Bays Mountain Park & Planetarium

Park Improvement Plan

853 Bays Mountain Park Rd, Kingsport, TN 37660

January 2024

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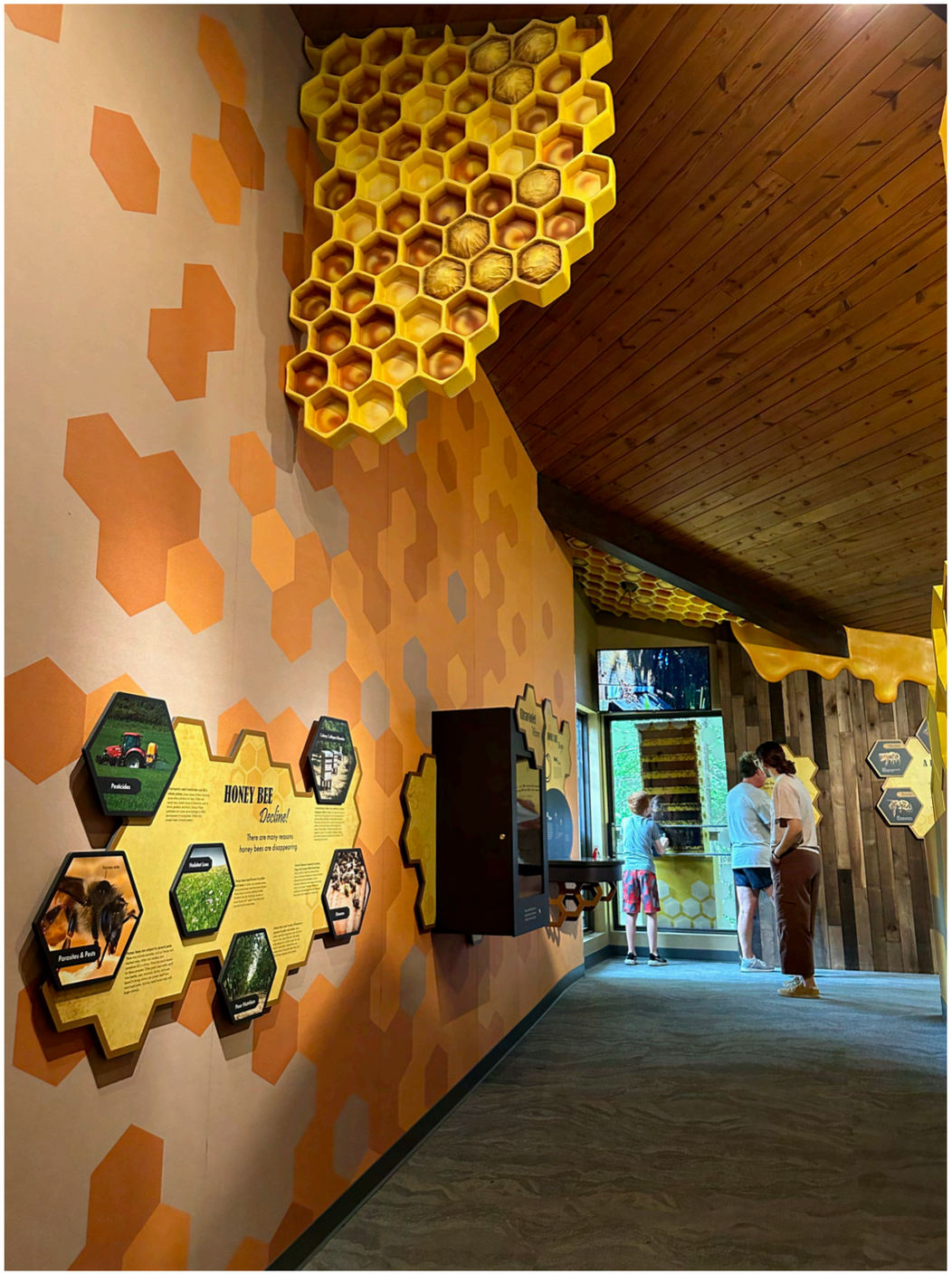

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Executive Summary

The Park Improvement Plan (PIP) is a long-term plan and vision for improving the animal habitats at Bays Mountain Park. The PIP incorporates the latest standards for animal care and welfare and expands opportunities for visitor engagement. Improvements proposed under the PIP extend accessibility and connect key park assets particularly those related to observing and learning about wildlife including: the Nature Center, the Herpetarium, the animal habitats, viewing experiences and walking trails.

The PIP provides a framework that considers the existing site conditions and overall visitor experience and ensures that future improvements align with stakeholder interests as well as funding and staffing realities. The PIP focuses on siting and integration of current and future projects as well as connectivity to ensure a memorable visitor experience. A critical part of this effort is understanding what visitors want, building on what makes Bays Mountain Park unique and ensuring improvements are logically phased, and budgets are realistic and attainable.

Bays Mountain has a long and rich history in the evolution of the local community. First settled by Europeans in the late 1700's, the region's abundant resources sustained homesteads that lasted generations. The first major transformation of Bays Mountain came in the early twentieth century when one of Kingsport's founders acquired 1200 acres to dam a valley and create a water source for the growing city. From the time of the creation of the lake to when it ceased to be used as a drinking water source in 1944, many locals had come to enjoy a variety of outdoor activities including hiking, fishing and hunting. As outdoor recreation grew "so did the public's interest in preserving the mountain" as a community asset.

In 1965 a committee was appointed to study ways to develop the mountain into a park. Following the committee's report, the City hired the National Audubon Society to develop a vision for the park.

Their recommendations included:

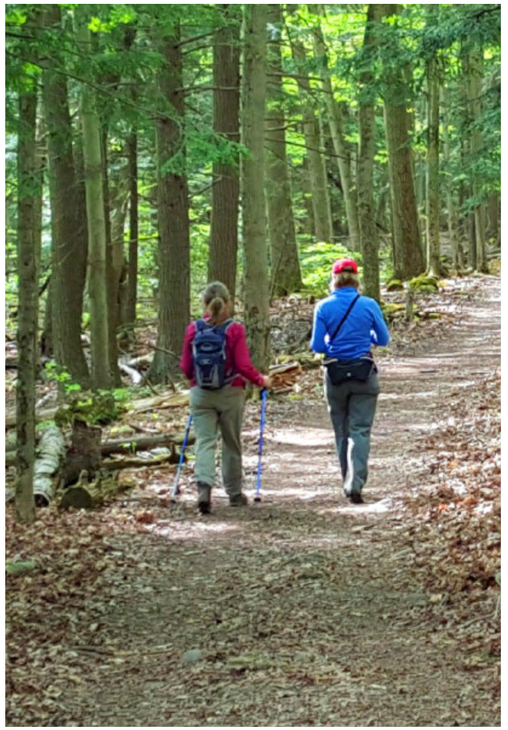
> *"...designating the area as a nature preserve to allow hiking, naturalist-led activities, natural history studies, research and leisure activities wildlife observation and school day-use. The park was to be of great service to the public, including schools, while also serving to preserve the natural habitat it featured."*
>
> *From 'A Park is Born' on www.baysmountain.com/park/history)*

In the 1970s and 1980s work began in earnest to build the infrastructure needed to support the vision for the park including the Nature Center and Planetarium, parking, trails, animal habitats and the Farmstead Museum.

Today Bays Mountain Park and Planetarium includes 3,750 acres and is the largest city-owned park in the state. The park welcomes 150,000 visitors each year to enjoy its rich natural beauty, science and environmental programs, and regional history. Among its many assets are a forty-four acre lake, forty miles of hiking and biking trails, animal habitats, a nature center, a state-of-the-art planetarium, and a history museum.

After years of increased use and deferred maintenance the park is currently in need of a long-term plan for phased improvements. A capital campaign outreach effort was launched in 2021 which identified several priority projects including interior and exterior improvements to the nature center, a new amphitheater, improvements to the existing animal habitats, and a new otter exhibit.

The PIP builds on recently completed work including the Programs and Operations Assessment completed in January 2020.



Park Improvement Plan

Planning Process Summary

The PIP is focused on a core area of the park that includes the Nature Center north to Lakeside Trail and south to the parking lot, and east to the wolf habitat. This area of focus was agreed upon for several reasons: the need to dovetail planned improvements to the interior of the nature center with needed exterior improvements; park user interest in improving and expanding the existing animal habitats and ensuring the highest level of animal welfare which includes the eventual addition of an AZA compliant perimeter fence.

The planning process began in May and was completed in December 2023.

Key Stakeholders in the process include Bays Mountain staff, and members of the Bays Mountain Park Commission (BMPC) and the Bays Mountain Park Association (BMPA).

Park users are important stakeholders and their input was solicited at the outset of the project through a survey conducted in May 2023 by BMP staff that yielded 873 responses.

Survey questions and responses related to the animal habitats included:

1. Improvements to animal habitats that add value to the park experience: viewing, interpretive/signage, resting areas, connectivity between habitats.
2. Favorite Animal: wolves followed by in descending order: bobcat, birds, herps, red fox, turtles
3. Preferred new animals in order: river otter, red panda, large carnivores, hoofstock, small mammals, birds of prey
4. Improvements that would motivate more visits: new animals, improvements to existing animals, nature play, new trails, wildflower/ pollinator gardens, food and beverage

<u>A summary of priorities related to play included:</u>

- Nature play that appeals to children of different ages and allows parents to participate in play was identified as the preferred approach.
- Top play elements include: interactive elements with animal habitats, dig and natural play, rock wall, ropes and climbing.
- Elements for a nature play area: proximity to restroom, places to eat, and elements for children with different abilities.

Goals

The following goals & objectives were developed over the course of the planning process through multiple stages of review with stakeholders:

1. Improve animal habitats in terms of both visitor experience and animal care/welfare.

- Create a variety of visitor experiences and engagements.
- Identify changes needed to current habitats to meet/exceed AZA standards.
- Identify other changes needed for AZA accreditation (perimeter fence, quarantine).
- Identify opportunities to expand enrichment practices.
- Identify opportunities for new animals.

2. Improve arrival sequence, wayfinding, trail access and connectivity, expand ADA access where possible.
3. Provide two defined entries from parking area, one at the Nature Center and one at the Fox Den Playground.

- Plan an accessible route from parking to the Nature Center, herpetarium, and future Fox Den Playground.
- Plan for an accessible loop through the site that includes the Nature Center and one accessible view for current and future animal habitats.
- Consider incorporating principles of Universal Design as defined by Centre for Excellence in Universal Design in new areas.
- Evaluate existing visitor services and identify opportunities to expand/enhance.
- Identify opportunities to strengthen wayfinding and interpretive messaging.

