beveridge.<sup>1</sup>

The historic design principle provides a basis for developing practical design and management strategies with a park that receives more than eight million visitors a year. The goal has been to maintain important historic principles, while also accommodating contemporary uses, needs and demands.

### Summary of Goals and Objectives

The goals and objectives of the Landscape Improvements Plan are summarized below:

- Develop strategies for park rehabilitation that reflect the overall intent of the Frederick Law Olmsted/Calvert Vaux 1887 General Plan, with appropriate modifications for contemporary park use.
- Incorporate sustainable landscape management and maintenance practices in the planning and implementation of all rehabilitation projects.
- Outline strategies to restore the diverse forest and shoreline ecosystems with native plant communities.

- Develop concept plans for improvements to the following priority areas of the park:

- 1a. Prospect Point
- 1b. Lower Grove / American Rapids Trail
- 1c. American Falls Pedestrian Bridges
2. North Shoreline Trails
3. Luna Island
- 3a. Luna Island Pedestrian Bridge
4. Stedman’s Bluff
5. Cave of the Winds Pedestrian Plaza
6. Gorge Rim Trails
7. Terrapin Point
8. South Shoreline Trails
9. Three Sisters Islands
10. Three Sisters Islands Restroom
11. Central Woodlands
12. East End Woodland Grove and Shoreline

- Reduce the amount of paved surfaces and lawn areas throughout the park where appropriate and consistent with operating needs.
- Define a palette of site furnishings, railings, paving and other materials to be used consistently throughout the park.
- Develop budget estimates.

### Project Planning Approach

A comprehensive approach has been taken in the development of this Landscape Improvements Plan. The approach is to balance the historic vision with ecological sustainability and accommodation of contemporary uses, needs and demand. The landscape improvement proposals that have been developed are consistent with the historic design intent in the Olmsted/Vaux 1887 plan for the Niagara Reservation.

<sup>1</sup> Olmsted City, p. 11

This study has also been coordinated with other initiatives including:

- Niagara Reservation State Park 1982 Master Plan
- Niagara Falls State Park Operations Plan
- Robert Moses Parkway – South “Riverway” Restoration Project
- Niagara River Greenway Plan
- Niagara Falls National Heritage Area

This Niagara Falls State Park Landscape Improvements Plan is based on a comprehensive assessment of the current conditions and the historic features of the park. Recommendations have been provided for repair, improvement and maintenance.

## Universal Access

The NYSOPRHP remains committed to ensuring that all current and future designs adhere to the applicable standards of the Americans with Disabilities Act (ADA). Appendix 3: Accessibility outlines planned improvements for universal access on Goat Island.

An excerpt of the Draft Guidelines for Outdoor Developed Areas that address picnic facilities, viewing areas, outdoor recreation access routes, trails, camping, and other facilities is included.

## Sustainability

Sustainability is defined by The Sustainable Sites Initiative (SITES) as, “design, construction, operations, and maintenance practices that meet the needs of the present without compromising the ability of future generations to meet their own needs.”<sup>2</sup>

Sustainable practices and management decisions range from reduced mowing regimens and remediating compacted soil to selecting furnishings and paving materials that are constructed with sustainable materials, contain recycled materials, and can be reused or recycled at the end of their useful life. Ongoing management practices, such as reducing energy consumption and reducing the need for irrigation, also are important sustainable strategies.

Appendix 2: Sustainability describes the SITES program and identifies sustainability strategies appropriate to the park.

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2 The Sustainable Sites Initiative, p. 8

## CHAPTER 2: THE OLMSTED VISION AND THE 1887 PLAN FOR THE NIAGARA RESERVATION

### Historic Olmsted Plan

Niagara Falls State Park is the oldest state park in the United States. The scenic reservation was established by New York State in 1885, and in 1887 Frederick Law Olmsted, along with his colleague Calvert Vaux, prepared a master plan for the preservation and enhancement of the natural landscape and scenery surrounding Niagara Falls, along with the islands and river rapids above the falls.

The original vision of preserving and restoring the natural scenery surrounding the falls must be considered within the context of the current demands of eight million visitors per year. Through the years the park has accommodated steadily increasing numbers of visitors, and in order to provide facilities for this increased usage

and demand for visitor services, substantial modifications have been made to the park. Modifications have included new roadways, parking areas, structures, large expanses of lawn, and paving. Such action has resulted in the removal of natural plantings and landscapes.

This trend was initially addressed subsequent to the adoption of the 1982 Master Plan and Environmental Impact Statement for Niagara Falls State Park. This plan called for making major improvements to the visual quality of the “Reservation” and signaled the beginning of a process to return to a more naturalized environment consistent with the original vision and intent of the park.

### 1887 Olmsted and Vaux Plan



While it is difficult to discern what of Olmsted and Vaux's proposed 1887 layout of roads, trails, and other improvements were ever even implemented, his design intention has to a large degree survived and is as relevant today as it was when first introduced.

Existing infrastructure, structures, parking areas and other hardscape improvements as well as changes to the City-Park interface would make a literal implementation of the 1887 plan quite difficult. However, a Cultural Resource survey could determine the extent of historic elements remaining and could offer more detailed and informed guidance when responding to the legacy of the historic plan as contemporary improvements are considered.

The following "Olmstedian Principles of Design"<sup>1</sup> have influenced the design concepts and landscape improvement recommendations in this plan. The principles of "Scenery," "Suitability," and "Subordination" were particularly influential.

- **Subordination:** The subordination of all elements, features and objects to the overall design.
- **Separation:** Separation of areas designed in different styles; separation of movement to ensure safety; separation of conflicting or incompatible uses.
- **Sanitation:** Adequate drainage and engineering, not just surface arrangement; designs to promote physical and mental health of users.
- **Service:** Design serves direct social and psychological needs.

- **Scenery:** Designs that give a sense of movement through a series of spaces large and small that constantly open up to new views. This is achieved by indefinite boundaries and the play of light and shadow.
- **Suitability:** Respect for the local site and its natural scenery, vegetation and topography.
- **Style:** Use of different styles with specific purposes: 'pastoral' for soothing, 'picturesque' for a sense of richness and bounteousness of nature and for a sense of mystery.

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1 Olmsted City, p. 11

## CHAPTER 3: PROJECT AREAS / LANDSCAPE IMPROVEMENT CONCEPT PLANS

Goat Island and the approaches from Prospect Point have been divided into discrete management zones which correspond to the viewing sequence outlined in the Olmsted/Vaux “General Plan for the Improvement of the Niagara Reservation” written in 1887.

The proposed project areas are indicated on the diagram on this page. Proposed landscape improvements for each project area are described on the following pages in Chapter 3.

Illustrations that demonstrate the collective appearance of specified design elements may be used as a way of defining the theme in particular areas of the park, i.e., natural, historic, contemporary, city interface. Drawings that illustrate the entire ensemble should be submitted for each project area at the time of detailed design.

Criteria for determining path width, curb type, pavement mix, signage, rails and bollards should be determined based upon actual use, topographic limitations, ADA requirements, shared use if any, vehicle class, and alternate routes for service and emergency vehicles.





LEGEND

- 1. Approaches to Goat Island
- 1a. Prospect Point
- 1b. Lower Grove / American Rapids Trail
- 1c. American Falls Pedestrian Bridges
- 2. North Shoreline Trails
- 3. Luna Island
- 3a. Luna Island Pedestrian Bridge
- 4. Stedman's Bluff
- 5. Cave of the Winds Pedestrian Plaza
- 6. Gorge Rim Trails
- 7. Terrapin Point
- 8. South Shoreline Trails
- 9. Three Sisters Islands
- 10. Three Sisters Islands Restroom
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## 1a: Prospect Point

Prospect Point is the point of arrival and visitor orientation for the park. Olmsted and Vaux identified the Upper Grove and Prospect Point as the preferred locations for visitor services. However, Goat Island is a main attraction of the park, and helps to distribute the impact of high volume visitation overall.

Olmsted and Vaux noted that Prospect Point was an area that simultaneously afforded a view of the American Falls and the river above it, a view of the islands between the American and Canadian Falls, a view of the Canadian Falls, and the background of “verdurous declivity” of the Ontario Reservation. They even recommended constructing an inclined structure at this overlook to “allow visitors at a distance to look over the head of those nearer the more attractive point.”

Olmsted and Vaux recognized that from this point, visitors could orient themselves to the entire area – the falls, the rapids, and the forests – before setting off to experience each of the special park elements individually.

While the views from this location are spectacular, the physical environment is degraded. The area should be improved to reflect its stature as a primary viewing point of a National Natural Landmark and an international destination.

Rehabilitation of the area should address potential improvements to plantings, pavements, railings, and furnishings.



Concept Design Plan



Existing Conditions



Proposed Site Improvements

### Magnitude Costs

Prospect Point	
Mobilization / General Conditions	\$394,000
Demolition / Site Preparation	\$ 87,000
Railings	\$535,000
Site Improvements / Furnishings	\$318,000
Planting	\$134,000
Contingency	\$337,000
<b>TOTAL</b>	<b>\$1,805,000</b>



## 1b: Lower Grove / American Rapids Trail

The Lower Grove trails follow the American Rapids upstream to the American Falls pedestrian bridges and beyond. These trails provide views and landscape experiences that are less spectacular, but no less significant or interesting, than those at the falls. The rapids provide opportunities to study the interplay of water and light against the sound of the rushing water. This is an area of contemplation, different from other areas in the park.

Landscape rehabilitation strategies in this area should focus on re-establishing the quiet viewing, contemplative qualities of the area, while also accommodating groups of pedestrians passing from Prospect Point to the American Falls Pedestrian Bridges and Goat Island.

Hierarchy should be established between the upper and lower walkways to indicate that the upper walkway is the through-route, and the lower walkway is the more scenic route.

Clear separation should be established between the upper and lower walkways. This could be accomplished by replacing the lawn with a low-growing groundcover and meadow grasses. Installing cobbles or similar rough-textured material at the edges of the walkways would visually define walkway edges, and encourage pedestrians to stay on the main walking surface.

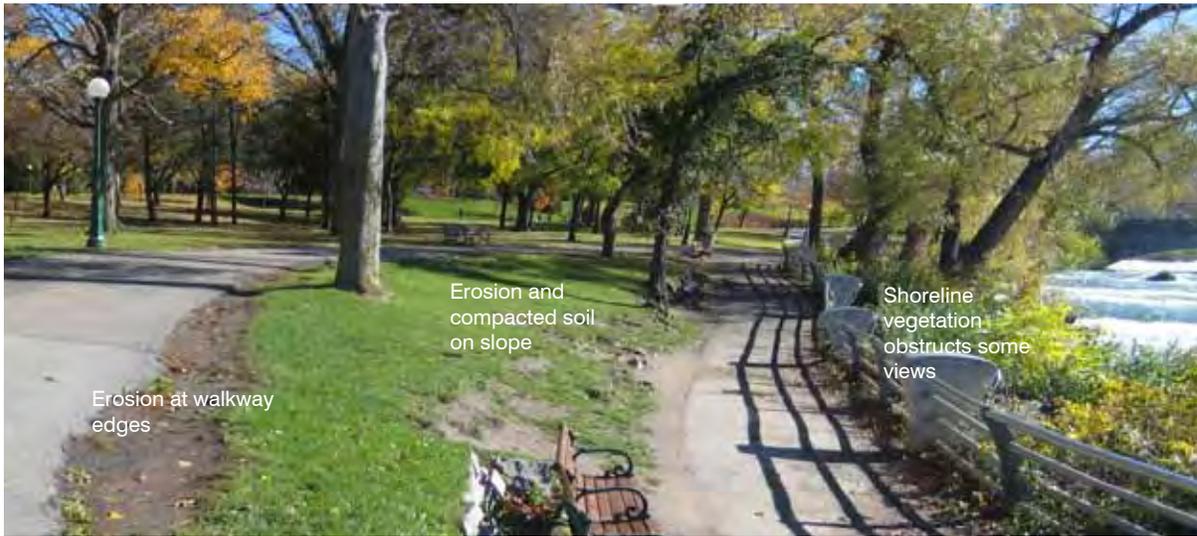
A stormwater management system should be installed to intercept run-off before it reaches the slope between the upper and lower walkways. This stormwater system could be integrated into a cobble gutter at the edge of the upper walkway.

Salt used to clear winter walkways has contributed to vegetation decline here and in other areas. New salt-tolerant plants should be installed where salt is used frequently.

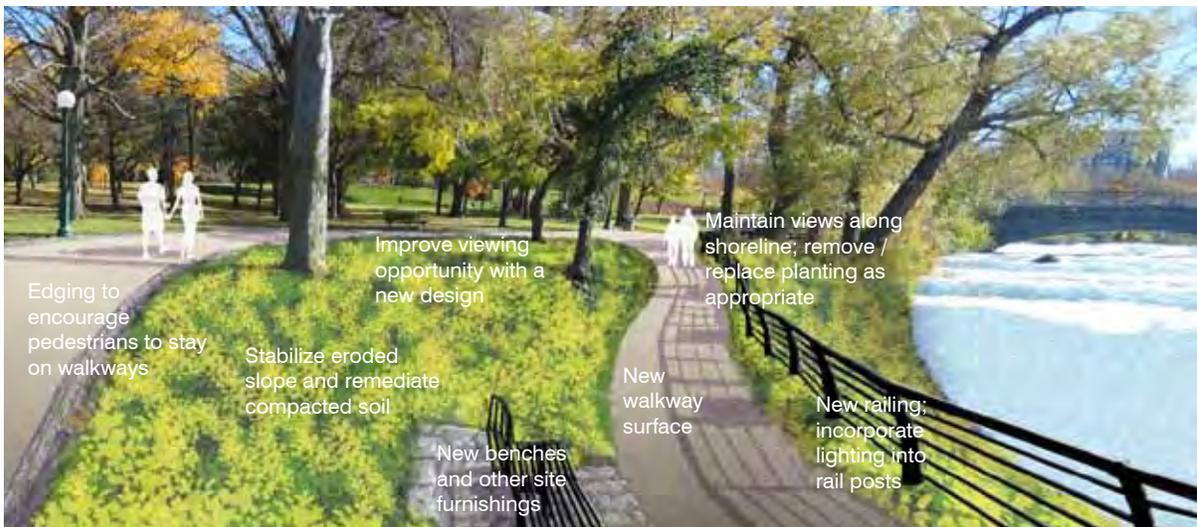
Trimming and/or removing overgrown vegetation between the railing and the shore would open up views for patrons.



Concept Design Plan



Existing Conditions



Proposed Site Improvements

### Magnitude Costs

Lower Grove / American Rapids Trail	
Mobilization / General Conditions	\$564,000
Demolition / Site Preparation	\$112,000
Railings	\$878,000
Site Improvements / Furnishings	\$424,000
Planting	\$212,000
Contingency	\$503,000
<b>TOTAL</b>	<b>\$2,693,000</b>



## 1c: American Falls Pedestrian Bridges

Constructed in 1901, two stone facade arch bridges provide access between Prospect Point, Green Island and Goat Island. Pedestrians have expansive, iconic views of the rapids and the river from these bridges.

The bridges are significantly deteriorated and in need of repair. In 2004, they were spanned with a temporary steel truss structure. Utilities serving the tourist facilities on Goat Island are conveyed across the bridges, beneath the paving.

Plans are currently underway to either replace or rehabilitate these bridges. Though this report does not include a cost estimate, replacing the bridges is expected to exceed \$25 million.

Several walkways converge at the northeast (mainland) entrance to the bridges. At present this area contains a variety of paving styles, site furnishings and signage. These landscape features should be simplified to create a clear, cohesive transition between the mainland and the bridges crossing to Goat Island.

The Goat Island end of the bridges intersects with the North Shore line Trails. This is the first area many pedestrians experience on Goat Island. It would be appropriate to create a simple plaza in this location with way-finding signage.



Concept Design Plan

Magnitude costs for landscape improvements associated with the American Falls Pedestrian Bridges to be included in bridge reconstruction costs.





## 2: North Shoreline Trails

Though the North Shoreline Trails on Goat Island parallel the Lower Grove trails along the American Rapids, they provide different views and experiences.

The lower trail between the American Falls Pedestrian Bridges and Luna Island has a mysterious quality, with a steep wooded bank on one side and the rapids on the other. Here the rapids are less tumultuous than those in the main channel as they are tamed by the islets (Bird Island, Crow Island, Cedar Island, Seldom Seen Island, Juniper Island, Rock Island, and Robinson Island).

The existing asphalt walk is narrow with chipped edges bordered by bare and eroded soil. In several locations pedestrians have created “outlaw trails” to access the water’s edge and capture intimate views of the river.

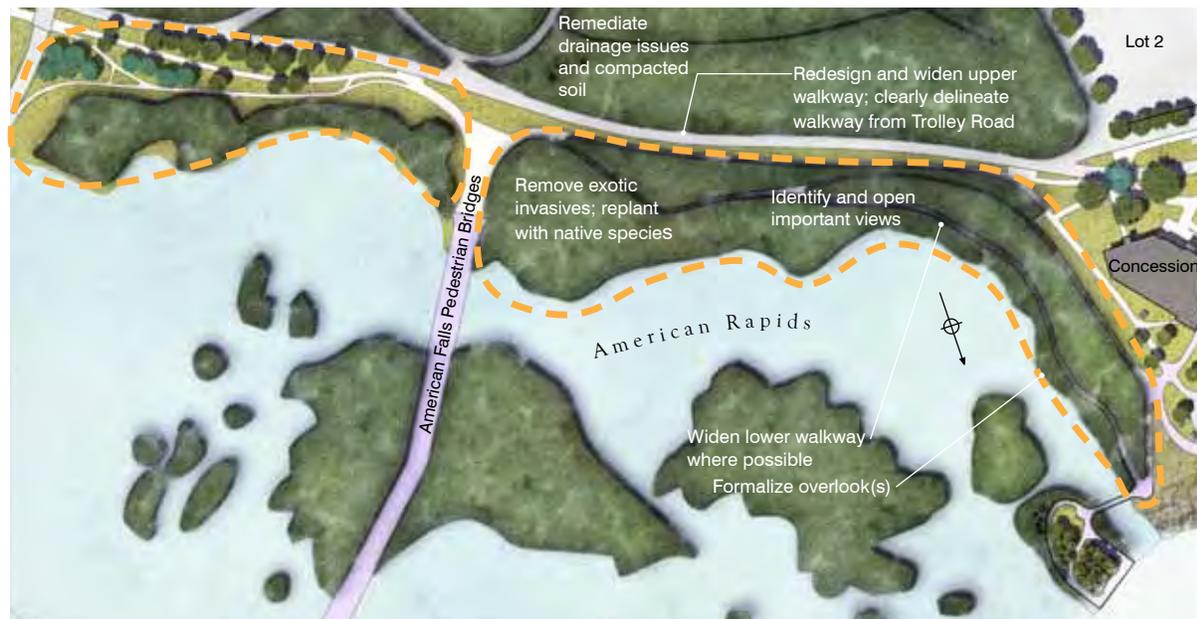
Exotic invasive plant species have become prevalent in the forest understory on the north slope between the bridges and Luna Island.



In some locations along the upper trail at the top of the slope, vegetation has been removed with a brush-hog type of machine, apparently to open views, with no regard to the species being removed or the importance of the views. This type of wholesale clearing should cease as it is destructive to the forest and the visual environment.

Important views from both the upper and lower walkways should be identified, and vegetation should be selectively cleared to open up these views.

Other improvements in this area should focus on widening the walkways as appropriate, based



Concept Design Plan

on topographical limits and patron use, and highlighting important overlooks. Edging should be installed along the walkways to minimize damage from foot traffic.

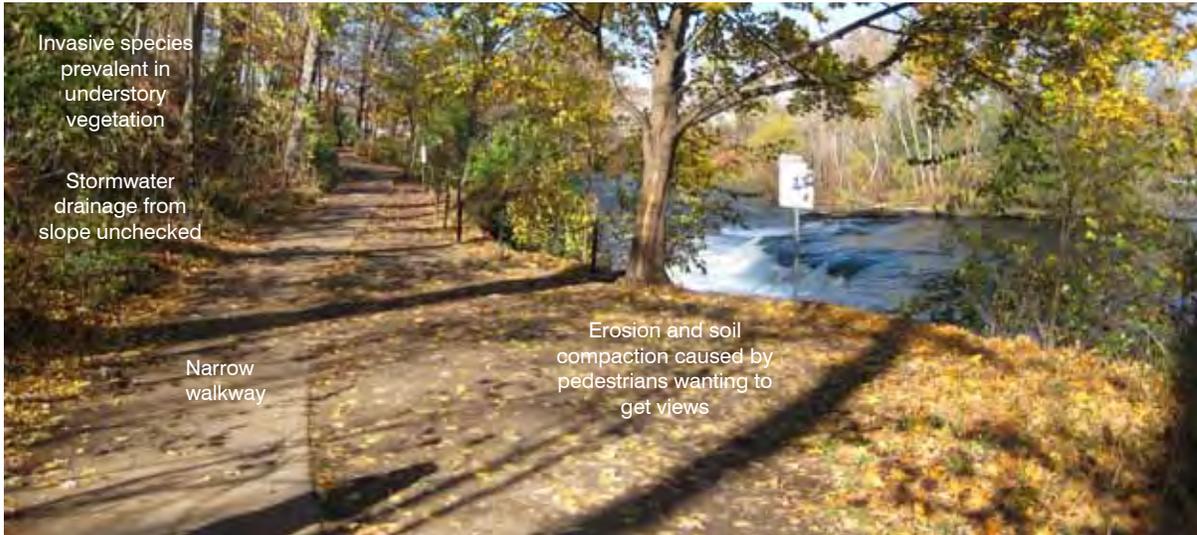
Exotic invasive species should be removed from the forested slopes, and the slopes should be replanted with regionally appropriate species.

Design for the lower trail should provide access for maintenance and emergency vehicles if feasible.

The feasibility of making the lower trail universally accessible should be explored. If feasible, conversion of this route to an ADA route would provide universal access to the currently inaccessible Luna Island.

### Magnitude Costs

North Shoreline Trails	
Mobilization / General Conditions	\$300,000
Demolition / Site Preparation	\$203,000
Railings	\$ 18,000
Site Improvements / Furnishings	\$421,000
Planting	\$126,000
Contingency	<u>\$245,000</u>
<b>TOTAL</b>	<b>\$1,313,000</b>



Existing Conditions



Proposed Site Improvements



### 3: Luna Island

Luna Island provides patrons with some of the most astonishing experiences in the park. While Olmsted believed that the superior view was from Stedman’s Bluff above Luna Island, this small island has become one of the most popular destinations in the park. It is less about the spectacular view and more about the physical, visceral experience. Pedestrians are immediately drawn in groups one or two deep along the railing at the edges of the island where they are at nearly the same elevation as the water crashing over the brink.

Luna Island once had much more vegetation than it does today. Historic photos show an abundance of conifer trees on the island. It appears that the current condition is a remnant of a project conducted in the 1950s to blast unstable rock from the face of the island. It appears that the area disturbed by the blasting operation was restored with asphalt and lawn.

Today the center lawn panel has been so trampled that it barely supports lawn. The soil is severely compacted, tree roots are exposed and there is severe soil erosion. The one tree in the center of the island is an exotic invasive hedge maple. The plant communities on the shores of the island,



This photo shows the historic vegetated condition of Luna Island in the early 1900s.

beyond the rail, include a mix of native and invasive shrubs and groundcover.

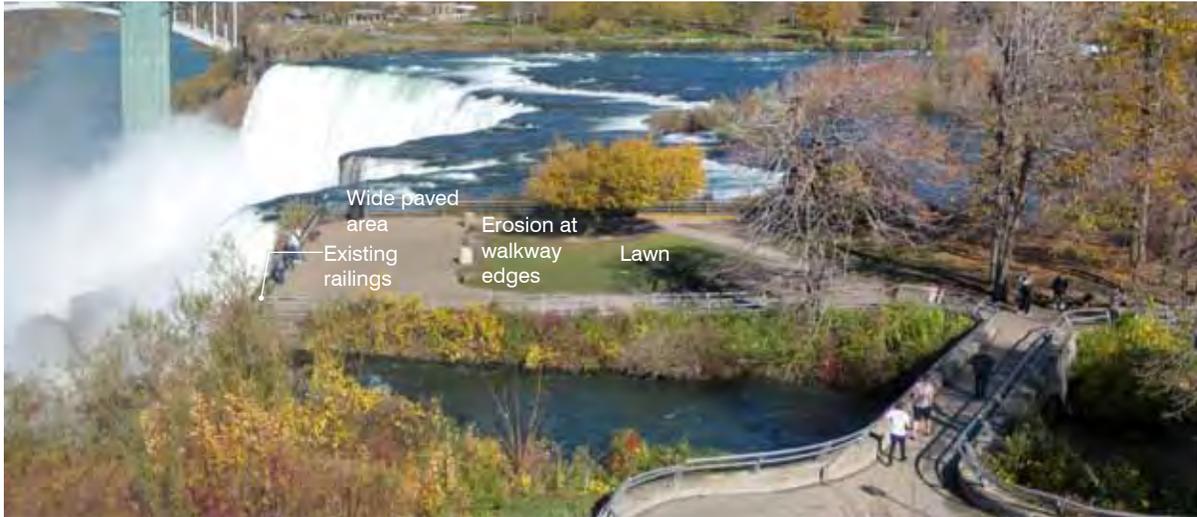
Luna Island should be re-landscaped in a manner consistent with other locations on Goat Island. This will require soil remediation, importation of new soil appropriate to the conditions, and new, regionally-appropriate plantings.

The design that is currently being developed includes replacing the railings and creating a gentle mound in the center of the island to support new vegetation. Boulders at the perimeter of the planting area would provide seating, while also discouraging pedestrians from leaving the hardscape. Any new plantings should be kept low at the western end of Luna Island to maintain views of the falls from Stedman’s Bluff. Plants with the potential to adapt to the sculpting influences of wind and ice, a process which then contributes to the development of the picturesque aesthetic of the landscape, should be selected. The precipice of Luna Island shall be paved in a manner reflecting its status. Existing walkways will be regraded to be ADA compliant on the island itself.

A small amount of low level, unobtrusive bollard lighting should be installed at the east end of the island for the convenience of night-time visitors.

#### Magnitude Costs

Luna Island	
Mobilization / General Conditions	\$125,000
Demolition / Site Preparation	\$ 45,000
Railings	\$570,000
Site Improvements / Furnishings	\$305,000
Planting	\$160,000
Contingency	\$146,000
<b>TOTAL</b>	<b>\$1,351,000</b>



Existing Conditions - As Viewed From Stedman's Bluff



Concept Design Plan



Proposed Site Improvements - Section



### 3a: Luna Island Pedestrian Bridge

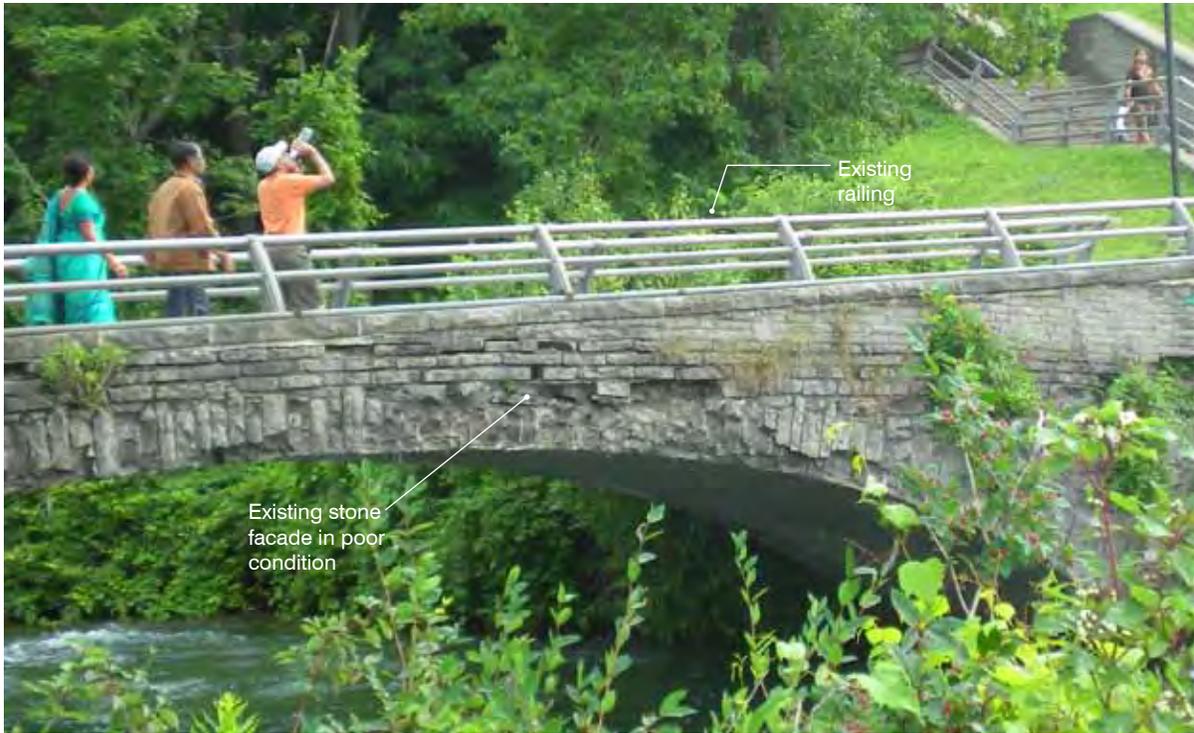
The stone bridge connecting Luna Island to Goat Island is degraded and in need of rehabilitation. A structural analysis is needed to determine the correct course of action. Bridge repair should include restoring the stone facing on the bridge and replacing the railings in a manner stylistically consistent with the railings on Luna Island.

Technical issues to be addressed in the rehabilitation of the bridge will include determining the need and scope for removal of the above grade portion of wing walls; sheet drainage from all areas of the bridge deck; and the installation of bollards to prevent vehicle passage.

Consideration should be given to extending the paving material proposed for Luna Island across the bridge deck.



Magnitude costs for landscape improvements associated with the Luna Island Pedestrian Bridge to be included in bridge reconstruction costs.



Existing Conditions



Proposed Site Improvements



## 4: Stedman's Bluff

The Stedman's Bluff overlook and the Cave of the Winds Pedestrian Plaza areas receive some of the most concentrated pedestrian traffic on Goat Island. Stedman's Bluff allows spectacular views of the American Falls and is an important viewing area. Care should be taken to maintain this view, particularly for individuals with disabilities.

Landscape rehabilitation strategies in this area should focus on remediating soil compaction and re-establishing low-growing understory vegetation. Views should be maintained between the tree-line and the surface of the understory for safety and aesthetic reasons.

Walkways and seating should be replaced and reconfigured to accommodate heavy pedestrian traffic while also preserving vegetation. The amount of paving should be appropriate to patron loading.

In addition to perimeter seating, local quarried boulders along the perimeter of the planting area will protect bluff plantings from patron traffic, much like the boulders on Luna Island. In green areas along the gorge where patron impacts are less but still a chronic threat, a combination of benches, boulders, pipe rails and shrubbery should be installed.

### Magnitude Costs

Stedman's Bluff	
Mobilization / General Conditions	\$385,000
Demolition / Site Preparation	\$ 55,000
Railings	\$380,000
Site Improvements / Furnishings	\$293,000
Planting	\$315,000
Contingency	\$328,000
<b>TOTAL</b>	<b>\$1,756,000</b>



Concept Design Plan



Existing Conditions



Proposed Site Improvements



Existing Conditions



Proposed Site Improvements



## 5: Cave of the Winds Pedestrian Plaza

The Cave of the Winds Pedestrian Plaza is consistently the most active area on Goat Island. Visitors tend to congregate in large groups here to access visitor services such as restrooms, concessions and the Cave of the Winds tours. The park's public safety office also is located at the west end of the concession building.