4. Improve overall park aesthetic while considering staffing resources and long-term maintenance.

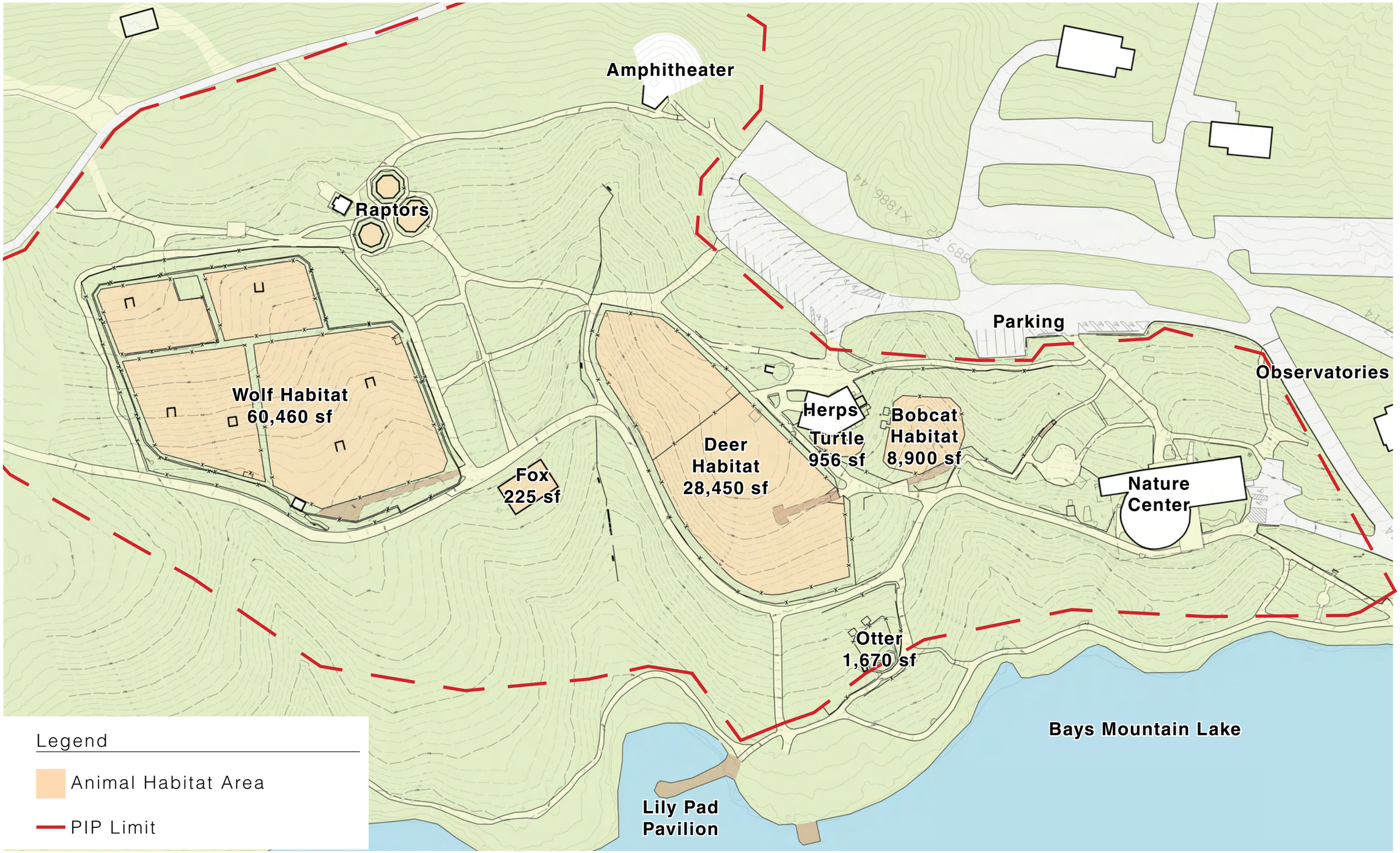
- Identify a palette of materials.
- Identify a ‘look and feel’ for visitor gathering points.
- Identify opportunities for vista clearing and expansion of ecotype landscapes (meadow, successional forest, riparian corridor)

5. Understand what park users want through a survey and expand the visitor demographic.

6. Develop a cohesive and actionable plan that builds on park assets considers the park staffing plan, and facilitates advocacy for additional resources.

- Design a phasing plan that is achievable and considers short- and long-term access.
- Coordinate planned improvements to the Nature Center with future adjacent opportunities.
- Identify a location for the Fox Den Playground.
- Highlight the wolf management program with visitors.
- Optimize the site topography with strategically placed visitor nodes for long views/orientation and dramatic viewing of animals.
- Invest in exterior improvements around the herpetarium and raptor center.

Park Improvement Plan (PIP) Project Overview



Place Making Zones

The PIP engages the site's unique topography, natural history and physiographic context as a basis of conceptual design and establishing 'Place Making Zones.'

The natural history and development history at Bays Mountain Park is influenced by the region's ridge and valley context. These landforms characteristic of this Appalachian Mountain province created bio-diverse ecosystems and drove settlement patterns.

Three main zones - The Ridge, Knoll and Lake Shore - provide a framework for site planning and considering the environmental conditions unique to each zone.

The Ridge as defined in the PIP extends from the new fox habitat east and uphill to Lake Road and south to the parking lot and includes the raptor center and wolf habitats. As part of the PIP, a connecting path from the fox habitat brings visitors along the wolf habitats to the top of the ridge where the raptor walk takes advantage of flatter areas and long views for new loop paths and enclosures. The western side of the ridge remains as an undeveloped forest buffer between the ridge and the knoll.

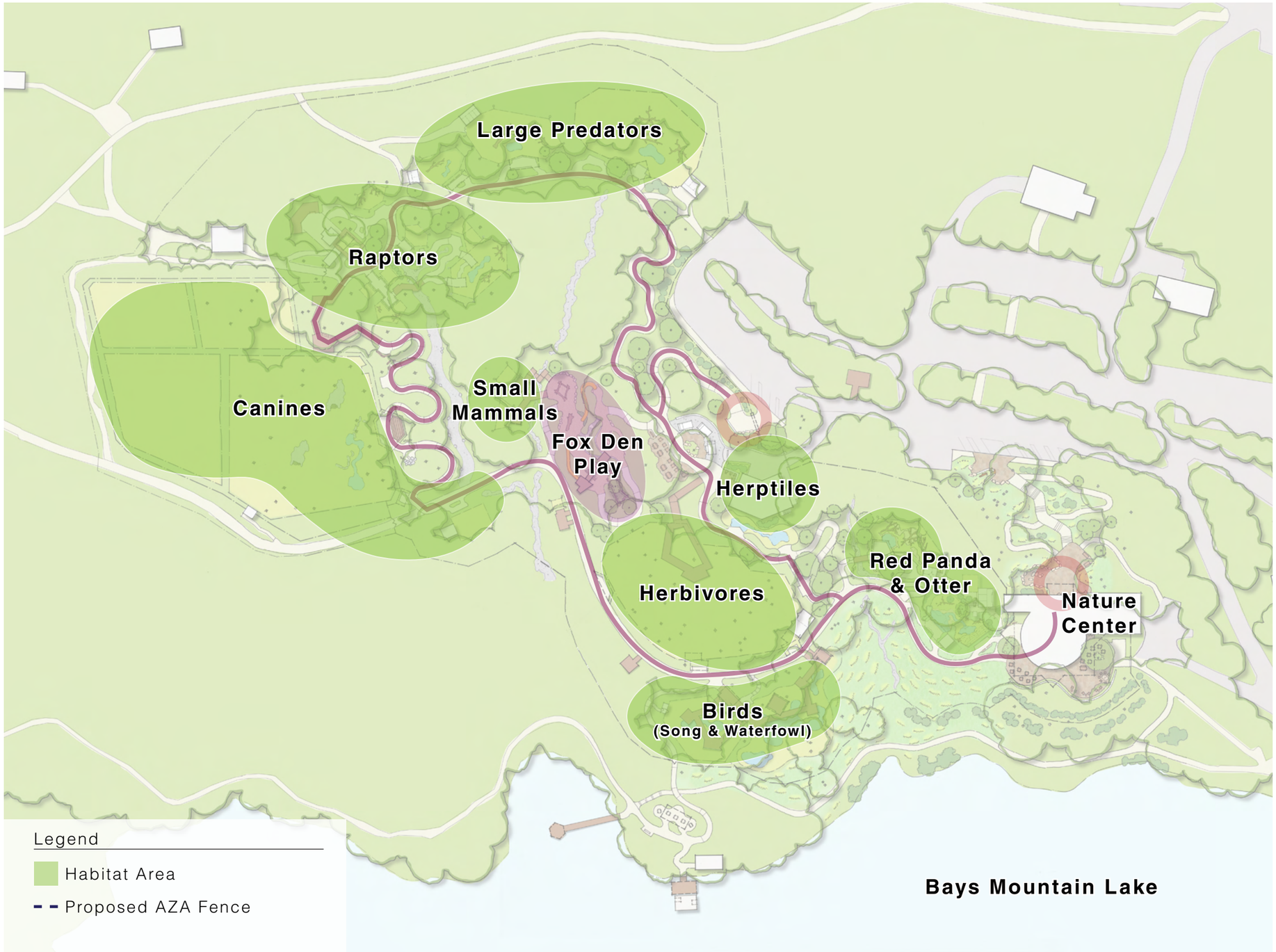
The Knoll includes the Herpetarium and current deer habitat. This large centrally-located zone connects the lake shore and the ridge and becomes a hub with visitor amenities and animal habitats.

The Lake Shore spans from the north and west sides of the Nature Center along the lake side of the main visitor path. This gently sloped area will include future habitats for river otter and waterfowl along with connections to existing lake edge activities.

A fourth zone, Ancient Forests, makes connections to the region's early Pliocene history uncovered in nearby fossil digs.

The Nature Center/arrival zone is separately defined for its importance in welcoming and orienting visitors to the site.

Taxonomic Organization



There are many ways to consider site organization and for zoos and nature centers the typical approach is taxonomic. This approach organizes animal habitats by taxa or family which creates a context for learning and interpretation. It also allows for an ergonomically efficient approach to animal husbandry by grouping similar types of care within defined areas.

The PIP identifies a series of taxonomically organized areas that build on what BMP already has.

Phasing Plan

Given the long-term vision of the Park Improvement Plan, a carefully considered phasing plan with associated Rough Order of Magnitude Costs for each phase (see Appendix A) was essential. Development of a phasing plan considered: currently funded projects, park user priorities identified in the May 2022 survey, size, scope and cost of projects and construction access and site topography. Project phasing considered construction access and logistics for heavy equipment to avoid impacts to each completed project. Stakeholders agreed on a general strategy of starting with projects closer to the lake shore and working uphill.

Phase 1

Phase 1 includes two projects currently funded, the Fox Den Playground (1a) and the Otter Habitat (1b). The third project the Event Terrace (1c) could be completed as part of the Otter project or at a later date. This project has the potential to generate revenue through rentals for a variety of corporate and private events as well as meet the general needs for a larger outdoor gathering place.