The decision to re-route the trolley route to avoid this plaza provides an opportunity to reconfigure the queuing lines (greater separation and efficiency) for the Cave of the Winds tour and concessions.

Additional restroom facilities are needed in this area.

Since the concession area is operated privately and the Cave of the Winds is operated by OPRHP, it is important that all capital improvements be properly coordinated to ensure that both features function effectively and in a manner that provides patrons with the best possible experience.

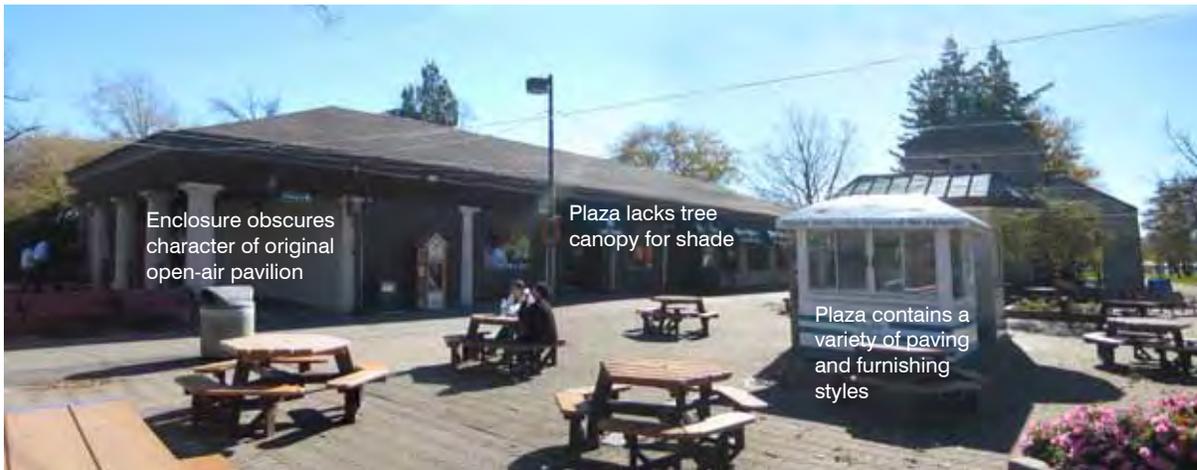


Concept Design Plan

Since the plaza needs to accommodate upwards of 120 patrons at one time, pedestrian flow is critical. Thus, the following amenities should be carefully considered: Paving, Tables & Benches (shape, size, quantity, and location), Trees (species, form, canopy, ice load, salt tolerance, pavement upheaval), and Grading and Drainage.

### Magnitude Costs

Cave of the Winds Pedestrian Plaza	
Mobilization / General Conditions	\$432,000
Demolition / Site Preparation	\$ 64,000
Railings	--
Site Improvements / Furnishings	\$1,090,000
Planting	\$ 95,000
Contingency	\$374,000
<b>TOTAL</b>	<b>\$2,055,000</b>



Existing Conditions



Proposed Site Improvements



## 6: Gorge Rim Trails

The Gorge Rim trails follow the edge of the gorge between Stedman’s Bluff and Terrapin Point, connecting two very popular viewing areas. The walkways also provide connections to the nearby Cave of the Winds concession area and the Top of the Falls restaurant. There are opportunities for establishing seating areas that provide quiet, contemplative views of the gorge in this area of the park.

Improvements in this area should focus on replacing the railing and furnishings along the gorge rim and assessing width of walkways based on visitor use. In some instances walkways may need to be widened, and in others it may be appropriate to reduce the amount of paving.

The area between the Cave of the Winds Pedestrian Plaza and the top of the Falls Restaurant was once forested, but is now maintained as a lawn area with trees. Although potentially an area that could be returned to forest with understory, maintaining a safe environment for park visitors is paramount.

New trees and shrubs to be planted will be selected based upon a palette derived from existing inventories of native plants, as per Eckel 1990 and Wesley 2005. Planted areas should be less than 200 sf each and maintained below eye level, with simple mulch groundcover. Selections should warrant no more maintenance than annual weeding, pruning and mulch.



Concept Design Plan



Existing Conditions - Gorge Rim



Proposed Site Improvements - Gorge Rim

## Magnitude Costs

<b>Gorge Rim Trails</b>	
Mobilization / General Conditions	\$510,000
Demolition / Site Preparation	\$111,000
Railings	\$950,000
Site Improvements / Furnishings	\$292,000
Planting	\$ 87,000
Contingency	<u>\$450,000</u>
<b>TOTAL</b>	<b>\$2,400,000</b>



## 7: Terrapin Point

Terrapin Point provides outstanding views and landscape experiences of the Horseshoe Falls. Historically, it was a small island or large rock that was reached by a series of bridges. Since the slope leading to the point is very exposed to harsh winter winds and ice loading, it does not support large woody vegetation. Over time the area between the point and the mainland has been filled in and the slope has been converted to lawn.

Similar to Luna Island, the visitors here tend to congregate in small groups one or two deep along the railing to view the Falls and experience the thrill of being at the same elevation as the thundering water. Other similarities include the need to replace pavement and the existing railings (top rails at this location are severely deformed due to the effects of ice loading).

The extent of paving in this overlook area should be reevaluated to determine what is necessary to accommodate patron loading. The style of paving

should be consistent with significant overlook areas throughout Goat Island. The feasibility of providing an ADA compliant route to Terrapin Point should be explored.

Since light spillage from existing lights on the Falls already provides a significant amount of light in this area, it may be possible to replace the existing pedestrian lights with bollards.

In selected areas, consideration should be given to introducing native meadow. Though the healthy meadows adjacent to Terrapin Point and elsewhere on Goat Island should be investigated further to identify the exact species at these locations, these new meadows should be planted with annual grasses and wildflowers to achieve a cover quickly. Perennial species should also be introduced and include a combination of seed, plugs, and potted plants. Grasses should comprise 90% of the plant mix to slow successional intrusions. To avoid a weedy appearance, species selection should strive for uniformity in meadow height and texture.





Existing Conditions



Proposed Site Improvements



Plant selections should be amenable to annual or twice annual mowing. Erosion control in sloped areas of mixed planting can be achieved with compost slurries, fiber mulch, and coir logs. Woody plants and invasives should be removed on an annual basis using a combination of mechanical and chemical means, with the goal of achieving a lush, low maintenance herbaceous groundcover.

### Magnitude Costs

Terrapin Point	
Mobilization / General Conditions	\$450,000
Demolition / Site Preparation	\$ 76,000
Railings	\$780,000
Site Improvements / Furnishings	\$738,000
Planting	\$157,000
Contingency	\$390,000
<b>TOTAL</b>	<b>\$2,591,000</b>



## 8: South Shoreline Trails

The South Shoreline trails provide views of the Canadian rapids. The views and landscape experiences in this area are expansive, since the river is quite wide at this point.

Improvements in this area should focus on reducing the amount of lawn, formalizing one or two important viewing areas, and replacing the understory planting in the wooded area on the north slope.

Though much of the lawn along the South Shoreline Trail should be replaced with low-growing native or regionally-appropriate plantings, a strip of lawn should be retained along the walkway to provide a unified appearance along the trail's length, to keep taller meadow grasses from spilling onto the pathway, and to enhance safety.

In some locations on the slope north of the walkway, vegetation has been removed using a brush-hog type of machine without regard to species, presumably to open up views from above. This method of indiscriminate vegetation removal should be prohibited, as it allows exotic

invasive species to become established in what previously were relatively healthy forested areas.

Olmsted and Vaux did indicate some significant viewing areas from the South Shoreline in their 1887 plan. These viewing areas could be formalized in a manner that is appropriate to the natural and tranquil setting. Views to the rapids from the walkway on the top of the slope also could be established by selectively removing vegetation.



Concept Design Plan



Existing Conditions



Proposed Site Improvements

### Magnitude Costs

South Shoreline Trails	
Mobilization / General Conditions	\$231,000
Demolition / Site Preparation	\$ 76,000
Railings	--
Site Improvements / Furnishings	\$155,000
Planting	\$310,000
Contingency	\$177,000
<b>TOTAL</b>	<b>\$949,000</b>



## 9: Three Sisters Islands

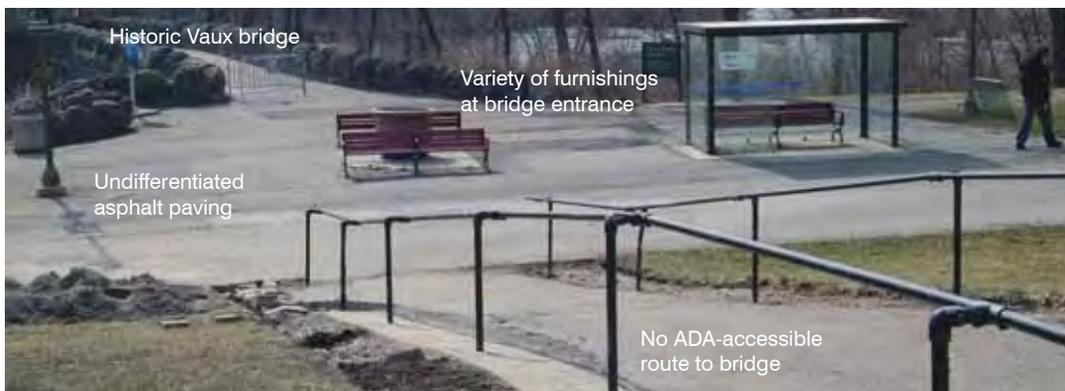
The Three Sisters Islands provide some of the most intriguing and intimate experiences in the park. From the Third Sister Island visitors can nearly touch the rapids and have expansive views of the river in all directions. The vegetation on these islands is lush and richly varied, although it has been degraded by the introduction of exotic invasives.

Since Three Sisters Islands is among the most popular areas on Goat Island, the adjacent parking is in great demand. Unfortunately, the route between the parking area and the first Island is not ADA compliant, nor are the primary walkways that connect the first, second and third Islands.

The stone bridge between Goat Island and the First Sister Island was designed by Calvert Vaux.

The concrete bridges between the First and Second Sister Island and the Second and Third Sister Island were constructed in the 1940s, and are visually jarring relative to the historic Vaux bridge. The decks of those bridges are in good condition, but the railings are failing.

The landscape of the Three Sisters Islands is the most diverse and ecologically varied of any location within the park. The *Goat Island Historic Restoration: Executive Summary* includes an inventory and description of the plant communities on the islands. Vegetation communities include upland forests, wetlands, fens, limestone barrens and shoreline fringe. Many areas of the islands exhibit a high degree of ecological integrity. Other areas have significant populations of invasive species. The shores of the islands are badly invaded by purple



Existing Conditions



Proposed Site Improvements



Proposed Site Improvements for Three Sisters Islands

April 18<sup>th</sup>, 2012



loosestrife, (*Lythrum salicaria*), an aggressive exotic species that destroys habitat. The dry uplands in some areas are badly invaded by non-native shrubs, especially hybrid honeysuckles (*Lonicera*).

The proposed design for the Three Sisters Islands includes enhancements that are consistent with the stature and character of the islands. Proposals include a new trolley stop, expanding existing and ADA parking, and creating an ADA compliant walkway that links the new parking with the islands. The primary walkway that traverses the islands will be widened to accommodate patron loading and will be constructed to ADA standards. Formalized overlooks will be constructed that highlight viewing opportunities and these too will be ADA compliant.

Soil remediation, removal of exotic invasive vegetative species, and planting of native species has been incorporated into this project. In addition, OPRHP is investigating how best to

manage (long term) invasive species utilizing a combination of in-house forces and outside groups.

Controlling access in ecologically sensitive, but highly scenic natural areas should be improved to guide access in order to preserve restoration efforts. Separation of the resource from the patron can include ‘elements of guidance’ such as boulders, low or high rails, bollards, fencing, shrubs, and signage.

### Magnitude Costs

Three Sisters Islands: Phase I	
Mobilization / General Conditions	\$190,000
Demolition / Site Preparation	\$143,000
Railings	\$693,000
Site Improvements / Furnishings	\$690,000
Planting	\$554,000
Contingency	\$250,000
<b>TOTAL</b>	<b>\$2,520,000</b>



Existing Conditions



Proposed Site Improvements

## 10: Three Sisters Islands Restroom

In his 1887 General Plan, Olmsted recommended the construction of only two structures on Goat Island. “Both are in the midst of the woods; they are intended to be simply large roofs supported upon piers of rough masonry, without walls, except... there should be inclosures (sic) for water-closets, and the keeping of police conveniences....” The drawing accompanying Olmsted’s narrative shows one intended structure in the location of the existing restrooms near the Three Sisters parking area. The other was in the area that is now the Cave of the Winds Pedestrian Plaza.



This photo shows the open air pavilion that was constructed at the Three Sisters comfort station in 1913.

The open air pavilion Olmsted recommended near the entrance to the Three Sisters Islands was completed in 1913. “The ground around the Three Sisters comfort station has been graded and seeded, and the paths laid out and built. An opening was made by removing some trees in front of the building and a fine view of the Canadian rapids is a result,” the Reservation officials said in the 20th Annual Report to the Commissioners. A photo of the new structure accompanied the description.

Consideration should be given to re-establishing an open-air pavilion on the east end of the island since none currently exists to accommodate gatherings. Siting should consider proximity to parking, restrooms and access to views. The feasibility of utilizing the historic theme of the columned arcade should be explored.

### Magnitude Costs

Three Sisters Comfort Station Area	
Mobilization / General Conditions	\$165,000
Demolition / Site Preparation	\$ 60,000
Railings	\$150,000
Site Improvements / Furnishings	\$150,000
Planting	\$115,000
Contingency	\$110,000
<b>TOTAL</b>	<b>\$600,000</b>



Three Sisters Islands Restroom



## 11: Central Woodland

The “verdure” of Goat Island was frequently noted in Olmsted’s writings, and in the writings of other noted botanists such as Dr. Asa Gray, Sir Joseph Hooker, and David F. Day. These luminaries believed that the abundance and variety of vegetation on the island was as significant as the falls themselves.

According to Day it was not that Goat Island contained rare and special plants; just that the island supported so many different plants. “...the distinguishing characteristic of its flora is not the possession of any plant elsewhere unknown, but the abundance of individuals and species, which the island displays,” Day wrote in a botanical inventory published in the 14th Annual Report of the Commissioners in 1898. “There are to be found in Western New York about 170 species of trees and shrubs. Goat Island and the immediate vicinity of the river near the falls can show of these no less than 140,” he concluded.

What remains of the 1898 population may be discerned from a review of the 1990 botanical study of the island by botanist Patricia Eckel and the 2005 study by F. Robert Wesley. Wesley concluded that the highest forest quality and integrity occurs toward the north and west portions of the forest. The edges, especially the southern and eastern edges, tend to be most invaded by non-native, weedy species. Eckel makes numerous recommendations for the invigoration of the flora across all of Goat Island.

Invasive species should be removed and replaced with appropriate native species. In several locations, soil and other materials have been dumped in the Central Woodland. These dumped materials should be removed, and the disturbed areas should be restored with native plantings. The forest areas with highest integrity should be monitored and maintained as a natural area.



*The drawing, also included in the 1879 New York Survey, was titled “In the Woods of Goat Island.” The image presumably captures Olmsted’s vision for the ideal natural character on Goat Island*



The Central Woodland Today



Existing Conditions - Central Roadway



Concept Design Plan

### Magnitude Costs

Central Woodland	
Mobilization / General Conditions	\$391,000
Demolition / Site Preparation	\$394,000
Railings	--
Site Improvements / Furnishings	\$180,000
Planting	\$489,000
Contingency	\$334,000
<b>TOTAL</b>	<b>\$1,788,000</b>



## 12: East End Woodland Grove and Shoreline

The eastern end of Goat Island splits the Niagara River into the American Rapids and the Canadian Rapids. There are spectacular views up the river from this area.

This east end had been cleared for grazing before the park was established. When the Olmsted plan was drawn up for the park in 1887 this area had an abundance of thick young growth, and presumably was in a successional stage toward woodland.

The Olmsted plan shows this area as an open lawn or meadow area with interspersed shade trees defining the open spaces. In the narrative accompanying the plan, Olmsted and Vaux recommended replacing the thick young growth with trees. Their intent, however, was not to provide a solid screen of vegetation, but to define open spaces and to allow intermittent views up the river.

In the mid-twentieth century the east end of the island was significantly extended with imported

fill. Roughly all of the area east of the perimeter road is fill and not original to the island. The eastern perimeter was shored up with rip rap to counter erosion. A parking lot was constructed on the filled area.

At present there is lawn with shade trees in the area that originally had been meadow. The trees have been planted continuously and with relatively uniform spacing with no spatial definition. The expanse of lawn area should be reduced and the shade trees should be selectively removed to create defined open areas.

The paved parking area at the East End of Goat Island should be reduced and/or pulled westerly to enlarge the green area at the tip of the island. This green area can be redesigned to highlight its location as a scenic overlook to the Upper Niagara River. The extent of the parking area should be assessed for operational requirements, and consideration given to reducing and/or screening pavement.



Concept Design Plan

This parking area is one of the few in the park that would lend itself to porous pavement. Because the area is constructed of earth fill - it means that there is not bedrock near the surface. Bedrock near the surface makes infiltration of porous pavements impossible.

Additionally, reconfiguration of the parking on the east end should include an assessment of the lighting to determine if there is the potential to reduce the number of fixtures. The 2003 Lighting Improvement Plan for the Niagara Reservation State Park points out that the frequency of light fixtures at this end of the park results in some redundancy.

<b>Magnitude Costs</b>	
<b>East End Woodland Grove &amp; Shoreline</b>	
Mobilization / General Conditions	\$569,000
Demolition / Site Preparation	\$301,000
Railings	--
Site Improvements / Furnishings	\$963,000
Planting	\$379,000
Contingency	<u>\$508,000</u>
<b>TOTAL</b>	<b>\$2,720,000</b>

## CHAPTER 4: DESIGN PALETTE

Niagara Falls State Park offers visitors powerful experiences of nature. As such, design elements in the park, such as site furnishings and paving materials should be understated, with minimal ornamentation. Simplicity and natural materials should dominate. Furnishings should be of durable construction and require minimal maintenance.

# B E N C H E S

## High-Use Areas



### Series Bench

*Purpose:* controlling patron traffic across a wide area and in wait areas of high demand

*Finish:* powder coated steel

*Color:* black

- Steel rod style currently being used in the Observation Tower area on Prospect Point.
- Length and shape is flexible to adapt to site conditions. Can be installed in straight runs or curvilinear forms.
- Use in areas where large crowds of visitors tend to congregate, such as Prospect Point or Cave of the Winds area on Goat Island. Use shorter segments along major pathways.
- Use as landscape barrier to direct pedestrians away from areas to be protected, such as the wooded area at Stedman's Bluff.
- Steel rod style not appropriate for use in rustic, natural areas of the park.

## Informal Areas



### Single Bench

*Purpose:* occasional seating where one or two benches are required, and in natural areas

*Finish:* powder coated steel frame

*Wood:* high density, rot resistant wood slats (black locust, composite, ipe)

*Color:* unobtrusive and compatible with the surrounding landscape. Steel: black, Wood: natural

- Simple, steel-frame benches with wood or metal slats.
- Steel frame should have durable, high-quality finish that does not require regular painting.
- Use along walkways and in strategic viewing and/or contemplative areas.
- Only available in straight runs. Not available in curvilinear form.
- Consider phasing out benches that require annual painting.

## High use and Rustic Areas



### **Quarried Limestone blocks**

*Purpose:* seating amenity coincident with their use as a barrier edge

*Finish:* rough hewn dolomite; natural or sawn edges

*Color:* natural

- Planted areas can be bordered by native stone to protect plantings, guide pedestrian traffic, and provide seating.
- Native quarry stone.
- Use in rustic, natural areas where standard benches are out of character, such as overlooks on Three Sisters Islands.

# P I C N I C T A B L E S

## High-Use Areas



**6' and 8' table with integral bench - ADA accessible**

*Purpose:* seating in heavily used concession areas

*Finish:* black powder coated steel frame

*Wood:* high density wood slats (black locust, composite, ipe); natural finish



**Fixed round table with chairs - ADA accessible**

*Purpose:* alternative form of seating in high use areas

*Finish:* powder coated steel frame

*Color:* black or bright colors in high use areas with concessions

- Linear tables can be arranged in rows to provide higher capacity seating.
- Fixed, wood slat or metal tables with high quality finish or high-density wood or composite material that does not require regular refinishing.
- Provide at least one wheelchair space for each 24 linear feet of usable table surface perimeter, as per Draft Final Accessibility Guidelines for Outdoor Developed Areas. (See Appendix 3)
- Use in areas where concessions are available, such as the Cave of the Winds and Prospect Point concession areas.
- Brightly colored tables may be appropriate at high-use areas with vendors such as Cave of the Winds plaza.
- Include at least some tables that accommodate umbrellas, particularly if there are not other constant sources of shade in the area.



**Fixed contemporary round table with benches - ADA accessible**

*Purpose:* seating where capacity is not an issue

*Finish:* powder coated steel frame

*Color:* black or bright colors in high use areas with concessions

## Informal and Rustic Areas



### **6' picnic table**

*Purpose:* picnic seating in open lawn areas

*Finish:* cedar

*Color:* natural

- Wood or composite / recycled material tables.
- Use in informal picnic areas, such as the East End of Goat Island.
- May be fixed or movable.
- Material selection should be rot resistant and should not require regular refinishing.

# P E D E S T R I A N P A V I N G

Paving materials and patterns should be simple, uncomplicated and slip-resistant. Colors and finishes should be consistent with naturally occurring colors on Goat Island, Prospect Point and the Niagara Gorge. The native dolomite stone is a predominantly dark charcoal color. There are also layers of stone in the gorge in a range of colors including brown, red, tan and charcoal. The primary circulation system should be constructed of asphalt paving. Primary and secondary overlook areas will utilize specialty pavements to establish hierarchy and signify the stature of their settings.

## Primary Circulation System



### Asphalt

*Purpose:* Standard pavement for circulation system including walkways, parking lots, roads and trolley paths

*Finish:* porous asphalt installations should be considered before standard asphalt and where soil conditions permit

*Color:* grey-black

- Standard asphalt is efficient, economical and appropriate for most walkways and circulation routes in the park.
- Do not use asphalt in large pedestrian gathering areas where large expanses of paving are required. Large, undifferentiated areas of asphalt begin to take on the appearance of a parking lot, and should be avoided.
- Porous asphalt is a sustainable stormwater management strategy. The pervious surface allows water to filter through subsurface material, reducing pollutant run-off and erosion, and recharging the groundwater.

## Primary Overlooks



### “Specialty Pavers,” precast textured concrete pavers emulating the native stone, random pattern

*Purpose:* provide a higher level of amenity at primary overlooks and at primary pedestrian gathering spaces with pavers that reflect native stone character

*Finish:* textured concrete pavers as shown

*Color:* charcoal and/or brown

- Use specialty pavers at primary overlooks within the park to signify the special nature of these locations. Specialty pavers provide a higher level of amenity and enhanced experience at these locations.
- Use specialty paving in primary pedestrian gathering spaces where large expanses of paving are required and asphalt would be undesirable, such as the Cave of the Winds or Prospect Point concession areas.
- If there is any chance that maintenance vehicles or other vehicles will drive on this specialty paving, it must be engineered for vehicular traffic.

## Secondary Overlooks



**Colored and textured concrete option**



**Native Stone option (irregular pattern)**

*Purpose:* Use native stone or colored and textured concrete at secondary overlooks to provide a higher level of amenity which reflects the stature of the setting.

*Finish:* Native stone - sawn or sandblasted or shot-peen finish. Colored concrete texture as shown

*Color:* Native stone - natural stone color  
Concrete - charcoal or brown

- Use native stone quarried from the Niagara Escarpment in natural rustic settings and where there is minimal mist from the falls and where vehicle loads are absent.
- Use colored and textured concrete where mist will occur, where flexibility in design is required and where vehicle loads are likely. The colored and textured concrete can be engineered for vehicular loads.
- When installing colored, textured concrete, it is paramount to have a skilled and experienced contractor. Repair work is challenging in that colors and finishes cannot be exactly duplicated.

## Tertiary Areas



**Precast brussels block “paver”**

*Purpose:* economical easy to install paver for low visibility areas

*Finish:* standard concrete paver finish

*Color:* limestone blend

- If there is any chance that maintenance vehicles or other vehicles will drive on this paving, it must be engineered for vehicular traffic.

## Informal and Rustic Areas

### Gravel pavement and Bark Mulch

*Purpose:* Provide a flexible, cost effective solution for natural areas of the park where the design theme is focused on colors, textures, sounds and ambience of the immediate locale.

*Finish:* as selected

*Color:* grey, brown, earthtones

- Use in natural or rustic areas of the park where informal trails are more appropriate than formal walkways, such as secondary paths in the Central Woods.
- Use at overlooks where existing bedrock is dominant and where it is difficult to install other paving materials such as at the terminus of the Third Sister Island.
- Gravel and bark mulch can be formed at will around boulders, trees, and other existing features. Seasonal maintenance and vehicle use protocols must be compatible.
- Limestone dust paving is considered ADA-accessible. Bark mulch is not.
- Bark mulch can be installed with little site disturbance. Limestone dust requires excavation for base course material.
- Limestone dust and bark mulch trail surfaces should be replenished annually.
- Choose bark mulch sources carefully. Only import bark mulch that is certified to be free of invasive weeds and insects.



Limestone dust paving



Bark mulch trail surface

# PAVEMENT AND BED EDGING

Pavement and bed edging are important to control vehicular and pedestrian traffic, stormwater runoff and to provide guidance for mowing, snow-plowing and other maintenance activities.

## Roadways



### Granite vertical curb

*Purpose:* protecting landscape islands in parking areas, areas of heavy plowing and buildings

*Finish:* sawn granite

*Color:* natural grey stone



### Concrete roll curb with integral gutter

*Purpose:* provide mower access between roadways and lawn areas

*Finish:* brushed concrete

*Color:* standard grey concrete

- Use granite for raised curbs along park roadways.
- Snow plowing and dip-and-trip hazard should control the selection of any edge treatment.
- Use edging to encourage vehicles to stay on designated roads.
- Use raised curbing along roadways where there is little to no separation between pedestrian walkways and the road. Curbing provides separation for safety.
- Use mountable curbs sparingly since visitors and maintenance staff may inappropriately drive over them.
- Consider installing cobble gutters to capture and direct stormwater. If they are designed as pervious systems, they may not require drainage structures or subsurface infrastructure.
- Where pavement is not curbed, consider:
  - Large native quarry stones to separate pedestrian walkways and trolley roads where they are adjacent.
  - Rustic timber railings are appropriate along roadways in natural or rustic areas of the park, such as the road in the Central Woods on Goat Island. Select dense grained wood that does not require regular painting / refinishing. See section on Permanent Landscape Protective Barriers.

## Walkways

- Use edging to encourage pedestrians to stay on designated walkways.
- Use cobble edging along heavily used walkways. Cobble edging is uncomfortable to walk on and discourages pedestrians from trampling walkway edges.
- Cobble edging can be used to visually delineate asphalt pavement and so can be used at intersections and other areas that require more extensive pavement to accommodate vehicular turning, etc.
- Cobble gutters also can be used to capture and direct stormwater. If they are designed as pervious systems, they may not require drainage structures or subsurface infrastructure.
- Raised curbs may be used around planting areas in some high-use areas such as Prospect Point or Cave of the Winds Pedestrian Plaza to contain mulch and prevent trampling.



### **Cobble curbs, canted or vertical**

*Purpose:* protecting green areas along walkways not subject to plow impacts

*Finish:* natural hewn cobbles

*Color:* grey and / or earthtones



### **Flush cobble edging**

*Purpose:* protect pavement edges; define and delineate pavement

*Finish:* natural hewn cobbles

*Color:* grey and / or earthtones



### **Cobble valley gutters**

*Purpose:* Control pedestrian traffic and storm water; define and delineate asphalt pavement; provide a higher level of finish. Design must include adequate slope for self-cleaning - use on sloped areas only

*Finish:* natural hewn cobbles

*Color:* grey and / or earthtones



### **Concrete vertical curb**

*Purpose:* protect plantings and contain mulch

*Finish:* formed concrete

*Color:* standard grey concrete

# S I T E W A L L S

Site walls are used to create site features; contain planting beds; provide definition to use areas; highlight and define overlooks, viewing areas and entrances; and to create barriers and guide traffic. Colors and materials should generally be compatible with the natural surroundings.

## Primary Areas



### Native Stone Wall

*Purpose:* highlight and define overlooks, viewing areas, entrances and use areas; plant beds, and create barriers between patrons and planted or sloped areas.

*Finish:* Grey blend - natural bed face, natural cleft rock



### Quarried limestone, rough or fitted

*Purpose:* create barriers between patrons and planted or sloped areas

*Finish:* natural stone

*Color:* grey blend



### Accent boulders

*Use:* accenting planted areas, occasional use

*Finish:* collected fossil boulders

*Color:* natural stone



### Granite, cut and honed

*Purpose:* creating formal entry features at major park entrances

*Finish:* cut and honed granite

*Color:* grey blend

- Granite entrance walls currently define the primary entrances to the park.

## Secondary Areas



### Precast Brussels block stone walls

*Purpose:* containing plant beds, smaller installations in areas with low visibility

*Finish:* Brussels blocks

*Color:* limestone blend

# M I S C E L L A N E O U S S I T E F U R N I S H I N G S

## Trash and recycling receptacles



Simple, dark-colored, covered metal trash receptacles. This receptacle has been used at the Observation Tower area in Prospect Point.



### Steel frame contemporary trash can

*Purpose:* general use trash and recyclables collection throughout the park with maximum capacity

*Finish:* powder coated steel

*Color:* black, potentially brighter colors if they match picnic tables or other furnishings in high use areas such as the Cave of the Winds Pedestrian Plaza or Prospect Point Visitor Center



Combination receptacle

- Miscellaneous furnishings should stylistically match benches.
- Trash receptacles should be securely covered.
- If they are not combined, place recycling containers adjacent to trash receptacles. Recycling containers should be clearly marked, but stylistically similar to other site furnishings.
- Site furnishings should have high quality finishes that do not require frequent maintenance.

## Bike Rack



### Pipe single u-form bike rack

*Purpose:* provide a secure furnishing in a limited area. Ground attachments should be portable to allow re-placement on demand

*Finish:* powder coated steel

*Color:* Black with potential for other colors if they match picnic tables or other furnishings in high use areas such as Cave of the Winds Pedestrian Plaza or Prospect Point Visitor Center

- Miscellaneous furnishings should stylistically match benches.
- Locate bicycle racks in visible locations that are perceived to be relatively secure.
- Surface-mounted bicycle racks are easier to replace than ground-mounted racks.
- Site Furnishings should have high quality finishes that do not require frequent maintenance.

## ADA Detectable Warning



### Corten Steel ADA Detectable Warning Strip

*Purpose:* indicate the boundary between a pedestrian route and a vehicular route where there is a flush rather than a curbed connection for pedestrians who are blind or have low vision.

*Finish:* Corten Steel

- Install at curb ramps or other locations where pedestrian routes cross streets or roads

# RAILINGS AND BARRIERS

## Railing Type 1



### Fabricated stainless steel railing

*Purpose:* replace railings in reconstructed areas

*Finish:* high performance coating system

*Color:* color TBD

- Use in gorge-edge or hazardous drop-off conditions.
- Custom-designed, stainless steel rail with high-performance coating system, complying with New York State Building Code.
- Finish color should be unobtrusive and compatible with the surrounding landscape.
- Minimum height: 42".
- Maximum space between rails: 4".
- Inward cant to discourage climbing.
- Top and bottom rails: tubular steel.
- Intermediate rails: solid steel rod.
- Intermediate stiffener to prevent deflection.