Phase 2

Phase 2 includes the arrival and entry walk from the parking area to the front of the Nature Center. This project creates an accessible route for all visitors from the parking lot as well as a more generous and welcoming arrival experience. Improvements to the arrival and exterior of the Nature Center should be planned and implemented concurrently with interior improvements.

Phase 3

Phase 3 includes relocating the existing bobcat habitat (3a) and building a new facility for quarantine (3b). Given the degraded condition of the bobcat habitat and its location over a major drainage way, the design team recommends that this habitat be rebuilt in a new location adjacent to the raptor amphitheater. A quarantine facility is currently needed and is required for future AZA accreditation. A new site behind the Puppy Corner is recommended for ease of access.

Phase 4

Phase 4 includes the Barge and Pavilion ADA Trail (4a), Waterbird and Songbird Habitats (4b) and the Red Panda Habitat (4c). Built at once these three areas represent the largest capital investment proposed under the PIP however, they can be undertaken separately in the order suggested.

Phase 5

Phase 5 includes renovation of the existing deer area into a habitat for herbivores such as elk and turkey (5a) and visitor viewing areas. Also included in this phase is an accessible trail that connects the main lower path with the Knoll. Phase 5b includes the food truck and picnic areas that link the parking area with the Fox Den Playground.

Phase 6

Phase 6 is a new trail that connects the Herpetarium with the Raptor Walk and completes a continuous trail to all the habitats. This trail segment is accessible according to the Forest Service Trail Accessibility Guidelines (FSTAG), which are less stringent that ADA.

Phase 7

Renovation of the Gray Wolf habitats is Phase 7 and includes refreshing existing habitats and a new visitor trail that winds up the hill on grade connecting multiple viewing areas.

Phase 8

Phase 8 includes full renovation of the Raptor walk with new enclosures, visitor paths and a walk through enclosure.

Phase 9

Phase 9a and 9b identify locations for small pull-off gathering and seating places and mammal habitats in the event these critters are desired or there is donor interest.

Phase 10

Phase 10 is the AZA fence, 8’ in height, that is intended as a secondary barrier to keep the animals in as well as to keep predators out.

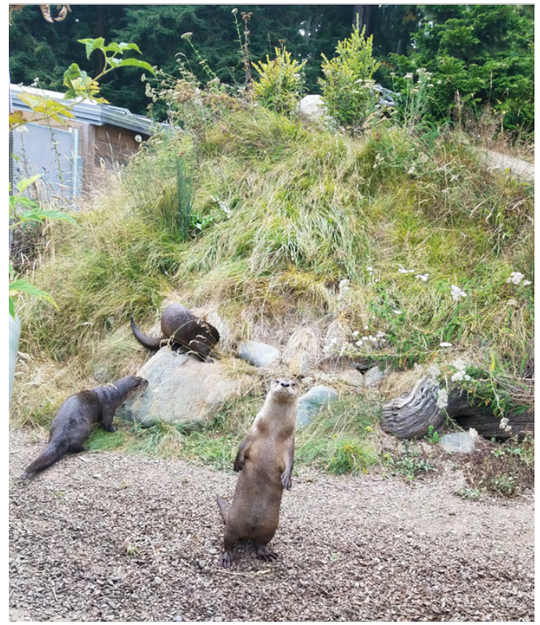
Phases 11 & 12

Phases 11 and 12 identify options for future carnivore habitats where the current amphitheater is located.

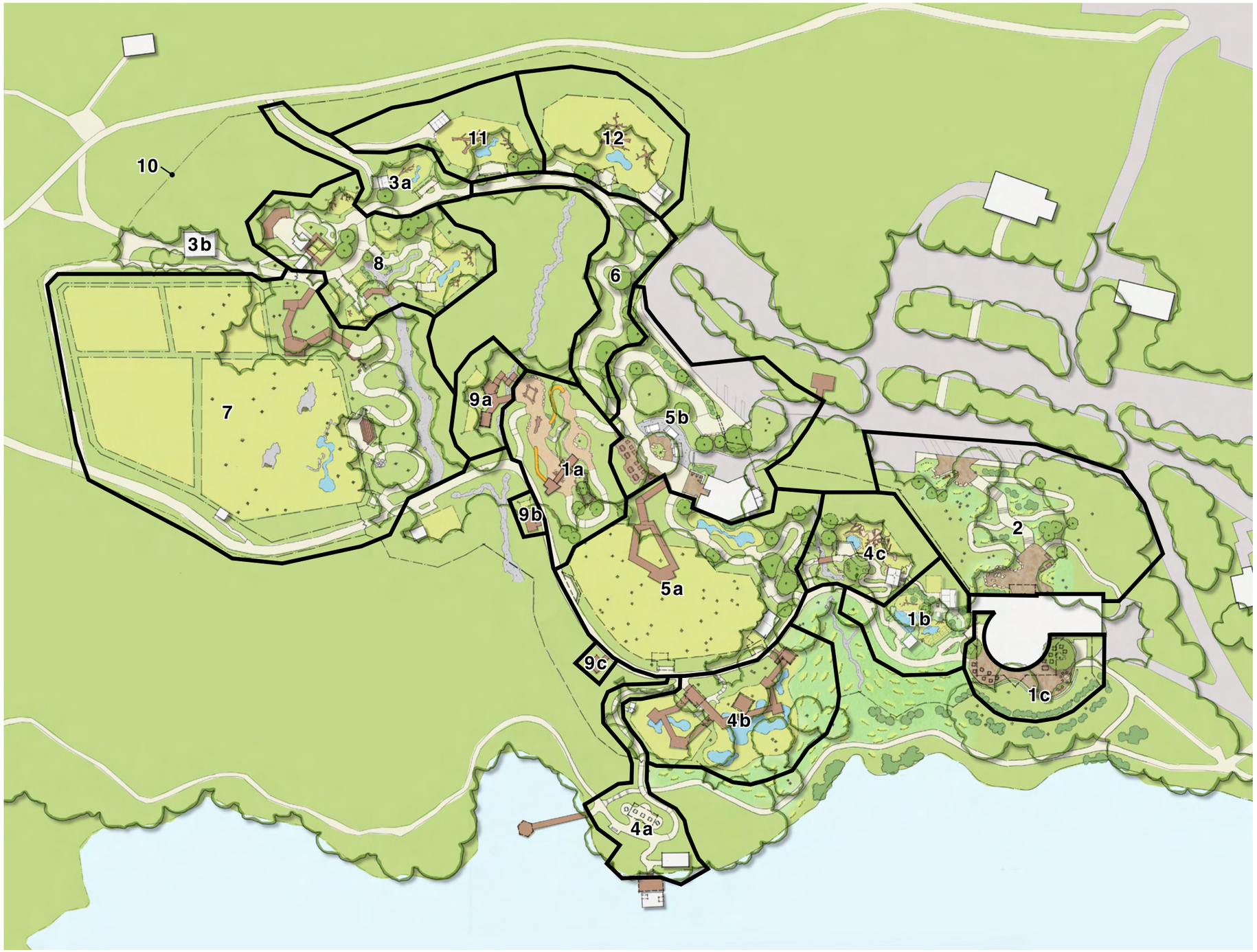
Staffing Plan

The following staffing plan was developed as a means of tracking changes in personnel requirements as each project phase is completed.

1	Fox Den Playground Otter Habitat	ADD – 2 part-time to full-time staff
2	Arrival and Entry Walk	No new staffing required
3	Bobcat Habitat Quarantine	No new staffing required
4	Barge & Pavilion Trail Water birds & Songbirds Red Panda Habitat	ADD – 1 full-time staff
5	Elk Habitat Food Truck & Picnic	ADD – 1 full-time staff
6	Ridge Trail	
7	Gray Wolf	
8	Raptor Walk	
9	Small Mammals	
10	AZA Fence	No new staffing required
11	Carnivore Habitat	ADD – 1 full-time staff
12	Carnivore Habitat	



Phasing Plan



Legend

1. a) Fox Den Playground
   b) Otter Habitat
   c) Event Terrace
2. Arrival & Entry Walk
3. a) Bobcat Habitat
   b) Quarantine
4. a) Barge & Pavilion ADA Trail
   b) Waterbirds & Songbird
   c) Ancient Forests - Red Panda
5. a) Knoll ADA Trail & Habitats
   b) Food Truck & Picnic Area
6. Ridge FSTAG Trail
7. Gray Wolf Habitat Renovation
8. Raptor Walk
9. a) Fox Den Small Mammals
   b) Deck & Small Mammal Habitat
   c) Classroom Deck
10. AZA Accreditation - Perimeter Fence
11. Large Carnivore Mesh Habitat
12. Large Carnivore Habitat

Landing at the Nature Center

The Landing at the Nature Center is a dedicated place for visitor groups of diverse sizes to meet or gather before making their way to the Nature Center. This arrival area includes stone-clad seat walls, lush native plantings with four-season interest, and sculpture such as a wolf pack that honors the important conservation work taking place at BMP.

From the Landing, visitors have the choice to take a series of wide stairs or a gently sloped path that meanders through the nearby forest brimming with spring bulbs and flowering understory trees. At the entrance to the Nature Center another gathering area provides opportunities for seating, meetups and reading interpretive signage about BMP's history and commitment to animal welfare.