## Railing Type 2

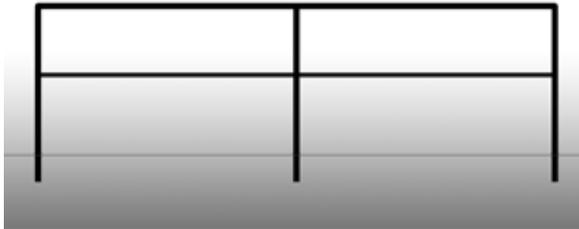


### Fabricated stainless steel railing

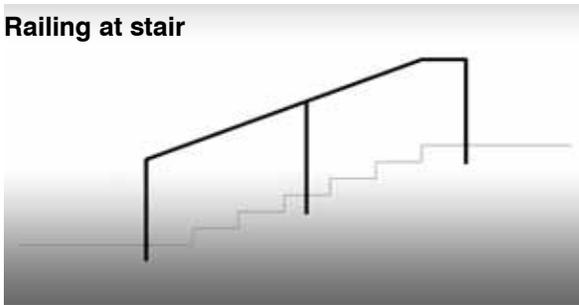
- Use in gorge setback conditions.
- Simplified version of Railing Type 1. Maximum space between rails: may vary, but may be greater than 4". Minimum height: 42".
- Post design, railing materials, coating system, and final color to match Railing Type 1.

## Railing Type 3

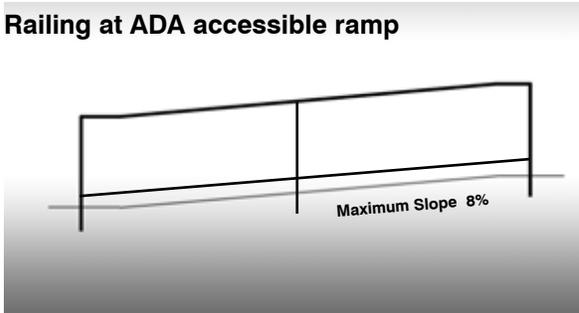
### Hand rail and protective barrier



### Railing at stair



### Railing at ADA accessible ramp



### Steel pipe rails

*Purpose:* handrail for stairs, ADA ramps or for separating patrons from minor slopes or planted areas and where a handrail would provide guidance along pathways

*Finish:* stainless steel with high performance coating system

*Finish:* high performance coating system

- Use as handrails along walkways, stairs and ramps.
- Rails for stairs and ADA-accessible ramps must comply with New York State Building Code. For site stairs not associated with a building a handrail is required when there are more than four risers
- Code-compliant rails must extend 12" beyond the top step or top or bottom of

## Existing Railing



### Aluminum tube rails

*Purpose:* continued use along the gorge rim and some water areas where condition has not been compromised and substantial new construction is not planned

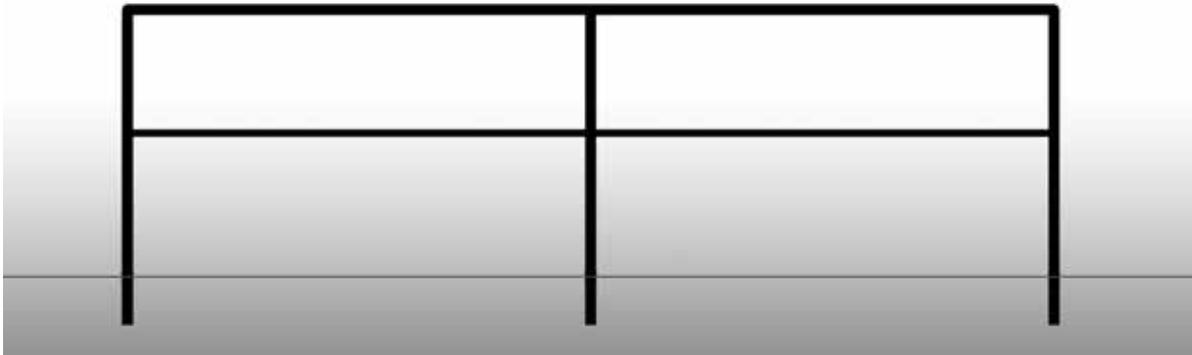
*Finish:* aluminum

*Color:* grey

ramp. Rails must return downward at all endpoints.

- Rails should have high quality finishes that do not require frequent maintenance.
- Height: 36".
- Tubular steel posts and rails.
- Final color to match Railings Type 1 and 2.

## Permanent Landscape Protective Barriers



### Steel pipe rails

*Purpose:* one, two or three rails for separating patrons and minor slopes or planted areas

*Finish:* stainless steel with high performance coating system

*Finish:* high performance coating system

- Use simple, tubular steel handrails with an intermediate rail where pedestrians tend to create desire lines across landscape areas.
- Rails should have high quality finishes that do not require frequent maintenance.
- Color of steel pipe railings to match Railing Types 1, 2 and 3.
- Use simple, timber railing in more rustic, natural areas
- Height of rails and fences: 36"
- Stone barriers to be native quarry stone boulders.



### Timber rails

*Purpose:* one or two high density wood rails for separating patrons from vehicle use areas or vegetated slopes

*Finish:* stained

*Color:* brown



### Native stone

*Use:* separating patrons from vehicle use areas where there is no curb or vegetated slopes

## Temporary Landscape Protective Barriers



### Temporary Landscape Protective Barriers

*Purpose:* protect landscape plantings during the establishment period

*Finish:* steel wire

*Color:* black

- Use dark-colored wire mesh fence with dark-colored metal posts to temporarily restrict access to certain areas, such as areas undergoing landscape restoration.
- 14" galvanized steel welded wire fence, with vinyl PVC coating
- Openings 2" x 4"
- Height: varies as per application
- Installed height of post should be even with top of fence (Note: posts should be 2' longer than fence is high)
- U- channel, knock-in steel posts with fastening clips



### Queuing rails

*Purpose:* seasonal and occasional use for controlling patron movements in high traffic areas

*Finish:* galvanized steel

*Color:* grey

# SMALL STRUCTURES

Small structures on Prospect Point and Goat Island historically exhibited a high level of architectural detailing and were constructed of high quality materials. These historic structures provide an appropriate design vocabulary for the construction of new small structures in the park. In general, structures should incorporate rusticated or cut stone, timber frame construction and craftsman details.

Small structures throughout the park should incorporate similar details, materials and colors. Native stone and natural wood should be the primary material choices consistent with the aesthetic of a natural park setting.

The central administration building at Prospect Point is constructed of cut Indiana limestone. The Indiana limestone is a buff color and quite different than the native limestone of the region. It was commonly used in civic/institutional architecture of the era. The Indiana limestone is more formal in appearance than the native limestone and while appropriate for the administration building, for small structures in the park it is more appropriate to use stone in the color of grey, brown or red as would occur naturally in the region.

## Trolley Stop



### Trolley Stop

Incorporates copper roof, timber frame construction and brackets.

- The trolley stop shown above was designed for the Three Sisters Islands and shall serve as the standard for trolley stops throughout the park. Two sizes are anticipated - a larger version for high use areas such as the Three Sisters Islands and a smaller size. The stop includes a built-in wood bench and lighting. A glass windbreak is also optional dependent on siting.
- Roof: Copper hip roof.
- Material: Douglas Fir grade FAS, sawn on all sides and finished with three coats of clear Cabot's oil stain.
- Body: Timber frame construction, all connections to be mortise and tenon with hardwood dowels.
- Base for posts: native limestone.
- Sizes:
  - Large: 10' x 18'
  - Standard: 8' x 12'

## Existing Structures Provide Design Vocabulary

A rustic craftsman style should dominate for all small structures in the park. Use native stone, timber frame construction with brackets and exposed hardware.



**Utility Building**



**Maintenance Building / Former Stables**

**Small structures should incorporate the following:**

- Roof: Hip-roof in standing seam metal or copper.
- Base: Limestone or granite.
- Body: Stone masonry / or wood / timberframe construction
- Trim: Green, tan, grey and brown
- Doors: Painted wood or metal
- Hardware: Metal, concealed; or craftsman, exposed
- Finish Colors: Tan, grey, buff and brown.



**Brackets**



**Craftsman Details**



**Stone Electrical Building**

# UTILITY STRUCTURES

Treatment of utility structures should employ many of the same principles described throughout this report, i.e. the use of warm greys and earthtone colors and native stone so that elements blend with the environment.

## Utility Boxes



- Transformers and utility boxes should be a warm medium grey to blend with tree trunks. Locate utility boxes strategically so as to be out of major site lines and not highly viewable. Do not install extensive landscaping or fencing to screen utility boxes - this only serves to draw more attention to them.

## Headwalls



- Existing headwalls are concrete with granite caps.



- New headwalls should include limestone or other local stone facing.

# A P P E N D I C E S

## Appendix 1: Relation of This Plan to Other Plans

**The Niagara Falls State Park Landscape Improvements Plan** is being coordinated with a number of completed and ongoing planning initiatives or studies. The more closely related plans are identified below and their relationship to the Landscape Improvements Plan is outlined.

### **Niagara Falls (Reservation) State Park Master Plan/FEIS (1982)**

A planning document titled Niagara Reservation: Options for the Future published in 1981 and an accompanying Draft Environmental Impact Statement (DEIS) published in 1982 recommend a number of significant design modifications to circulation, buildings and other structures, and the overall landscape character in Niagara Falls State Park.

The Options for the Future plan developed three alternative conceptual plans for the park; evaluated advantages, disadvantages and major impacts of each alternative; incorporated public input on each alternative; and recommended a preferred plan. The DEIS, undertaken to evaluate the probable environmental effects of the preferred plan, concluded that the preferred plan would have no significant impacts “which could not be mitigated through overall plan implementation.”

Several, but not all of the design proposals in the Options for the Future document were implemented. Portions of the Robert Moses Parkway were removed, which allowed removal of pedestrian bridges that had been required to cross the parkway to move between the park and the city; a new interpretive/concession building was constructed in the Prospect Point area; and parking was reduced in the Prospect Point area.

However, it does not appear that the recommendation to return significant portions of the park landscape to a more natural

state was implemented. The preferred plan envisioned large portions of Goat Island as “naturalized” or “semi-naturalized” areas. The naturalized areas would be reforested with native plantings. The “semi-naturalized” areas, near the major viewing areas on Goat Island would have a more meadow-like character. The envisioned landscape character is consistent with recommendations in this Niagara Falls Landscape Improvement Plan and will be realized as the Plan is implemented.

### **Executive Summary Analysis Phase: Three Sisters Islands Historic Restoration (2001)**

The Three Sisters Islands include the most unique ecological habitats in the Niagara Reservation State Park. The focus of this study was documenting the botanical habitats of the Three Sisters Islands including the species composition of the habitats, level of integrity, rarity, and disturbance. This provides the baseline information required for landscape restoration. A botanical survey was conducted and plant lists compiled that identify existing native, unique and invasive species on each of the islands. The native species lists were the basis for restoration plantings on Three Sisters Islands to be commenced in 2012. The invasive species lists formed the basis of the plan to remove invasive plants on the islands. This study also identified the need to provide accessible routes to the Three Sisters Islands and restroom, replace the railings on the Three Sisters Islands bridges and to formalize some overlooks. These recommendations are being implemented in the Three Sisters Islands Improvements project to commence in 2012.

### **Executive Summary: Goat Island Historic Restoration (2002)**

This study extends the botanical inventory documented in the **Three Sisters Islands Historic Restoration (2001)** to all of Goat Island and identifies landscape restoration projects on the island. The following projects are proposed:

- Three Sisters Islands
- Luna Island
- Woodland Restoration at Top of the Falls Restaurant
- Shoreline Naturalization
- Terrapin Point meadow Establishment

These projects have been refined and advanced in the Landscape Improvements Plan. The woodland restoration at the Top of the Falls Restaurant has been eliminated from consideration at this point in time. There is a concern that woodland restoration in this location would reduce visibility and there is a desire to keep sight lines clear in this area. The plan also identifies areas on Goat Island for replacing lawn with low maintenance/low-mow alternatives as well as areas where invasive species are concentrated. These can provide a guideline for future sustainability initiatives.

### **Lighting Improvement Plan for the Niagara Reservation State Park (2003)**

The Lighting Improvement Plan for the Niagara Reservation State Park, prepared in 2003 includes an inventory of existing lighting at the park and makes recommendations for lighting improvements. An assessment of the existing lighting in the park includes:

- An evaluation of light levels considering safety, the natural and historic setting, user patterns, operations and maintenance requirements
- An evaluation of the appropriateness of light fixtures and standards given the historic natural setting and the mix of styles;
- An evaluation of the appropriateness of the light color, and

- Understanding existing lighting adjacent to the park on city streets and other properties.

While many of the recommendations for lighting placement remain valid, improvements in lighting technology and standards for dark sky/light pollution have advanced significantly since the completion of the study almost 10 years ago. As a result, recommendations for specific light fixtures need to be reconsidered. Appendix 4: Site Lighting of this report includes a more detailed discussion of lighting proposals from the 2003 plan and suggested updates to those recommendations.

### **Niagara River Greenway Plan (2006)**

The Niagara River Greenway Plan was completed in 2006 and all projects proposed in the Niagara Falls State Park Landscape Improvement Plan must be submitted to the Niagara River Greenway Commission for a determination of “consistency” with the Greenway Plan.

There are eight principles and goals to the Greenway Plan. Greenway related projects should find consistency with as many of the principles and goals as possible, but should make a significant qualitative contribution within one or more of them as well.

- Excellence – the program of improvements contained in the Landscape Improvements Plan will do more to reinvigorate the Olmsted legacy than any other project in the past 50 years.
- Sustainability – materials having an exceptional life span and extremely low maintenance requirement will be used. Locally produced paving materials, quarried rock, and fabricated railing systems make up 3/4ths of the plan
- Accessibility and Connectivity – while all of the projects are within the limits of the park, all of the projects are about improving the movement and experience of patrons through the landscape. ADA criteria for accessibility are included in all of the proposed improvements.
- Ecological Integrity, Restoration and

Protection – invasive plants will be removed from all of the project areas. Native plants will be installed to replace them and to enhance existing landscapes.

- Public Well Being – walkways will be widened; seating and shelters introduced.
- Authenticity and celebration of history and heritage; extending Olmsted’s Legacy – Olmsted park design principles guide the choices at all levels in all of the designs.
- Partnerships and community based – The design process for deciding many of the improvements included a two-day study and discussion attended by Niagara Region Park Commissioners, park staffers, and even passersby through the park.
- Spark revitalization and renewal – supporting tourist’s expectations of Niagara as an experience was a major criterion when deciding upon all of the improvements in the plan.

### **Niagara Falls State Park Operations Plan (2011)**

This study focuses on upgrading capital and operational planning related to better accommodating visitor support services and amenities.

The Niagara Falls State Park Operations Plan contains numerous alternates for improving many areas of the park listed in the Landscape Improvements Plan. These alternates attend to the same problem but in various levels of cost and detail.

- The Niagara State Park Operations Plan supports the Landscape Improvements Plan as follows.
- Removal of excess pavement at Lot 3 for additional greenspace on the east end of Goat Island.
- Recommendation for design standards and a coordinated pallet of materials. However, the recommendation to continue the use of existing materials has been largely replaced in the Landscape Improvements Plan with a new palette of materials.

- Recommendation for specialty pavements at prominent overlook and gathering areas, and a recommendation for a less special paving material when reconstructing walkways
- The recommendation for intensifying the level of detail focused on surface treatment and planting details in key destinations, (like overlooks and gathering areas).
- Unifying the design and appearance of subordinate structures, such as kiosks and trolley booths.
- Recommendation for a new trolley stop design is made, but is realized in the Landscape Improvements Plan as a timber frame structure, rather than a contemporary structure.
- Recommendations for thinning vegetation to create filtered views;
- Recommendation for introducing new pavements in lieu of asphalt at overlook areas; Improving trolley stop layout and landscape.
- Removing non-native and invasive plants and the use of native plants when reworking areas.
- Recommendation for a unified set of site furnishings to create a consistent visual context so that visitors can be assured that they are in The Park.

### **Robert Moses Parkway – South “Riverway” Project (2011)**

The first objective of the Scoping Report is To Improve the Park. This objective will be realized through the preservation and interpretation of the Olmsted and Vaux design features and principles; and the development of a scenic landscape that will provide a cohesive and continuous unfolding experience. Likewise, the Landscape Improvement Plan proposes a continuous series of improvements from Prospect Point, over the Goat Island Bridge and around the entire Goat Island complex. A prescribed and limited palette of pavements, furnishings, and landscape design techniques is intended to generate a sense of cohesiveness

throughout. While the RMP South Project and the Landscape Improvement Plan do not physically overlap, their objectives are consistent and are mutually supportive.

### **Niagara Falls National Heritage Area Plan**

The purpose of the Niagara Falls National Heritage Area Plan is to develop ways of heightening the appreciation of the region, to better preserve its natural and historic resources, improve coordination among existing programs and sites, and to improve the quality of life and economy of the area.

The Landscape Improvements Plan offers site specific methods and materials for heightening visitor's appreciation of the Falls, Rapids and various landscapes of Goat Island and Prospect Point. By coordinating many improvements, strategies for preserving and protecting the natural landscapes can be implemented consistently over a foreseeable period of years.

Most if not all of the techniques for improving the park call upon Olmsted's design principles for designing public parks, and in this way, the park as a historic resource can be honored as physical improvements and subsequent management strategies are implemented.

### **Niagara Falls and Niagara Gorge State Parks Historic Railing Replacement Project (April 2012)**

The Historic Railing Replacement Project was undertaken to develop a railing design that could be implemented in the various projects described in this Landscape Improvements Plan and would result in a consistent appearance throughout the park. The report describes the design process, historic Vaux railing design, design criteria, alternative materials, finishes, and configurations considered, and final recommended railing design for the replacement of deteriorated railings in the park. Design criteria for the new railings include the following:

- Emulate the simple and organic forms of the historic "Vaux" design;

- Minimize visual impact and maximize visual transparency;
- Provide for public safety; and
- Be durable enough to withstand the harsh and unique environmental conditions near the falls with a minimum of maintenance.

The recommended railing design provides a basis for consistency in future park projects. Some variation in the railing design can be expected from project to project, in response to specific site conditions. For example, locations with heavy ice loading, such as Luna Island and Terrapin Point, will require higher strength and closer post spacing than areas that don't experience heavy ice loads. However, the overall appearance of the railing will be visually cohesive between the various areas.

## Appendix 2: Sustainability

Sustainability is defined by the Sustainable Sites Initiative (SITES) as, “design, construction, operations, and maintenance practices that meet the needs of the present without compromising the ability of future generations to meet their own needs.”<sup>1</sup>

SITES is an interdisciplinary partnership led by the American society of Landscape Architects, the Lady Bird Johnson Wildflower Center at the at The University of Texas at Austin and the United States Botanic Garden to transform land development and management practices with the nations first voluntary rating system for sustainable landscapes, with or without buildings. As these guidelines become the accepted practices by professionals and nonprofessionals alike, they will transform the ways we design and build on the land, creating landscapes that nourish life for generations to come.

SITES provides “best management practices” for sustainability and should be incorporated into every facet of landscape design and management at Niagara Falls State Park.

Sustainable practices and management decisions range from reduced mowing regimens and remediating compacted soil to selecting furnishings and paving materials that are constructed with sustainable materials, contain recycled materials, and can be reused or recycled at the end of their useful life. Ongoing management practices, such as reducing energy consumption and reducing the need for irrigation, also are important sustainable strategies.

Following are sustainable strategies that should be incorporated, where possible, at Niagara Falls State Park.



Reduced mowing landscape areas. Traditional mowed lawn edge along roadway (left) and walkway (right) creates a neat, manicured appearance.

- Reducing or ceasing mowing in certain areas is a simple sustainable practice that can be instituted immediately.
- Maintaining a traditional mowed lawn edge along the reduced mowing or no-mow area creates a neat, manicured appearance along walkways and roadways.



- Bioretention areas, infiltration strips rain garden and porous asphalt are sustainable stormwater management strategies that allow water to filter through subsurface material, reducing pollutant run-off and erosion, and recharging the groundwater.
- Do not use porous asphalt if bedrock is too close to the surface to allow adequate space to install the appropriate amount of drainage material under the asphalt surface.



Bioretention island

- Do not use porous asphalt if soils are poorly drained and will not allow proper infiltration.
- Incorporate educational features into sustainable landscapes to let visitors know why the appearance of the landscape is changing. Education is particularly important if a landscape area is fenced off temporarily for ecological restoration.



Porous asphalt walkway with porous cobble edging

- Seek out site furnishing manufacturers who use sustainable practices to manufacture their products. These may include sourcing material locally or using a certain percent of recycled material in the final product.
- Reduce light pollution. Consider replacing existing site lighting with energy-efficient LED lighting.
- Reduce energy consumption for landscape management practices. Use energy efficient vehicles.
- Reduce the need for irrigation.
- Use renewable energy sources for



Infiltration strip

landscape management and exterior operations.

- Recycle or compost organic matter generated during site management operations.
- Minimize the use of products that contain volatile organic compounds (VOCs) or contribute to greenhouse gases.



Porous asphalt parking

- Minimize exposure to environmental tobacco smoke by posting high-use areas of the park as no-smoking areas.
- Consider requiring site designers, contractors and vendors to develop site projects to LEED and Sustainable Sites Initiative (SSI) standards.



Incorporate Educational Features

# Potential Sustainability Initiatives

Project Areas	Reduce mowing	Porous paving	Protect and restore riparian, wetland, and shoreline buffers	Design rainwater / stormwater features to provide a landscape amenity	Use native plants	Preserve plant communities native to the ecoregion	Restore plant communities native to the ecoregion	Reduce urban heat island effects	Use recycled content materials	Restore soils disturbed by previous development	Control and manage known invasive plants on site	Provide outdoor spaces for social interaction	Plan for sustainable site maintenance	Provide for storage and collection of recyclables	Reduce outdoor energy consumption for all landscape exterior operations	
1a. Approaches to Goat Island Prospect Point																●
1b. Lower Grove / American Rapids Trail																●
1c. American Falls Bridges Trail			●			●										
2. North Shoreline Trail						●										●
3. Luna Island			●													●
3a. Luna Island Pedestrian Bridge																
4. Stedman's Bluff																●
5. Cave of the Winds Pedestrian Plaza																●
6. George Rim Trails																●
7. Terrapin Point																●
8. South Shoreline Trails																●
9. Three Sisters Islands																●
10. Three Sisters Restroom Area																●
11. Central Woodlands																●
12. East End Woodland Grove and Shoreline																●

## SUSTAINABLE LANDSCAPE MANAGEMENT STRATEGIES

### Introduction

During the final design process, discussion with operations staff and/or representatives from the Buffalo Olmsted Park Conservancy will be required to outline maintenance regimes for the control of invasive plant material and the performance level of the newly planted area. The Environmental Management Bureau will be consulted on the use of herbicides and the efficacy of alternative methods of control. The results of these discussions should be reflected in the scope of areas to be replanted as part of the final design. The final design will thus anticipate the capacity of the operations staff to sustain the newly planted area. Initial removal of invasives and new plantings will be included with the rest of the work of each project area.

### Landscape Restoration and Re naturalization Strategies

This section identifies strategies for restoring the soil and natural vegetation in Niagara Falls State Park. As noted previously, F.L. Olmsted envisioned that the Prospect Point area of the park would be manicured lawn with shade trees, but there should be very little landscape work done on Goat Island. Prospect Point has largely maintained the tree and lawn character proposed in the 1887 Olmsted/Vaux plan.

Over time much of the vegetation on Goat Island has been modified and degraded. Many areas have been converted to lawn, and exotic, invasive species have become prevalent.

The long-term goal should be to reduce lawn areas on Goat Island and replace them with appropriate native plantings. Exotic invasives should be removed, and detailed monitoring and maintenance programs should be instituted.

Native landscapes and management practices may not meet visitors' expectations of a well-maintained site. It will be essential to conduct vigorous public education in areas where reduced mowing occurs to minimize reactions from park users and the community at large. This will help dispel the misperception that un-mown areas are "uncared for."



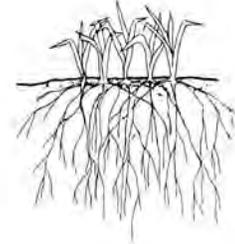
Some of the newly restored natural areas should be fenced for several years to prevent pedestrian and predator disturbance. Here too, public education will help visitors understand why

the fences exist and how the landscape is being restored.

### Soil

Healthy soil is fundamental to a sustainable ecosystem and is essential for healthy plant communities. Maintaining healthy soil also is the simplest method for reducing stormwater runoff and pollutants.

*Soil particles have interconnected pore spaces between them that are critically important to the movement of air and water through the soil. The more densely compacted the soil particles are (the higher bulk density) the less pore space will be available for air and water movement. Soil pores are formed by soil fauna, plant roots, water movement and freeze/thaw cycles. These soil pores are of significant importance in water management because they can behave like conduits, facilitating the rapid movement of water, regardless of overall soil saturation and soil type (clay v. loam). These pores also facilitate air movement through soil horizons, supporting a healthy soil organism community from the microbial (bacteria and fungi) level, through the macroarthropods (weevils and worms) and up.*



*Compaction and disturbance of soils in the upper horizon will eliminate the largest pores and significantly reduce air and water movement. The more densely compacted the soil particles are (the higher bulk density) the less pore space will be available for air and water movement. Runoff volumes and pollutant loads will increase, and the health of both vegetation and soil organisms will decrease with reduced water and air flow.*

*The use of soil amendments to improve soil health, combined with vegetative plantings intended to create extensive root systems, will create, increase and restore pores in disturbed soil horizons. Improving the opportunity for pore development in the upper soil horizon allows plant roots to grow deeper into lower soil horizons, facilitating deeper pore development and soil absorptive capability. Healthy soil will reduce runoff, increase infiltration and improve water quality.*

Healthy soil has interconnecting pore spaces that allow for movement of air and water and plant roots. And it is teeming with worms and insects, arthropods, bacteria, fungi, protozoa and nematodes.

Soil is a fragile natural system and it is sensitive

to disturbances. Soil disturbance can occur through natural processes such as floods or storms uprooting vegetation. However, most soil disturbance is caused by human activities such as construction or heavy foot traffic. In Niagara Falls State Park, and particularly on Goat Island, most soil disturbance has occurred in areas where there is unchecked pedestrian traffic. Where walkways are too narrow, or there is nothing to encourage pedestrians to stay on the paved walks, foot traffic has trampled vegetation and has caused severe soil compaction. In other locations pedestrians have created “desire lines” through vegetated areas where there are not formal walkways.

Once the vegetation has been killed by trampling there is nothing to hold the soil in place and it is vulnerable to erosion, exposing tree roots and subsurface soil layers. As unchecked foot traffic continues through these disturbed areas compaction and erosion continue to become more severe. In turn, the pores between soil particles get crushed, fewer roots can penetrate the soil, less water can infiltrate below the surface, and fewer species of soil organisms can survive. As the cycle continues desirable vegetation begins to die off and water sheets across the surface as if it were paved.

### **Soil Remediation**

Degraded soil can be successfully remediated. There is no “one-size-fits-all” solution for soil remediation. It must be done on a site by site basis, according to the causes, and the natural condition to which the soil is being restored. Following are some basic steps to take toward successful soil remediation.

Identify the cause of the soil degradation and stop it. This largely means controlling pedestrian flows and restricting access to the eroded areas. Remove exotic invasive plants from the soil remediation area.

Conduct bulk density tests to determine the level of compaction, and other tests to gauge soil pH, amount of organic matter, particle composition, and soil chemistry. These tests are easily and inexpensively done by many soils labs, including at Cornell University.

Break up compacted soil and incorporate

organic matter and other soil amendments as recommended by the soils tests. This may be done by mechanical tilling the compacted area. Or it may be done by vertical mulching which involves drilling small holes (approximately 2” diameter), and filling them with porous material such as sand and mycorrhiza.

On severely eroded slopes, install erosion control blankets and cribbing (two or three logs stacked on top of each other and pegged and wired in place) to hold the new soil in place.

On slopes where erosion is just beginning, only a single log, called a water bar, is necessary to hold the soil in place.

Using live vertical stakes may be appropriate for remediating soil compaction in certain areas.

Rather than disturbing entire compacted areas which can leave them open to invasives and erosion, live plant stakes are driven vertically into the soil. These live stakes will loosen soil pores, convey water and air downward, and add soil stability.

In some instances where the topsoil has been completely eroded away, importing a manufactured soil may be necessary. It is absolutely essential to ensure that imported soil is free of weed seeds.

Immediately replant the remediated soil with appropriate plantings. Select and manage for plants with deep root systems and large amounts of surface or root biomass to increase organic matter, improve soil structure and moisture through better infiltration.

### **Removing Invasive Species**

Invasive species to be removed from Goat Island have been documented in previous planning studies. Invasives removal should not begin until there is a commitment to monitor and maintain the area. Otherwise, the invasives will simply return.

It is recommended that Niagara Falls State Park begin with a small, manageable landscape unit in order to test methods and achieve a success. For instance, the Second Sister Island could be a manageable defined area.

The Invasive Plant Control Method Chart at the end of this section outlines control measures for the most common invasive species in the park.

## Sustainable Landscape Management Strategies

The first few years following a restoration planting are the most critical in the restored community's development. Root systems are still getting established, and are vulnerable to drought and desiccation. Tender seedlings and saplings are particularly susceptible to browsing and predation. The need for maintenance activities will be determined through regular site inspection and monitoring. Short-term management activities may include the following:

- Weed control to minimize competition with new plantings.
- Protection from predation and browsing. (This may require fencing.)
- Watering and mulching.
- Removal of exotic invasives.
- Removal and replacement of deceased or vandalized plants.

Ultimately, the goal of a natural restoration project is to create a self-sustaining ecosystem. However, some on-going maintenance is inevitable, and a long-term management strategy should be developed specific to each restoration area. The purpose of long-term management is to help maintain the integrity of the restored or protected community, to eliminate or control sources of degradation, and to facilitate the natural processes that allow it to evolve naturally over time.

Providing landscape maintenance with ecological sustainability in mind requires a change in management strategies. Management activities differ according to landscape type. Lawn maintenance is seasonal and generally encompasses regular mowing and irrigation schedules, whereas work in natural areas is less routine, and may include weekly or monthly tasks throughout the year.

- Where 'no-mow' grass is used, mow only once per year
- Where meadow grass/wildflowers are used, mow every 3-4 years
- Choose mowing time to avoid disturbing wildlife and prevent spread of weed seed; fall mowing can create food for insects and invertebrates.
- Follow bio-intensive integrated pest management recommendations
- Reduce the amount of lawn.
- Mow grass higher than conventional mowing height to conserve water and energy
- Leave grass clippings on turf to reduce moisture loss
- Reduce or eliminate use of fertilizer and pesticides in conjunction with selected lower maintenance species.



*Forests grow successionally from meadows and grasses to shrubs to small pioneer tree species and finally mature and old-growth forests. A healthy forest is multi-layered with large canopy trees, small sub-canopy trees, shrubs, and low-growing herbaceous plants. Fallen trees, twigs and leaf litter on the forest floor provide habitat for new seedlings. (Source: Restoring Nature's Place)*

## Meadow Management

Meadow areas proposed for all areas of the park should be shaped and defined with fixed markers, such as wood stakes, low boulders, trees and shrub beds.