Nature Center Arrival

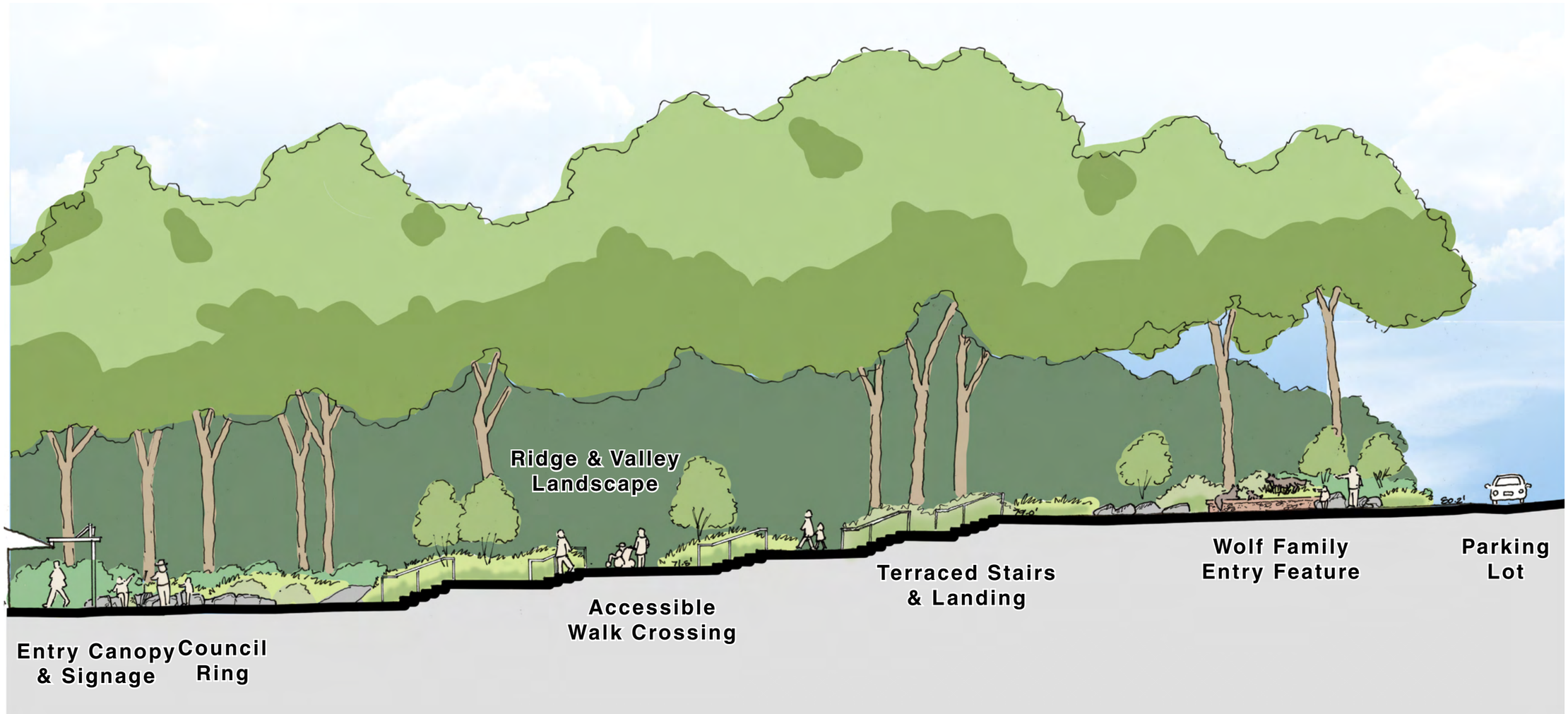
Legend

1. Bus Parking
2. ADA Parking
3. Visitor Landing
4. Bronze Wolf Statue & Seatwall
5. Terraced Stairs & Landing
6. 1:20 Accessible Route
7. Seating
8. Council Ring
9. Staff Non-ADA Walk
10. Staff Parking
11. Vendor Station
12. Balcony & Overhang Above
13. Flexible Patio space
14. Retaining Wall
15. AZA Perimeter Fence
16. Entry/Exit from Nature Center

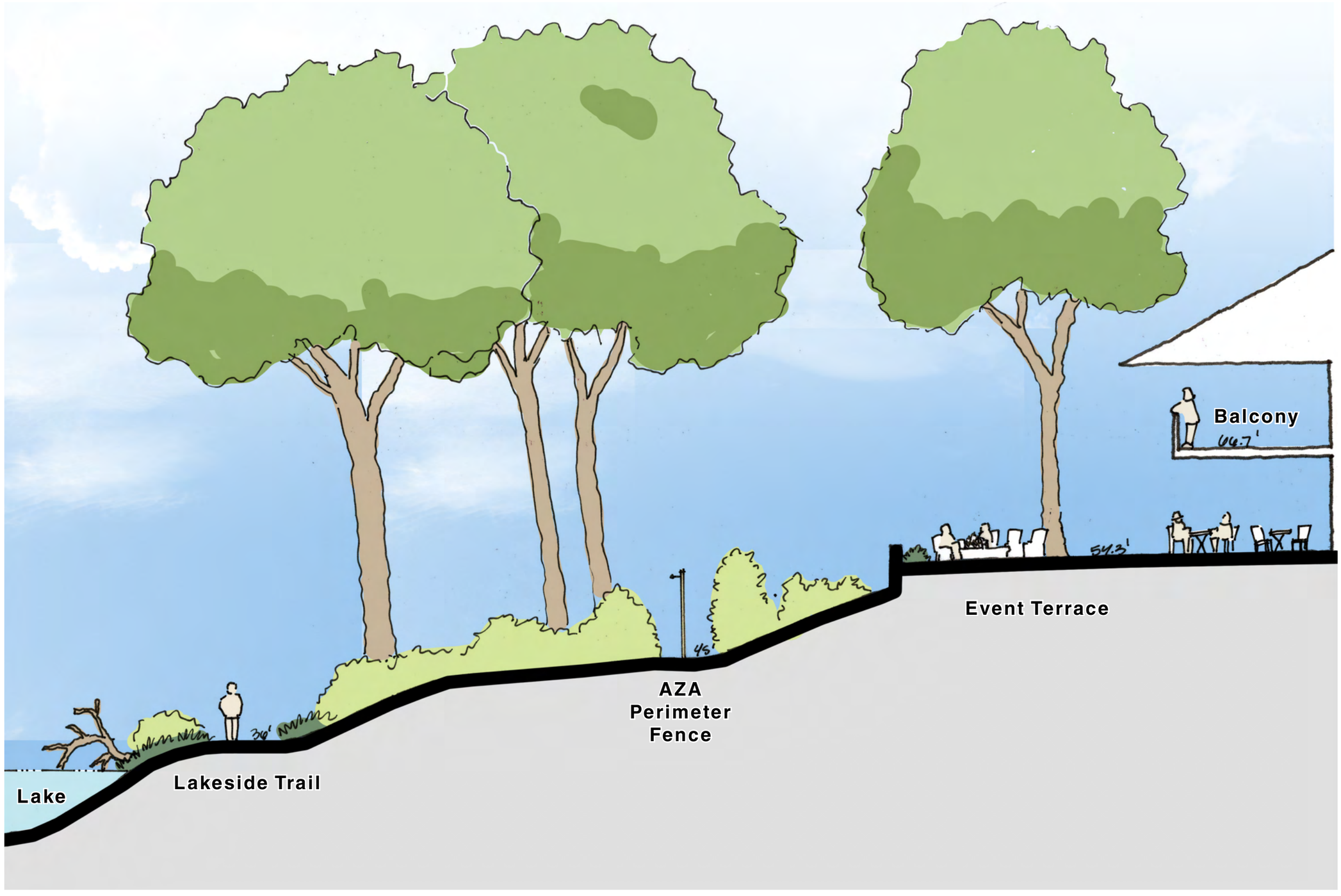
Program

Entry Walk	8,800 SF
Event Terrace	5,200 SF

Entry Walk Section

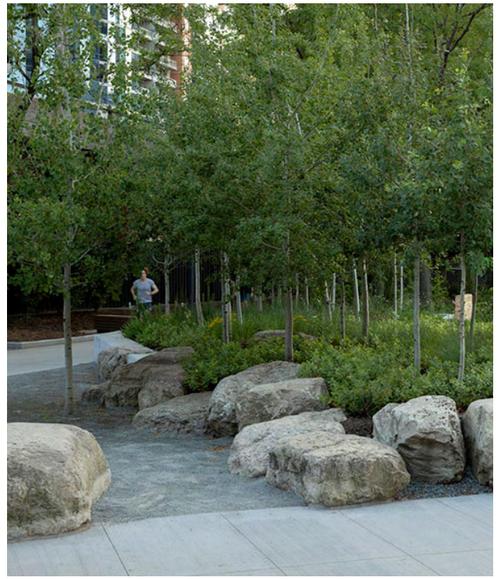


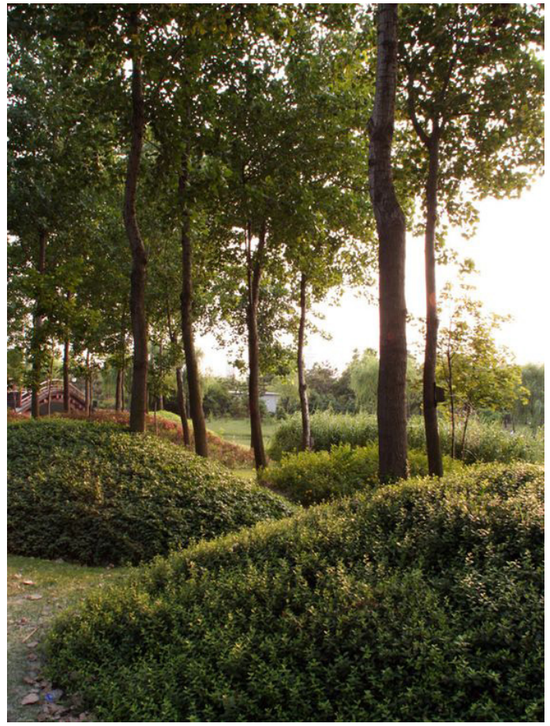
Event Terrace Section



0' 5' 10' 20'

Nature Center Arrival Character





Experiencing the Lake Shore

Bays Mountain Lake is one of the greatest assets of the park. The PIP identifies opportunities for future lakeside wildlife habitats that build on BMP's educational mission.

The centerpiece of the Lake Shore zone and the first phase of the PIP is a habitat for North American River Otter. Otters are an important wetland species; they are active and charismatic and park users and staff are excited to bring them back to BMP. Located adjacent to the Nature Center the habitat includes a large outdoor area in a marsh-like setting. Underwater views into a deep pool allow visitors to observe these playful animals as they swim and frolic. Animal care infrastructure includes a new night house with food prep and dens for up to three otters, an exterior off-exhibit area, and conditioned building for the pool life support system.

Other habitats in the Lake Shore zone are located between the downhill side of the main path at the base of the Knoll (current deer habitat) and Lakeside Trail. Gentle slopes and lake views make this a terrific location for immersive habitats and visitor linkages between the core park area (within the future AZA fence) and existing lake edge destinations including the Barge and Lily Pad Pavilion.

Bridging the slope, a series of boardwalks and viewing stations create a loop off the main trail that leads visitors to several avian habitats. The first is a large pond and marsh area to attract and support a variety of local waterfowl including: ruddy and wood ducks, green-winged teal, hooded merganser, black-crowned night heron and others. Further along the loop boardwalk visitors can observe songbirds in a walk-through aviary. Managed species may include: northern cardinal, red-winged blackbird, Baltimore oriole, hooded warbler and marsh wren.