Management activities needed to establish the meadow may include: weed control (to minimize competition with new plantings); protection from predation and herbivory; watering and mulching; and the removal and replacement of deceased or vandalized plants. Regular site inspections and monitoring should be undertaken to determine the need for these measures.

Beyond the immediate establishment period, a long-term management strategy for the site will be required. Long-term maintenance strategy may involve some or all of the following considerations:

- Controlling or restricting human access with fencing
- The periodic control and removal of invasive exotic species
- The control and removal of noxious weeds and competing vegetation
- Management of formal edges

A long-term management strategy must be adaptive; it may have to be refined, revised, or altogether rethought as the meadow area evolves over time and as the success or failure of techniques becomes evident.



**Trail Clearance Standards**

## Appendix 3: Accessibility

The Americans with Disabilities Act (ADA) includes accessibility standards issued by the United States Access Board for construction associated with buildings. Additional guidelines for recreation areas have recently been adopted by the Access Board. These guidelines are now part of the comprehensive 2010 ADA Standards for Accessible Design. Draft Guidelines for Outdoor Developed Areas have also been prepared by the United States Access Board, with the intention of incorporating these as final guidelines into the overall ADA Accessibility Guidelines sometime in 2012.

The Draft Guidelines for outdoor Developed Areas address picnic facilities, viewing areas, outdoor recreation access routes, trails, camping, and other facilities. An excerpt of the Draft Final Accessibility Guidelines for Outdoor Developed Areas, including the most relevant sections, is included at the end of this appendix. The NYSOPRHP remains committed to ensuring that all current and future designs adhere to all applicable standards, even so far as taking guidance from draft rules tentatively under adoption.

Many areas of the park, especially on Goat Island, are currently accessible. The perimeter walkway that encircles Goat Island is relatively flat and mostly accessible. However, the most popular viewing locations are situated where there is more dramatic topography and as a result, these locations are not accessible. Luna Island, Terrapin Point, Stedman's Bluff and the Three Sisters Islands are the most popular viewing locations on Goat Island. Stedman's Bluff is currently accessible. Every effort should be made to make the other viewing locations ADA compliant if feasible.

The current design for improvements to the Three Sisters Islands will create accessible parking, an ADA compliant route that traverses all three islands where none currently exists, and four accessible overlooks. Accessible parking will be expanded and new ADA compliant picnic tables will be installed. Additional ADA compliant picnic tables should be installed strategically throughout the park.

The design for improvements to Luna Island will improve ADA access on the island. However, there is currently no accessible route to Luna Island from Goat Island. It may be feasible to develop an accessible route along the lower segment of the North Shoreline Trail. However, the potential impacts of creating an accessible route in this location, including the cost impacts, needs to be thoroughly investigated. Terrapin Point should also be studied to determine if it is feasible to construct an accessible route to this important viewing area.

### Proposed Accessibility Improvements and Priority Areas For Goat Island



#### Proposed ADA Improvements

-  New ADA Compliant Route
-  New ADA Overlook
-  New ADA Picnic Table
-  New ADA Parking

#### Priority Areas for ADA Access

-  Conduct Feasibility Analysis for ADA Compliant Routes to Luna Island and Terrapin Point

**Excerpted from Draft Final Accessibility Guidelines for Outdoor Developed Areas, prepared by the United States Access Board, a federal agency committed to accessible design. A full copy of the Draft Final Guidelines can be found at the agency's web site:**

<http://www.access-board.gov/outdoor/draft-final.htm#12>

## Draft Final Accessibility Guidelines for Outdoor Developed Areas

October 19, 2009

- [Introduction](#)
- [General Issues](#)
- [Summary of Provisions](#)
- [Future Rulemaking](#)
- [Regulatory Process Matters](#)
- [Text of the Draft Final Accessibility Guidelines](#)

### 1011 Outdoor Constructed Features

**1011.1 General.** All outdoor constructed features shall comply with 1011.2 and 1011.3. Outdoor constructed features specified in 1011.4 through 1011.8 shall comply with those requirements, as applicable.

Advisory 1011.1 General. The requirements in 1011 apply to outdoor constructed features provided within camping facilities, picnic facilities, viewing areas, and trailheads or on trails.

**1011.2 Clear Ground Space.** A clear ground space complying with 1011.2 shall be provided at outdoor constructed features.

- EXCEPTIONS:**
- 1.** Where individual outdoor constructed features are altered and the ground surface is not altered, the clear ground space shall not be required to comply with 1011.2.2 and 1011.2.3.
  - 2.** In alterations, where a condition in 1019 does not permit full compliance, the clear ground space shall comply with 1011.2 to the maximum extent feasible.

**1011.2.1 Size and Location.** The size and location of the clear ground space shall be in accordance with Table 1011.2.1. Unless otherwise specified in Table 1011.2.1, one full unobstructed side of the clear ground space shall adjoin or overlap an outdoor recreation access route or a trail, as applicable, or another clear ground space.

**Table 1011.2.1 Clear Ground Space**

Outdoor Constructed Feature	Minimum Size and Location
Picnic tables	36 inches (915 mm) along all usable sides of the table measured from the back edge of the benches
Fire rings, grills, fireplaces, and woodstoves	48 inches (1220 mm) by 48 inches (1220 mm) on all usable sides of the fire ring, grill, fireplace, or woodstove  Center the space on each usable side of the grill, fireplace, and woodstove
Trash and recycling receptacles	36 inches (915 mm) by 48 inches (1220 mm) positioned for forward approach to the receptacle opening; or 30 inches (760 mm) by 60 inches (1525 mm) positioned for a parallel approach to the receptacle opening

Advisory 1011.2.1 Size and Location. The usable sides of picnic tables, fire rings, grills, fireplaces, and woodstoves are the sides of the outdoor constructed feature that can be used for eating or serving food, building a fire, or cooking. All sides of picnic tables are generally usable, unless the picnic table is placed against a rock or tree that renders the side against the rock or tree not usable. All sides of fire rings and grills are generally usable, unless there is a wall or other structure on a side that renders the side not usable. The front sides of fireplaces and woodstoves are generally the usable side.

**1011.2.2 Surface.** The surface of the clear ground space shall be firm and stable.

Advisory 1011.2.2 Surface. A stable surface remains unchanged by applied force so that when the force is removed, the surface returns to its original condition. A firm surface resists deformation by indentations.

**1011.2.3 Slope.** The slope of the clear ground space surface shall not be steeper than 1:48 in any direction.

**EXCEPTION:** When the surface is other than asphalt, concrete, or boards, slopes not steeper than 1:33 shall be permitted where necessary for drainage.

**1011.2.4 Openings.** Openings in the clear ground space surface shall comply with 302.3.

**1011.3 Operable Parts.** Operable parts shall comply with 309.3 and 309.4.

**EXCEPTIONS:** 1. Fire rings, grills, fireplaces, wood stoves, water hydrants, and water utility hookups shall not be required to comply with 309.4.

2. Trash and recycling receptacles with hinged lids and controls to keep out large animals shall not be required to comply with 309.4.

3. Dumpster type trash and recycling receptacles shall not be required to comply with 309.3 and 309.4.

**1011.4 Picnic Tables.** Picnic tables shall provide at least one wheelchair space for each 24 linear feet (7320 mm) of usable table surface perimeter. Wheelchair spaces shall be 30 inches (760 mm) minimum by 48 inches (1220 mm) minimum. Wheelchair spaces shall be positioned for a forward approach to the table and provide knee and toe clearance complying with 306 under the table.

**1011.5 Fire Rings, Grills, Fireplaces, and Wood Stoves.** Fire rings, grills, fireplaces, and wood stoves shall comply with 1011.5.

Advisory 1011.5 Fire Rings, Grills, Fireplaces, and Wood Stoves. Fire rings with double walls or insulation on the sides are recommended to prevent burns.

**1011.5.1 Fire Building Surfaces.** Fire building surfaces shall be 9 inches (230 mm) minimum above the ground surface.

**1011.5.2 Cooking Surfaces.** Where provided, cooking surfaces shall be 15 inches (380 mm) minimum and 34 inches (865 mm) maximum above the ground surface.

**1011.5.3 Raised Edges or Walls.** Where fire rings, grills, or fireplaces are constructed with raised edges or walls, the depth of the raised edge or wall shall be 10 inches (255 mm) maximum.

#### **1012 Parking Spaces within Accessible Camping Units and Picnic Units and Pull-Up Spaces at Recreational Vehicle Dump Stations**

**1012.1 General.** Parking spaces within accessible camping units and picnic units and pull-up spaces at recreational vehicle dump stations shall comply with 1012.

**1012.2 Recreational Vehicles.** Parking spaces and pull-up spaces for recreational vehicles shall be 20 feet (6100 mm) wide minimum.

**EXCEPTION:** Where two adjacent parking spaces are provided for recreational vehicles, one parking space shall be permitted to be 16 feet (4880 mm) wide minimum.

**1012.3 Other Vehicles.** Parking spaces for vehicles, other than recreational vehicles, shall be 16 feet (4880 mm) wide minimum.

**EXCEPTION:** Where two adjacent parking spaces are provided for vehicles, other than recreational vehicles, one parking space shall be permitted to be 8 feet (2440 mm) wide minimum.

**1012.3 Other Vehicles.** Parking spaces for vehicles, other than recreational vehicles, shall be 16 feet (4880 mm) wide minimum.

**EXCEPTION:** Where two adjacent parking spaces are provided for vehicles, other than recreational vehicles, one parking space shall be permitted to be 8 feet (2440 mm) wide minimum.

**1012.4 Surface.** The surface of parking spaces and pull-up spaces shall be firm and stable.

Advisory 1012.4 Surface. A stable surface remains unchanged by applied force so that when the force is removed, the surface returns to its original condition. A firm surface resists deformation by indentations.

**1012.5 Slope.** The slope of the surface of parking spaces and pull-up spaces shall not be steeper than 1:48 in any direction.

**EXCEPTION:** When the surface is other than asphalt, concrete, or boards, slopes not steeper than 1:33 shall be permitted where necessary for drainage.

## Sections 1013 and 1014 not applicable to Niagara Falls State Park

**1015.2 Clear Ground Space.** A clear ground space shall be provided at each distinct viewing location. The clear ground space shall be 36 inches (915 mm) minimum by 48 inches (1220 mm) minimum, and shall be positioned for either forward or parallel approach to the viewing location. One full unobstructed side of the clear ground space shall adjoin or overlap an outdoor recreation access route or trail, as applicable, or another clear ground space.

**1015.3 Unobstructed View.** An unobstructed view shall be provided between 32 inches (815 mm) and 51 inches (1295 mm) above the clear ground space at each distinct viewing location that extends the entire side of the clear ground space facing the landscape or point of interest.

**EXCEPTION:** Where guardrails or other safety barriers are provided to protect visitors from drop-offs, the guardrails or other safety barriers shall be permitted to obstruct the view.

Advisory 1016.3 Unobstructed View. See-thru panels or screened openings can be installed to create an unobstructed view above 32 inches (815mm) where guardrails or other safety barriers are provided to protect visitors from drop-offs.

**1015.4 Turning Space.** A turning space complying with 304.3 shall be provided within viewing areas.

**1015.5 Surface.** The surface of clear ground spaces and turning spaces shall be firm and stable.

Advisory 1015.5 Surface. A stable surface remains unchanged by applied force so that when the force is removed, the surface returns to its original condition. A firm surface resists deformation by indentations.

**1015.6 Slope.** The slope of the clear ground space and turning space surface shall not be steeper than 1:48 in any direction.

**EXCEPTION:** When the surface is other than asphalt, concrete, or boards, slopes not steeper than 1:33 shall be permitted where necessary for drainage.

## 1016 Outdoor Recreation Access Routes

**1016.1 General.** Outdoor recreation access routes shall comply with 1016.

- EXCEPTIONS:**
- 1.** In alterations to existing camping facilities, picnic facilities, and trailheads where a condition in 1019 does not permit full compliance with a specific requirement in 1016 on a portion of an outdoor recreation access route, that portion of the outdoor recreation access route shall comply with the specific requirement to the maximum extent feasible.
  - 2.** At viewing areas, where a condition in 1019 does not permit full compliance on a portion of an outdoor recreation access route with a specific requirement in 1016, that portion of the outdoor recreation access route shall comply with the specific requirement to the maximum extent feasible.
  - 3.** Where outdoor recreation access routes are provided within vehicular ways, outdoor recreation access routes shall not be required to comply with 1016.4, 1016.7, and 1016.8.

**1016.2 Surface.** The surface of outdoor recreation access routes and their related passing spaces and resting intervals shall be firm and stable.

Advisory 1016.2 Surface. A stable surface remains unchanged by applied force so that when the force is removed, the surface returns to its original condition. A firm surface resists deformation by indentations.

**1016.3 Clear Width.** The clear width of outdoor recreation access routes shall be 36 inches (915 mm) minimum.

**EXCEPTION:** The clear width shall be permitted to be reduced to 32 inches (815 mm) minimum for a length of 24 inches (610 mm) maximum provided that reduced width segments are separated by segments that are 48 inches (1220 mm) long minimum and 36 inches (915 mm) wide minimum.

**1016.4 Passing Spaces.** Outdoor recreation access routes with a clear width less than 60 inches (1525 mm) shall provide passing spaces complying with 1016.4 at intervals of 200 feet (61 m) maximum. Passing spaces and resting intervals shall be permitted to overlap.

Advisory 1016.4 Passing Spaces. Entities should consider providing either a 60 inches (1525 mm) minimum clear width on outdoor recreation access routes, or passing spaces at shorter intervals if the clear width is less than 60 inches (1525 mm), where an outdoor recreation access route is:

- Heavily used;
- Adjoins outdoor constructed features that are heavily used;
- A boardwalk; or
- Not at the same level as the ground surface adjoining the outdoor recreation access route.

**1016.4.1 Size.** The passing space shall be either:

1. A space 60 inches (1525 mm) minimum by 60 inches (1525 mm) minimum; or
2. The intersection of two outdoor recreation access routes providing a T-shaped space complying with 304.3.2 where the base and the arms of the T-shaped space extend 48 inches (1220 mm) minimum beyond the intersection. Vertical alignment at the intersection of the outdoor recreation access routes that form the T-shaped space shall be nominally planar.

**1016.5 Obstacles.** Obstacles on outdoor recreation access routes and their related passing spaces and resting intervals shall comply with 1016.5.

**1016.5.1 Concrete, Asphalt, or Boards.** Where the surface is concrete, asphalt, or boards, obstacles shall not exceed ½ inch (13 mm) in height measured vertically to the highest point.

**1016.5.2 Other Surfaces.** Where the surface is other than specified in 1016.5.1, obstacles shall not exceed 1 inch (25 mm) in height measured vertically to the highest point.

Advisory 1016.5 Obstacles. The vertical alignment of joints in concrete, asphalt, or board surfaces can be obstacles. Natural features such as tree roots and rocks on outdoor recreation access routes can also be obstacles. Where an outdoor recreation access route is provided within a vehicular way, traffic calming devices can be obstacles. Where possible, obstacles on outdoor recreation access routes should be separated by a distance of 48 inches (1220 mm) minimum so persons who use wheelchairs can maneuver around the obstacles.

**1016.6 Openings.** Openings in the surface of outdoor recreation access routes and their related passing spaces and resting intervals shall comply with 302.3.

Advisory 1016.6 Openings. Spaces between the boards in a boardwalk and drainage grates are examples of openings. Where possible, drainage grates should be located outside the minimum clear width of the outdoor recreation access route.

**1016.7 Slopes.** The slopes of outdoor recreation access routes shall comply with 1016.7.

**1016.7.1 Running Slope.** The running slope of any segment of an outdoor recreation access route shall not be steeper than 1:10. Where the running slope of a segment of an outdoor recreation access route is steeper than 1:20, the maximum length of the segment shall be in accordance with Table 1016.7.1, and a resting interval complying with 1016.8 shall be provided at each end of the segment.