0' 60' 120' 240' N

The Lake Shore

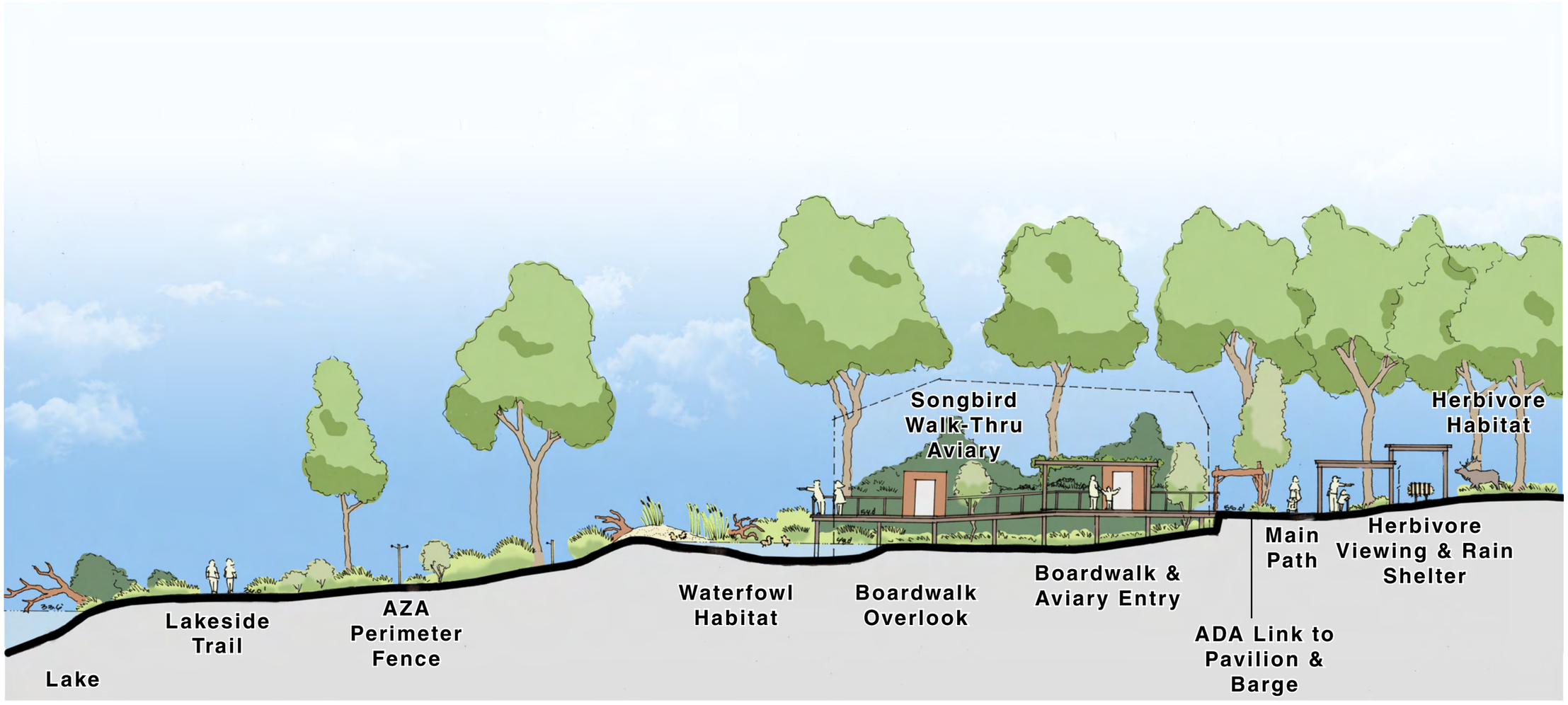
Legend

1. Decking/Boardwalk
2. Vegetated Bioswale
3. Underwater Viewing & Shelter
4. Otter Holding & Service Area
5. Otter Life Support
6. Shade Structure
7. Wildbird Station
8. Song Bird Walk-thru Aviary
9. Keeper Access
10. ADA access to Lakeside Trail
11. Picnic Pavilion
12. AZA Perimeter Fence
13. Knoll Herbivore Viewing
14. Knoll Herbivore Holding

Program

Otter Habitat	2,360 SF
Otter Holding	300 SF
Waterfowl Habitat	9,100 SF
Songbird Habitat	4,700 SF
Boardwalks	9,000 SF
Lakeside ADA Access	3,300 SF
Picnic Pavilion	500 SF

Lake Shore Cross Section



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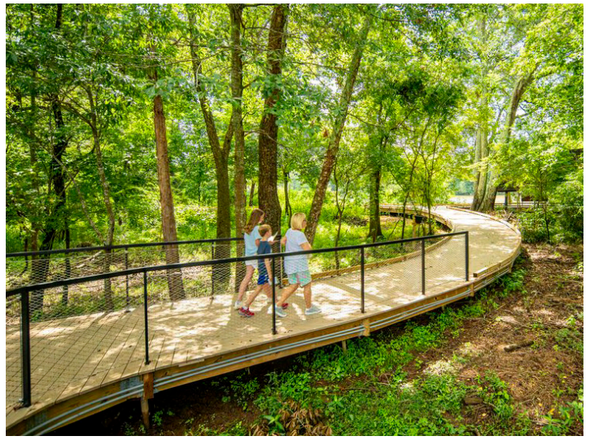
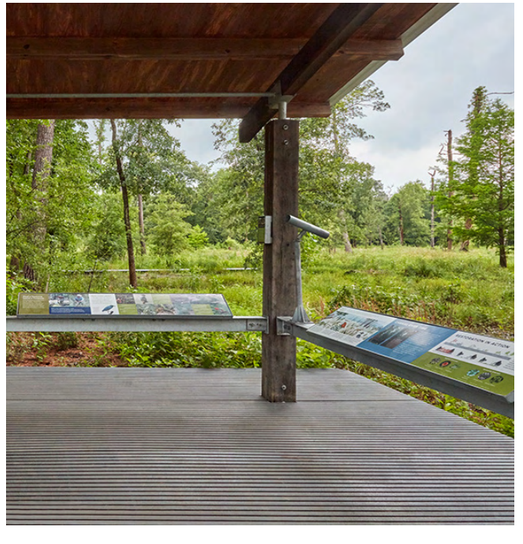
Lake Shore Character





Trekking through Ancient Forests

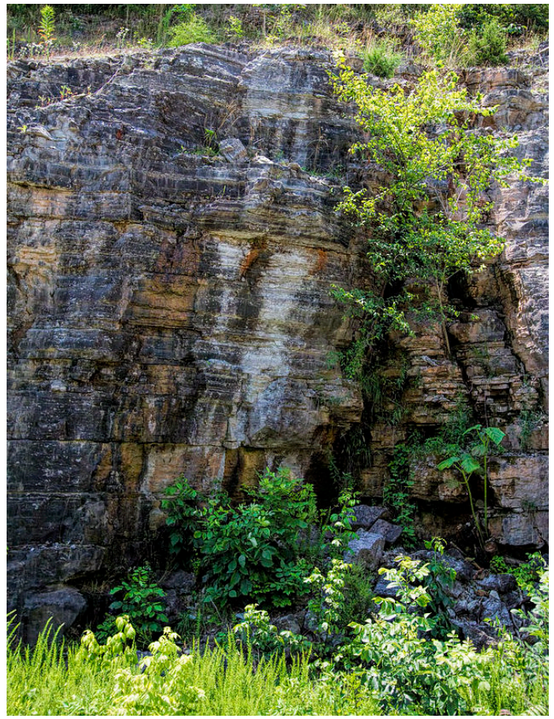
Ancient Forests is a unique zone to BMP that connects park users to the region's paleontology. Nearby places such as Gray Fossil Site and Museum have uncovered fossils dating to the Early Pliocene, between 4.5 and 4.9 million years ago. Among the fossils found are those of the extinct Pristinailurus bristoli (Bristol's Appalachian Panda), an ancient relative to the modern-day red panda.

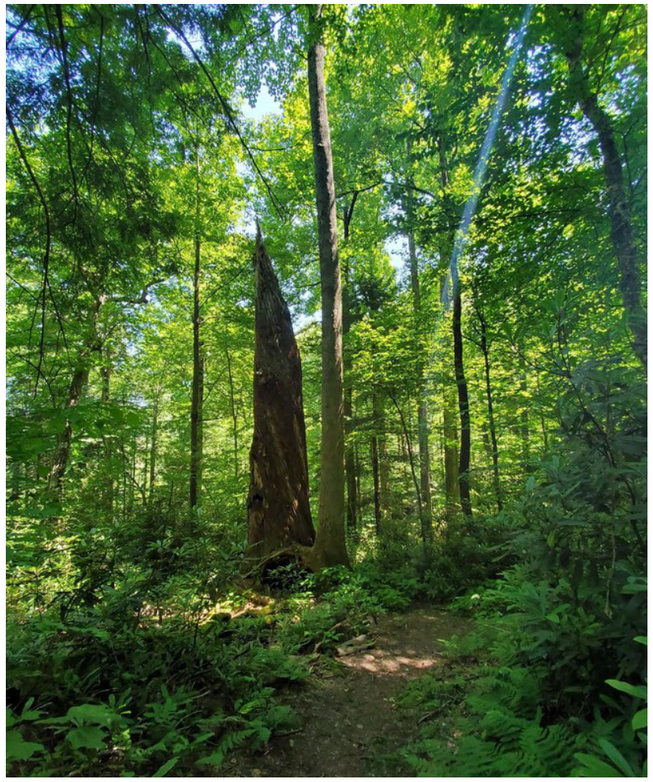
In the park user survey, respondents named Red Pandas as their preferred 'new animal' after North American river otter.

Besides their great appeal to visitors and paleontological connection, there are many reasons to consider bringing red pandas to BMP. The site proposed for a future habitat (current Bobcat habitat) is perfect for their need to be in a cool environment, especially in summer. With north facing slopes, shady forests and lake breezes this species can spend more time outside during warm seasons and limit the need for additional cooling. The site is also relatively close to the Nature Center and future otter habitat which makes access for animal care convenient.

A major conservation benefit is that as an endangered species, BMP would have an opportunity to participate in the AZA Species Survival Program (SSP).

The landscape experience of Ancient Forests immerses visitors in an old growth Tennessee forest with limestone outcrops and sinkholes typical of Karst formations.