**Table 1016.7.1 Running Slope and Resting Intervals**

Running Slope of Segment of Outdoor Recreation Access Route		Maximum Length of Segment
Steeper than	But not Steeper than	
1:20	1:12	50 feet (15 m)
1:12	1:10	30 feet (9 m)

Advisory 1016.7.1 Running Slope. Running slope can also be expressed as a percentage (grade).

**1016.7.2 Cross Slope.** The cross slope shall comply with 1016.7.2.

**1016.7.2.1 Concrete, Asphalt, or Boards.** Where the surface is concrete, asphalt, or boards, the cross slope shall not be steeper than 1:48.

**1016.7.2.2 Other Surfaces.** Where the surface is other than specified in 1016.7.2.1, the cross slope on other surfaces shall not be steeper than 1:33.

**1016.8 Resting Intervals.** Resting intervals shall comply with 1016.8.

**1016.8.1 Length.** The resting interval length shall be 60 inches (1525 mm) long minimum.

**1016.8.2 Width.** Where resting intervals are provided within an outdoor recreation access route, resting intervals shall be at least as wide as the widest segment of the outdoor recreation access route leading to the resting interval. Where resting intervals are provided adjacent to an outdoor recreation access route, the resting interval clear width shall be 36 inches (915 mm) minimum.

**1016.8.3 Slope.** Resting intervals shall have a slope complying with 1016.8.3.

**1016.8.3.1 Concrete, Asphalt, or Boards.** Where the surface is concrete, asphalt, or boards, the slope shall not be steeper than 1:48 in any direction.

**1016.8.3.2 Other Surfaces.** Where the surface is other than specified in 1016.8.3.1, the slope on other surfaces shall not be steeper than 1:33 in any direction.

**1016.8.4 Turning Space.** Where resting intervals are provided adjacent to an outdoor recreation access route, a turning space complying with 304.3.2 shall be provided. Vertical alignment between the outdoor recreation access route, turning space, and resting interval shall be nominally planar.

**1016.9 Protruding Objects.** Constructed elements on outdoor recreation access routes and their related resting intervals and passing spaces shall comply with 307.

Advisory 1016.9 Protruding Objects. Protruding objects on outdoor recreation access routes and their related resting intervals and passing spaces can be hazardous for persons who are blind or have low vision. Signs and other post mounted objects are examples of constructed elements that can be protruding objects.

**1017 Trails**

**1017.1 General.** Trails shall comply with 1017.

**EXCEPTIONS:** **1.** Where an entity determines that a condition in 1019 does not permit full compliance with a specific requirement in 1017 on a portion of a trail, that portion of the trail shall comply with the specific requirement to the maximum extent feasible. The entity shall document the basis for the determination, and shall maintain the documentation with the records for the construction or alteration project.

**2.** Where an entity determines that it is impracticable for an entire trail to comply with 1017, the trail shall not be required to comply with 1017. The entity shall document the basis for the determination, and shall maintain the documentation with the records for the construction or alteration project.

Advisory 1017.1 General Exception 1. Exception 1 can be applied to specific requirements in 1017 on a portion of a trail where full compliance with the requirement cannot be achieved due to any of the conditions in 1019.

Advisory 1017.1 General Exception 2. An entity should first apply Exception 1 to determine the portions of a trail where full compliance with the specific requirements in 1017 cannot be achieved. An entity should then evaluate the entire trail, taking into account the portions of the trail that can and cannot fully comply with the requirements in 1017 and the extent of compliance where full compliance cannot be achieved to determine whether it would be impracticable for the entire trail to comply with 1017. The determination is made on a case-by-case basis.

**1017.2 Surface.** The surface of trails and their related passing spaces and resting intervals shall be firm and stable.

Advisory 1017.2 Surface. A stable surface remains unchanged by applied force so that when the force is removed, the surface returns to its original condition. A firm surface resists deformation by indentations.

**1017.3 Clear Tread Width.** The clear tread width of trails shall be 36 inches (915 mm) minimum.

**EXCEPTION:** The clear tread width shall be permitted to be reduced to 32 inches (815 mm) minimum for a length of 24 inches (610 mm) maximum provided that reduced width segments are separated by segments that are 48 inches (1220 mm) long minimum and 36 inches (915 mm) wide minimum.

**1017.4 Passing Spaces.** Trails with a clear tread width less than 60 inches (1525 mm) shall provide passing spaces complying with 1017.4 at intervals of 1000 feet (300 m) maximum. Where the full length of the trail does not comply with 1017, the last passing space shall be located at the end of the trail segment complying with 1017. Passing spaces and resting intervals shall be permitted to overlap.

Advisory 1017.4 Passing Spaces. Entities should consider providing either a 60 inches (1525 mm) minimum clear tread width, or passing spaces at shorter intervals if the clear tread width is less than 60 inches (1525 mm), where a trail is:

- Heavily used;
- A boardwalk; or
- Not at the same level as the ground surface adjoining the trail.

Where the full length of the trail does not comply with 1017, placing the last passing space at the end of the trail segment complying with 1017 enables a person using a wheelchair to turn around and exit the trail.

**1017.4.1 Size.** The passing space shall be either:

1. A space 60 inches (1525 mm) minimum by 60 inches (1525 mm) minimum; or
2. The intersection of two trails providing a T-shaped space complying with 304.3.2 where the base and the arms of the T-shaped space extend 48 inches (1220 mm) minimum beyond the intersection. Vertical alignment at the intersection of the trails that form the T-shaped space shall be nominally planar.

**1017.5 Obstacles.** Tread obstacles on trails and their related passing spaces and resting intervals shall comply with 1017.5.

**1017.5.1 Concrete, Asphalt, or Boards.** Where the surface is concrete, asphalt, or boards, tread obstacles shall not exceed ½ inch (13 mm) in height measured vertically to the highest point.

**1017.5.2 Other Surfaces.** Where the surface is other than specified in 1017.4.1, tread obstacles shall not exceed 2 inches (50 mm) in height measured vertically to the highest point.

Advisory 1017.5 Tread Obstacles. The vertical alignment of joints in concrete, asphalt, or board surfaces can be tread obstacles. Natural features, such as tree roots and rocks, within the trail tread can also be tread obstacles. Where possible, tread obstacles should be separated by a distance of 48 inches (1220 mm) minimum so persons who use wheelchairs can maneuver around the obstacles.

**1017.6 Openings.** Openings in the surface of trails and their related passing spaces and resting intervals shall comply with 302.3.

**EXCEPTION:** Openings shall be permitted to be to be a size that does not permit passage of a ¾ inch (19 mm) sphere where openings that do not permit the passage of a ½ inch (6.4 mm) sphere cannot be provided due to the conditions in 1019.

**1017.7 Slopes.** The slopes of trails shall comply with 1017.7.

**1017.7.1 Running Slope.** No more than 30 percent of the total length of a trail shall have a running slope steeper than 1:12. The running slope of any segment of a trail shall not be steeper than 1:8. Where the running slope of a segment of a trail is steeper than 1:20, the maximum length of the segment shall be in accordance with Table 1017.7.1, and a resting interval complying with 1017.8 shall be provided at each end of the segment.

**Table 1017.7.1 Running Slope and Resting Intervals**

Running Slope of Trail Segment		Maximum Length of Segment
Steeper than	But not Steeper than	
1:20	1:12	200 feet (61 m)
1:12	1:10	30 feet (9 m)
1:10	1:8	10 feet (3050 mm)

Advisory 1017.7.1 Running Slope. Running slope can also be expressed as a percentage (grade).

**1017.7.2 Cross Slope.** The cross slope shall comply with 1017.6.2.

**1017.7.2.1 Concrete, Asphalt, or Boards.** Where the surface is concrete, asphalt, or boards, the cross slope shall not be steeper than 1:48.

**1017.7.2.2 Other Surfaces.** Where the surface is other than specified in 1017.7.2.1, the cross slope on other surfaces shall not be steeper than 1:20.

**1017.8 Resting Intervals.** Resting intervals shall comply with 1017.8.

**1017.8.1 Length.** The resting interval length shall be 60 inches (1525 mm) long minimum.

**1017.8.2 Width.** Where resting intervals are provided within the trail tread, resting intervals shall be at least as wide as the widest segment of the trail tread leading to the resting interval. Where resting intervals are provided adjacent to the trail tread, the resting interval clear width shall be 36 inches (915 mm) minimum.

**1017.8.3 Slope.** Resting intervals shall have a slope complying with 1017.8.3.

**1017.8.3.1 Concrete, Asphalt, or Boards.** Where the surface is concrete, asphalt, or boards, the slope shall not be steeper than 1:48 in any direction.

**1017.8.3.2 Other Surfaces.** Where the surface is other than specified in 1017.8.3.1, the slope on other surfaces shall not be steeper than 1:20 in any direction.

**1017.8.4 Turning Space.** Where resting intervals are provided adjacent to the trail tread, a turning space complying with 304.3.2 shall be provided. Vertical alignment between the trail tread, turning space, and resting interval shall be nominally planar.

**1017.9 Protruding Objects.** Constructed elements on trails and their related resting intervals and passing spaces shall comply with 307.

Advisory 1017.9 Protruding Objects. Protruding objects on trails and their related resting intervals and passing spaces can be hazardous for persons who are blind or have low vision. Signs and other post mounted objects are examples of constructed elements that can be protruding objects.

**1017.10 Gates and Barriers.** Where gates or barriers are constructed to control access to trails, gates and barriers shall comply with 1017.10.

**1017.10.1 Clear Width.** Gate openings and openings in barriers for hiker passage shall provide a clear width complying with 404.2.3.

**1017.10.2 Gate Hardware.** Gate hardware shall comply with 404.2.7.

**1017.11 Trail Signs.** Trail signs shall include the following information:

1. Length of the trail or trail segment;
2. Surface type;
3. Typical and minimum tread width;
4. Typical and maximum running slope; and
5. Typical and maximum cross slope.

## Appendix 4: Site Lighting

The *Lighting Improvement Plan for the Niagara Reservation State Park*, prepared in 2003 includes an inventory of existing lighting at the park and makes recommendations for lighting improvements. An assessment of the existing lighting in the park in the 2003 plan includes:

- An evaluation of light levels considering safety, the natural and historic setting, user patterns, operations and maintenance requirements
- An evaluation of the appropriateness of light fixtures and standards given the historic natural setting and the mix of styles
- An evaluation of the appropriateness of the light color
- Understanding existing lighting adjacent to the park on city streets and other properties.

While many of the recommendations for lighting placement remain valid, improvements in lighting technology and standards for dark sky/light pollution have advanced significantly since the completion of the study almost 10 years ago. As a result, recommendations for specific light fixtures need to be reconsidered.

### Prospect Point

The existing light fixtures at Prospect Point are a globe fixture mounted on a fluted green pole. In general, the number of fixtures and their distribution throughout the park is adequate. The “Central Park” fixture dominates on city streets leading to the park. The 2003 plan identifies a number of locations where additional lighting would enhance the experience of the visitor.

Those locations are outside the scope of this Landscape Improvements Plan, but are mentioned here for completeness. They are: the main pedestrian entrance to the park that links to the pedestrian mall in the city, the pedestrian entrances from Parking Lot #1 (this has been addressed subsequent to the study), and the Great Lakes Garden.

The 2003 plan recommended retaining the globe fixture but painting the green poles black. A disadvantage of the existing globe fixture is

that it is not available in dark-sky technology. Therefore, at this time it is recommended that the globe fixture be replaced over time, as projects in the park are undertaken, with a fixture that can provide both dark-sky and more energy efficient technology. A “transitional” style in black is recommended that is visually compatible with the “Central Park” fixture used on the city street system but is somewhat more contemporary in appearance.



Existing Globe Fixture at Prospect Point



Proposed “transitional” fixture for Prospect Point

## Goat Island

The existing contemporary lighting system on Goat Island consists of a simple round fixture with high-pressure sodium (yellow) lighting. Roadway poles and fixtures are silver. Pedestrian walkway lights are of a matching style but are black. Parking lot fixtures in parking lot #3 match the roadway fixtures but consist of a 4-plex head as opposed to the single roadway fixture.

The round fixture is neutral in appearance and recedes in the natural setting. The darker colored pedestrian fixtures recede more successfully than the bright reflective silver roadway fixtures. Given the neutrality and great number of fixtures in the park, it is recommended that the style of the existing fixtures be retained.

Replacement fixtures of a similar style but with white light, and dark-sky and LED technology should be installed as reconstruction projects are undertaken. Vehicular and pedestrian fixtures and poles should be black. The addition of LED bollard lighting is recommended in some locations on Goat Island.

The 2003 Lighting Improvement Plan for the Niagara Reservation State Park identified opportunities for reducing light pollution and the number of fixtures on Goat Island without reducing security. Light spillage from the floodlights on the falls and the rapids provides a significant amount of ambient light on the north and west shores of the island. Reduction or replacement of fixtures is recommended in these areas. The close spacing of fixtures on Goat Island makes some of the fixtures redundant and also provides opportunities for reducing the number of fixtures.



**Existing Goat Island Vehicular Fixture**



**Existing Goat Island Pedestrian Fixture**

- The 2003 study recommends the replacement of pedestrian fixtures at Terrapin Point with removable bollard lights. Light spillage from the lights on the falls already provides a significant amount of light for this area and the existing pedestrian lighting competes with the falls lighting. This concept should be evaluated as part of the Terrapin Point project (Project Area #7).
- The 2003 study recommends the replacement of pedestrian fixtures along the Gorge Rim Trail (Project Area #6) with bollards. This concept should be evaluated as part of the Gorge Rim Trail project.
- The 2003 study recommends the removal of pedestrian fixtures where vehicular fixtures provide adequate lighting for both vehicles and pedestrians. This occurs primarily on the east end of the island, between the American Rapids Bridge and parking lot #3.
  - The potential for reducing the number of light fixtures in the area of the East End Woodland Grove and Shoreline (Project Area #12) should be evaluated at the time this project is undertaken. High light levels in parking lot #3 spills over to the adjacent park roadway. As a result, the study identified the potential for removing the existing lights along the park roadway as it parallels the south shore.
  - This Landscape Improvements Plan recommends reducing the size of parking lot #3 and so lighting in the area needs to be reconsidered in a holistic manner with other site considerations.
- The 2003 study recommended no lighting on Luna Island or the Three Sisters Islands. However, at this time, some supplemental bollard style lighting is proposed for Luna Island as a convenience for patrons. It is recommended that the current condition of no lighting on the Three Sisters Islands be maintained.



**Proposed Bollard Fixture**



**Proposed Goat Island Pedestrian and vehicular Fixture**

**Lighting Requirements Table**

Area	Lighting Requirements	
1a.	Prospect Point	Existing lighting is sufficient
1b.	Lower Grove / American Rapids Trail	Existing lighting is sufficient
1c.	American Falls Pedestrian Bridges	Evaluate at the time of bridge replacement
2.	North Shoreline Trails	Existing lighting is sufficient
3a.	Luna Island	Supplement lighting for convenience
3b.	Luna Island Pedestrian Bridge	Evaluate at the time of bridge replacement
4.	Stedman's Bluff	Existing lighting is sufficient
5.	Cave of the Winds Pedestrian Plaza	Evaluate at time plaza is re-constructed
6.	Gorge Rim Trails	Light spillage from the lighting of the falls provides significant light to the area. Consider the potential to replace pedestrian fixtures with bollard lighting as per 2003 Lighting Improvement Plan
7.	Terrapin Point	Light spillage from the lighting of the falls provides significant light to the area. Consider the potential to replace pedestrian fixtures with bollard lighting as per 2003 Lighting Improvement Plan
8.	South Shoreline Trails	Existing lighting is sufficient
9.	Three Sisters Islands	Area closes at dark and lighting is not required
10.	Three Sisters Restroom	Supplement lighting for convenience of patrons
11.	Central Woodlands	Area closes at dark and lighting is not required
12.	East End Woodland Grove and Shoreline	The frequency of fixtures in this area of the park results in some redundancy. It may be possible to reduce the number of fixtures in this area.

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