Ancient Forests

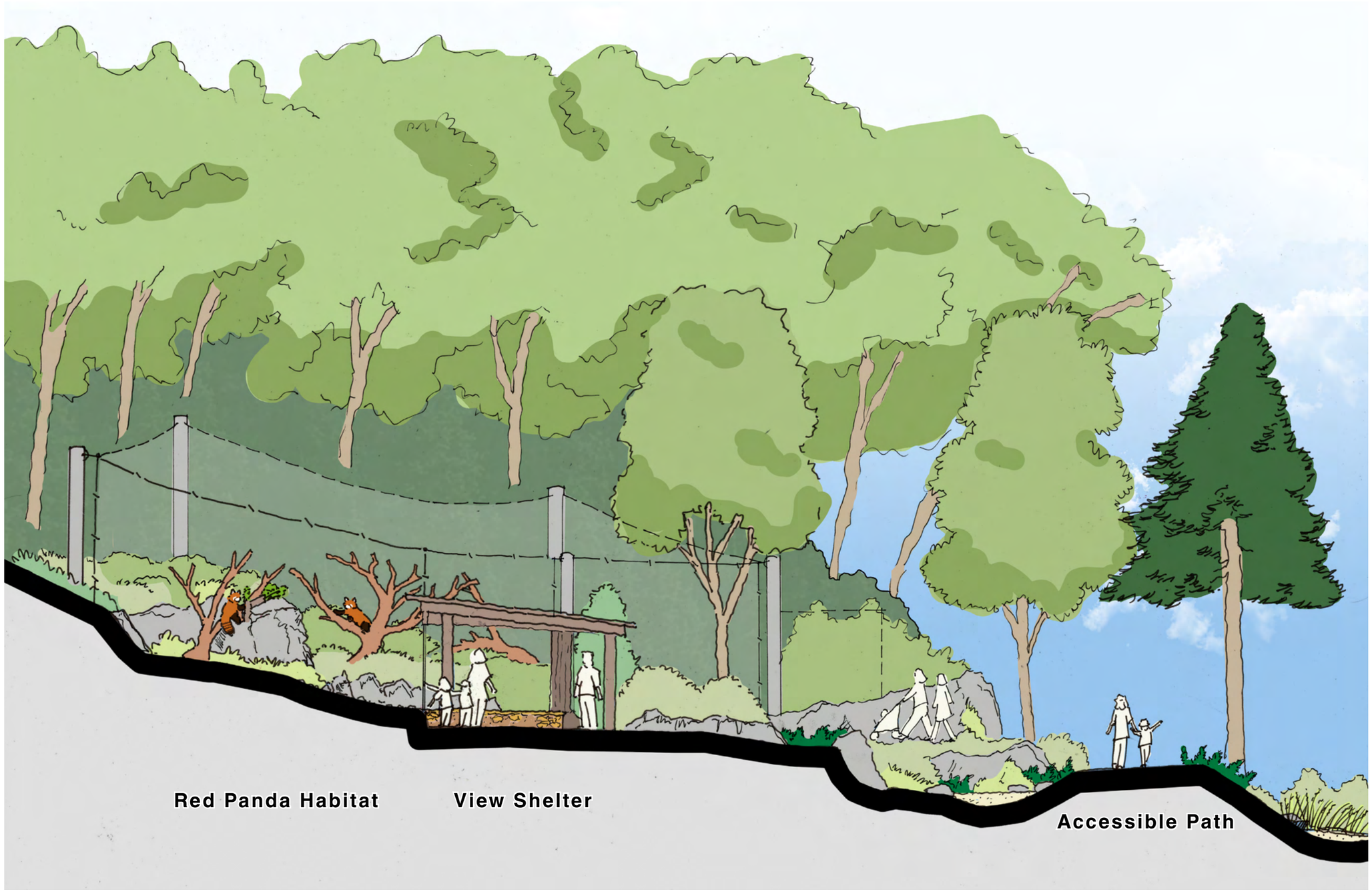
Legend

1. Bristol's Panda Entry Statue
2. Limestone Outcrop
3. Red Panda Holding
4. Holding View Window
5. Staff Access
6. Mesh enclosure
7. Covered Viewing Shelter
8. Bridge over Bioswale
9. Sinkhole Pool
10. Pathway to Knoll

Program

Red Panda Habitat	2,600 SF
Red Panda Holding	300 SF
Covered Viewing Shelter	343 SF

Ancient Forests Section



Exploring the Knoll

The Knoll is the hub of the PIP. Expanding on the Herpetarium and its proximity to the parking area a second entry point, the East Entry, is proposed. An ADA accessible path connects visitors from the parking area through the East Entry along a ramped path to a new visitor services area adjacent to the Herpetarium. Included are a shady picnic grove and locations for food trucks (with a dedicated service drive). Existing restrooms at the Herpetarium are nearby with the potential for expansion if needed.

From the picnic area visitors can walk out to the top of the knoll on a ADA accessible boardwalk to observe elk grazing in a large meadow with views of the lake beyond. Heading back to the Herpetarium and turning right a path leads past a large turtle pond and winds its way down the hill to the main path. As visitors walk toward the wolf conservation area, several additional view blinds offer opportunities to see elk in their large habitat.

Walking east from the picnic area visitors have two options, to either walk to the ridge or take a downhill ramp to the Fox Den Playground. Choosing the playground, visitors can experience a variety of physical and interactive play experiences including climbing, sliding, swinging, jumping, and exploring.

The Knoll

Legend

1. Knoll Stairs
2. Knoll ADA walkway
3. Elk Holding
4. Elk Viewing Shelter
5. Observation Deck
6. Herpetarium Entry Seating
7. Elk View Blind
8. Classroom Deck
9. Small Mammal Habitat ‘A’
10. Small Mammal Habitat ‘B’
11. Small Mammal Habitat ‘C’
12. Entry Portal with Roll-up Gate
13. New ADA Parking & Sidewalk
14. AZA Perimeter Fence
15. FSTAG Trail to Ridge
16. Entry Overlook View
17. Food Vendor Area
18. Exploration Trail
19. Covered Viewing Areas
20. Small Mammal Boardwalk Trail
21. Elevated Play Structure
22. Embankment Slide
23. Rustic Climbing Structures
24. New Service Driveway

Program

ELk Habitat	23,800 SF
Elk Holding	600 SF
Turtle Stream	1,600 SF
Observation Deck	2,200 SF
Classroom Decks	590 SF
Picnic Area	5,800 SF
Fox Den Playground	12,200 SF
Small Mammal Habitats	1,400 SF

Exploring the Ridge

The Ridge encompasses the east end of the site including the existing Raptor Center and Wolf Habitats. A large area of forest that buffers the parking lot is preserved and provides a transition to the Ridge protecting several natural drainageways. Visitors leave the sunny open Knoll and walk through the forest into the dappled light and dramatic views of the Ridge.

From the Fox Habitat along the main visitor paths visitors ascend the slope along the existing Wolf Habitats via switchback trails. At the lower view, visitors observe wolves up close through a glass view as they drink and play in a nearby stream. Continuing along the trail uphill a deck and overlook invites visitors to observe the wolves from a higher point on the ridge before returning to the path to the Raptor Walk.

The Raptor Walk reorganizes and replaces the existing Raptor Center. The main walk is located along the edge of a ridge with secondary loop paths for visitors to experience raptors as part of the typical landscapes they inhabit. Three areas include: the Owl Gallery (screech owl, barred owl, great-horned owl), the Clearing (red-tailed hawk and bald eagle) including a walk-through raptor aviary and Oak Forest (red-shouldered hawk, broad-winged hawk). Mesh enclosures are sized and shaped for each species.

Along the trail that returns to the Knoll visitors stop to encounter the bobcat habitat (relocated), a new mesh structure that encloses a hillside and allows the bobcat to climb above visitors where they prefer to be. Two future habitats for larger carnivores are located further along this trail eventually replacing the old amphitheater. The first is a large mesh enclosed habitat and the second is a 1/4 acre fence-enclosed habitat.

The Ridge

N

0' 35' 70' 140'

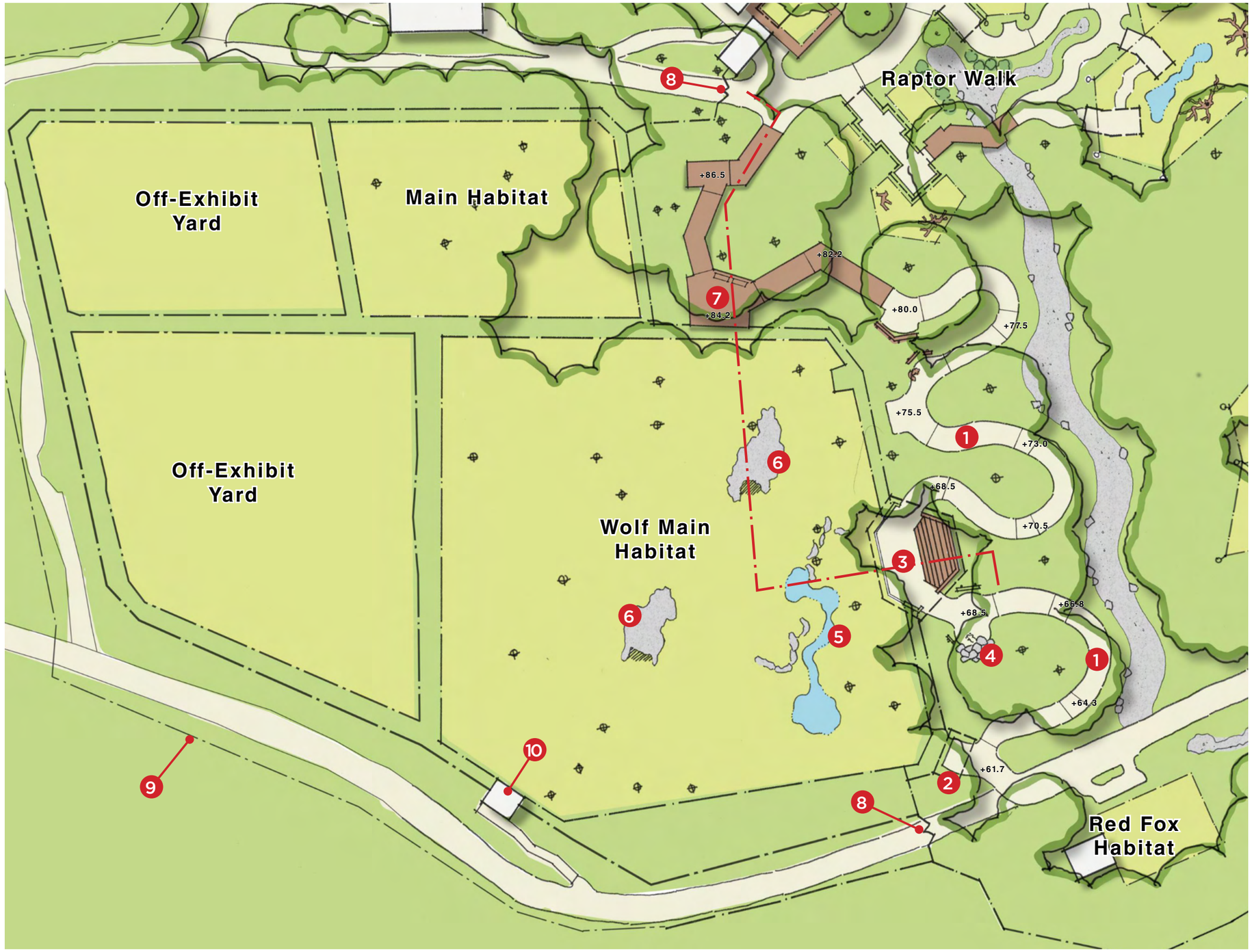
Wolf Habitat

Legend

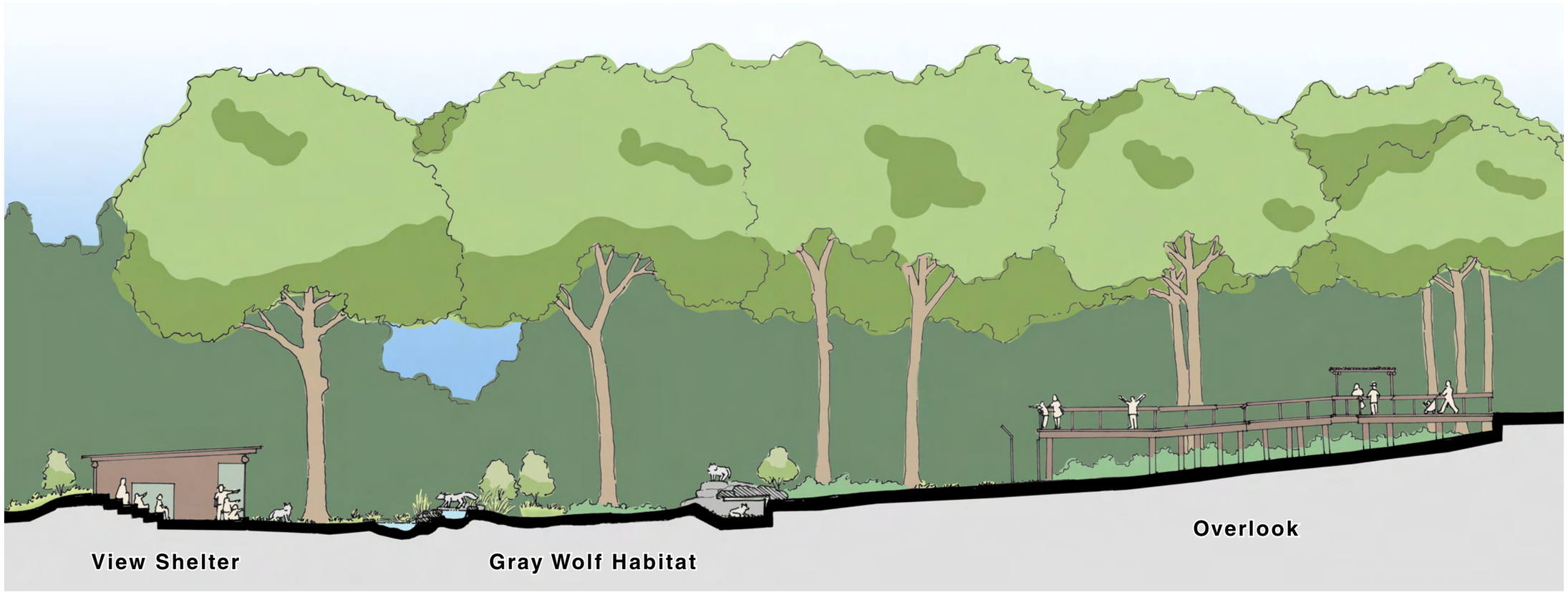
1. ADA Accessible Wolf Trail
2. Thru-the-Trees Canopy View
3. View Shelter with Seating
4. Wolf Interpretives
5. Stream Water Feature
6. Wolf Dens
7. Overlook and Elevated Trail
8. Staff Security Gate
9. AZA Perimeter Fence
10. Staff Observation Tower

Program

Wolf Main Habitat SF	30,250
Puppy Corner	8,140 SF
Off-Exhibit Yards SF	23,230
View Shelter	1,200 SF
Overlook & Elevated Trail	1,780 SF
Wolf Trail	4,120 SF



Wolf Habitat Section



0’ 10’ 20’ 40’

Raptor Walk & Carnivores

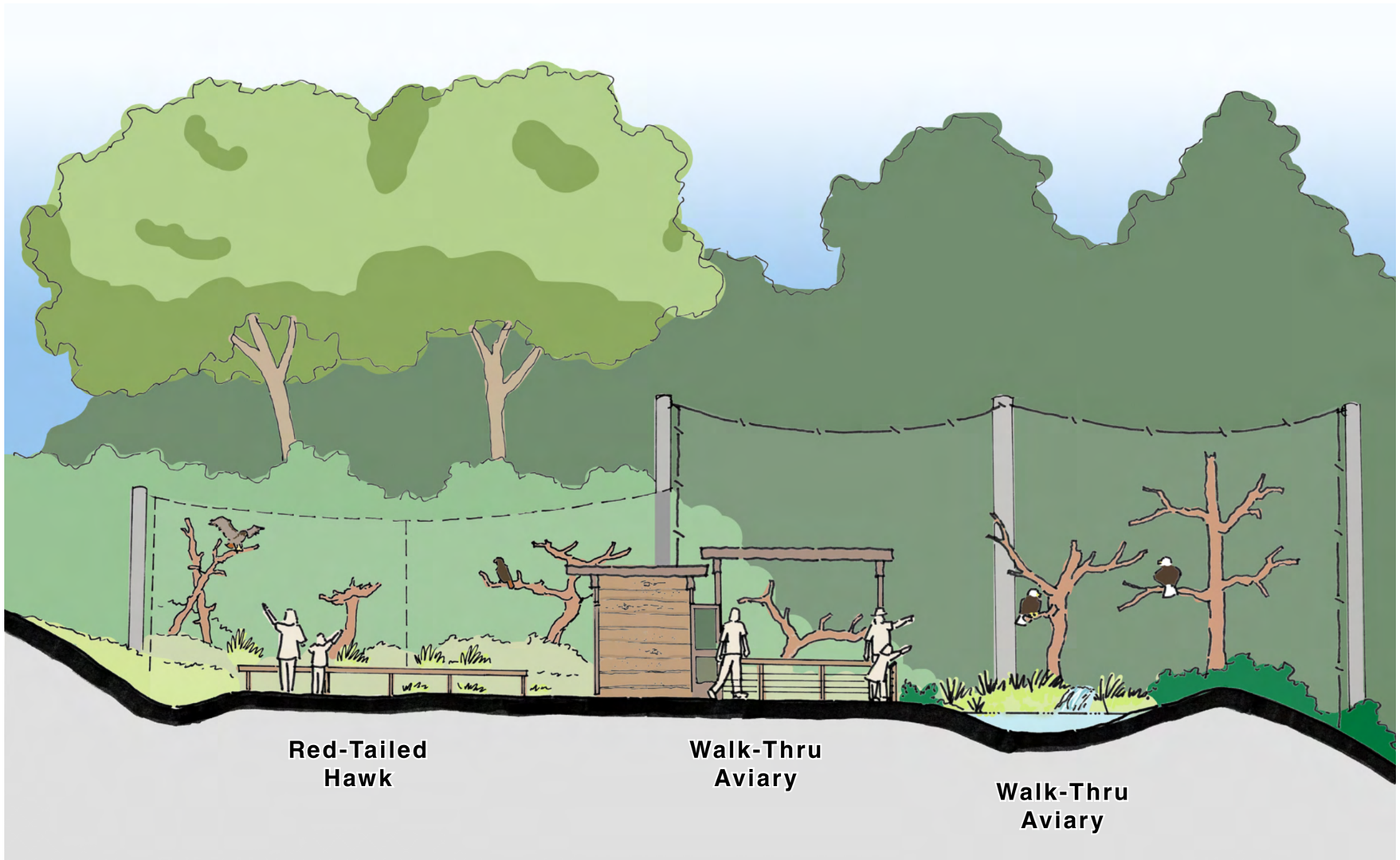
Legend

1. Elevated Trail from Wolf
2. Restrooms
3. Staff Security Gate
4. Amphitheater Seating
5. Screech Owl Aviary
6. Barred Owl Aviary
7. Barn Owl Shed Aviary
8. Great Horned Owl Aviary
9. Walk-Thru Raptor Aviary
10. Red Tailed Hawk Aviaries
11. Broad-Winged Hawk Aviary
12. Red-Shouldered Hawk
13. Covered Viewing Area
14. Glass Viewing Shelter
15. Holding Building
16. FSTAG Trail to Knoll
17. Vegetated Bioswale

Program

Restrooms	220 SF
Owl Aviaries	1,350 SF
Hawk Aviaries	1,800 SF
Walk-Thru Raptor Aviary	3,000 SF
Bobcat Habitat	1,500 SF
Bobcat Holding	190 SF
Meshed Carnivore Habitat	4,800 SF
Meshed Carnivore Holding	290 SF
Fenced Carnivore Habitat	11,200 SF
Fenced Carnivore Holding	400 SF
Quarantine	1,040 SF

Raptor Walk Section



0' 4' 8' 16'

Animal Habitats

Lakeshore

River Otter

Potential Species: North American River Otter

Habitat Size: 2,300 sf

Holding Area: Three 8’ x 10’ Holding areas, 300 SF total, covered & insulated, dump & fill pools, circulation fan, solid divider if breeding is desired

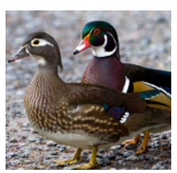
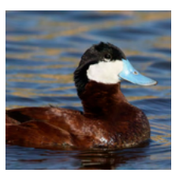
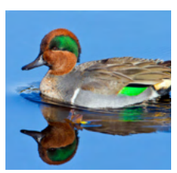
Landscape Description: Simulated small tributary to lake of shallow stream with deeper pools, hillside habitat with rolling terrain with wetland vegetation, boulders, and deadfall.

AZA Requirements

Space Requirements/ Considerations: 1615 SF for two + 377 SF each additional otter, Outdoor exterior yard recommended

Barrier Requirements: 6’ ht. non climbable with 2.5’ deep dig barrier

Habitat Requirements: 3:1 to 4:1 land to water ratio, complex pool, log piles & deadfall, natural substrate for digging, complex land terrain, varying water depths & shoreline type.

Waterfowl

Potential Species: Ruddy Duck, Wood Duck, Green-winged Teal, Hooded Merganser, Black-crowned Night-Heron, Common Gallinule, Green Heron, Northern Shoveler, Northern Pintail, American Beaver

Habitat Size: 9,065 sf

Holding Area: None

Landscape Description: Vegetated marsh with several sand banks, simulated along edge of lake, open canopy for simulated floodplain and views to lake, grasses, rushes, & sedge vegetation with snags

---

AZA Requirements
Space Requirements/ Considerations: TBD

Barrier Requirements: 2.5-3.5’ ht. fence

Habitat Requirements: Shallow water stream, marsh, & pools, snags & deadfall for shelter and perching



Songbird

Potential Species: Northern Cardinal, Red-winged Blackbird, Baltimore Oriole, Hooded Warbler, Belted Kingfisher, Marsh Wren

Habitat Size: 4,700 sf

Holding Area: None

Landscape Description: Floodplain fringe forest with shallow stream planted with natural food sources

---

AZA Requirements

Space Requirements/ Considerations: TBD

Barrier Requirements: Fully enclosed mesh, 1”x1” to limit Avian Flu

Habitat Requirements: Variety of natural vegetation for nesting & perching, water source for drinking & bathing

Ancient Forests

Red Panda

Potential Species: Red Panda

Habitat Size: 2,600 sf

Holding Area: Three holding areas of various sizes, 220 SF total, conditioned

Landscape Description: Hillside ridge habitat with natural limestone boulder formation to simulate late Miocene landscape, rich undergrowth of woodland perennials and understory shrubs and trees, natural fallen logs and deadfall for climbing

---

AZA Requirements

Space Requirements/ Considerations: 430 SF minimum per care manual. Conditioned space when above 80°F, 12’ vertical space. 360 SF outdoor off-exhibit recommended.

Nashville Zoo Exhibit: 2,000 SF

Sequoia Park Zoo Exhibit: 2,800 SF

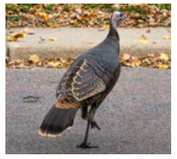
Barrier Requirements: Fully enclosed mesh (Preferred by BMP Staff) or 4’-5’ ht. non-climbable area. At least 12’ ht. of vertical space.

Habitat Requirements: Elevated climbing surfaces at various heights, ample shade, mist for cooling, public access on one side, at least 1 nest box more than number of red pandas.

Animal Habitats

Knoll





Elk

Potential Species: Roosevelt Elk, Turkey, Wild Boar

Habitat Size: 23,800 sf

Holding Area: 600 SF covered lean-to shelter

Landscape Description: Wooded hillside of large trees with little understory, occasional grasses & perennials on fringes.

AZA Requirements

Space Requirements/ Considerations: 2000 SF/ individual (Elk)

Barrier Requirements: 8’ fence for Elk

Habitat Requirements: Outdoor habitat with ample space and shade, browsing opportunities. Flat & stable terrain.


Turtle

Potential Species: Freshwater Pond Turtles, Common Snapping Turtle

Habitat Size: 1,600 (total), may be divided into 2-3 habitats

Holding Area: None

Landscape Description: Naturalistic stream & pond with native grasses and rushes

---

AZA Requirements

Space Requirements/ Considerations: N/A

Barrier Requirements: 1.5-3’ ht. non-climbable barrier

Habitat Requirements: Stream with multiple depths, areas of sun & shade, wood hides & natural vegetation



Small Mammal

Potential Species: Woodchuck, Opossum, Raccoon, Southern Flying Squirrel, Striped Skunk, Long-tailed Weasel

Habitat Size: 1,120 SF (total), (3) habitats of 115 SF, 430 SF, 575 SF.

Holding Area: Small insulated next box or off-exhibit holding of approximately 8-12 SF X 7’ ht.

Landscape Description: Natural woodland area with small trees, logs, boulders with some open areas.

AZA Requirements

Space Requirements/ Considerations: 470 SF x 12’ ht. for 2 raccoons (AZA) + 25% SF for each additional animal, nest boxes

Barrier Requirements: Fully enclosed mesh, size varies based on individual. Dig barriers

Habitat Requirements: Natural substrates, burrow or hides, climbing & digging opportunities based on the individuals, recommended pool or stream for raccoons.

Ridge


Fox

Potential Species: Red Fox, Gray Fox

Habitat Size: +/- 1,200 SF

Holding Area: +/- 200 SF

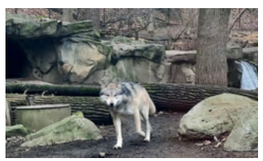
Landscape Description: Natural woodland area with small trees, logs, boulders with some open areas.

AZA Requirements

Space Requirements/ Considerations: 1,100 SF + 110 SF each animal X 8’ ht., 40 SF holding area for each animal, small nest boxes

Barrier Requirements: Fully enclosed mesh with dig barriers

Habitat Requirements: Variety of vegetation, digging substrate, variety of climbing branches, logs, rocks, hollow log or den

Wolf

Potential Species: Gray Wolf, Red Wolf

Habitat Size: 60,800 SF (total), (5) yards of 30,000 SF, 15,000 SF, 8,000 SF, 7,200 SF, & 600 SF (Existing yards)

Holding Area: 600 SF, 7,200 SF, & 15,000 SF will be off-exhibit outdoor yards

Landscape Description: Natural woodland with tall existing trees, rock outcrops with dens and small pool

---

AZA Requirements

Space Requirements/ Considerations: Multi-generational packs: 10,000 SF + 5,000 SF yards, (3) holding pens of 200 SF ea. Reintroduction group: 20,000 SF

Barrier Requirements: 9 gauge steel min. x 2”. 8.2’ ht. with 39” overhang at 35-45 deg. Angle. Dig barrier of 36” wide at 6-12” below grade

Habitat Requirements: Complexity and variety in habitat, flat areas with earthen berms or long slopes. Natural vegetation, not barren. Variety of furniture including hollow dogs, rock overhangs, underground dens, deadfall, logs, boulders, artificial den boxes. Elevated areas for rested (such as berms or rocks) Natural substrates with variety. Water features.

Animal Habitats

Ridge



Raptors

Potential Species: Barn Owl, Screech Owl, Barred Owl, Great Horned Owl, Bald Eagle, Red-Tailed Hawk, Broad-Winged Hawk, Red-Shouldered Hawk

Non-designated future options: Sharp-shinned Hawk, Cooper's Hawk, Golden Eagle, Peregrine Falcon, American Kestrel, Turkey Vulture, Black Vulture, Northern Harrier

Habitat Size: (9) Habitats: 450 SF (Barn Owl), 220 SF (Screech Owl), 320 SF (Barred Owl), 800 SF (Great Horned Owl), 3,820 SF (Bald Eagle), 800 SF (total) (2) X 400 SF (Red-Tailed Hawk), 630 SF (Broad-Winged Hawk), 920 SF (Red-Shouldered Hawk)

Holding Area: Nest boxes for smaller raptors, 40-60 SF temporary holding spaces for larger raptors

Landscape Description: (3) Areas: Hemlock forest with evergreen trees, perching & freestanding hollow logs for owls, Clearing or Forest glen with occasional trees, freshwater stream and grasses, Oak Forest woodland with mature existing trees and low understory

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AZA Requirements

Space Requirements/ Considerations: 260 SF (Barn Owl), 40 SF (Screech Owl), 260 SF (Barred Owl), 260 SF (Great Horned Owl)

Barrier Requirements: Fully enclosed mesh structures, 1"x1" to limit Avian Flu, predator dig barriers on outside

Habitat Requirements: Perches, nest areas, baths, plants, feed stations, shelters & safe havens, bathing pools 0.5-1 in. depth for small, 2-3 in. depth for larger birds, Natural light & shade

Bobcat

Potential Species: Bobcat

Habitat Size: 2,000 SF

Holding Area: (2) 60 SF holding areas, 120 SF total insulated & covered, circulation fan

Landscape Description: Elevated wooded hillside with rock outcrops, deadfall, small water feature

---

AZA Requirements

Space Requirements/ Considerations: 12' ht. minimum, Trailside Bobcat habitat: 1,800 SF, indoor: 128 SF

Barrier Requirements: Fully enclosed mesh with dig barrier

Habitat Requirements: Climbing opportunities of perches and elevated space to utilize vertical space, logs for clawing, hides or den, heating element for warming, shade



Future Large Carnivores

Potential Species: American Black Bear, Mountain Lion, Red Wolf, Coyote

Habitat Size: Meshed: 6,300 SF, Fenced: 15,000 SF

Holding Area: Meshed: 180 SF, Fenced: 280 SF, Insulated holding areas

Landscape Description: Elevated wooded hillside with rock outcrops, deadfall, small water feature

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AZA Requirements

Space Requirements/ Considerations: Minnesota Zoo Black Bear: 8,600 SF, indoor: 350 SF

Living Desert Zoo Mountain Lion/Jaguar: 2,500-3,000 SF

Ecotarium Mountain Lion indoor: 350-700 SF.

Barrier Requirements: TBD: Full enclosed mesh or tall fence with overhang, secondary hot wire recommended. Dig barriers.

Habitat Requirements: Varied topography and natural features, logs, stumps, earth mounds, pools, digging or rolling substrate

Materials Palette

Identifying a palette of paving materials is important for establishing a consistent look and feel throughout the park. Material selection can reinforce visitor wayfinding and orientation, path hierarchy (main and secondary trails) and safety by differentiating visitor trails from service roads. For budget planning purposes it is also important to consider materials since costs are wide ranging.

The current park paths are primarily asphalt and compacted earth. Materials recommended for main visitor paths include either asphalt or Flexi-Pave with secondary paths being the same or concrete or decorative concrete. Granular or loose material can be used for secondary trails along flat areas. For visitor nodes and gathering areas Tennessee flagstone is a good option for making these areas stand out from the trails.

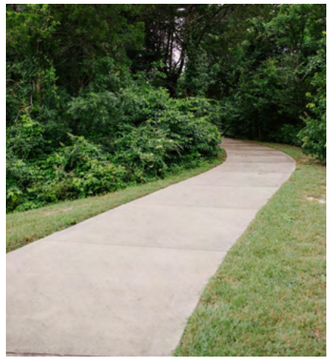
For service areas, asphalt is recommended and should be designed to support the largest vehicle that will be used.

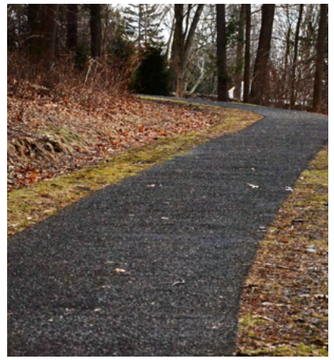
For play areas, engineered wood fiber (EWF) is recommended for most locations and should be designed in accordance with the fall height of the surrounding equipment.

For areas where visitor paths traverse steep topography raised boardwalks provide a dramatic experience while limiting impact to the ground below. For long term maintenance considerations BMP staff prefer to limit the use of boardwalks and use materials that have an extended lifespan such as black locust or composite decking.

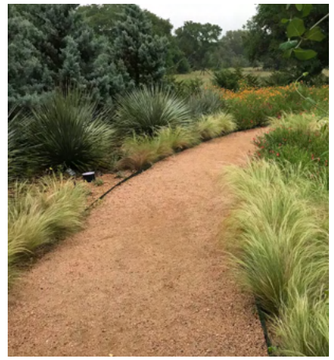
TRAILS


Asphalt


Natural Gray Concrete


Flexi-Pave

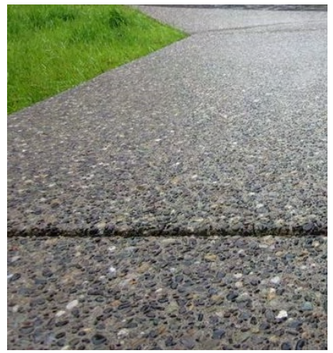

Resin-bound Aggregate Paving

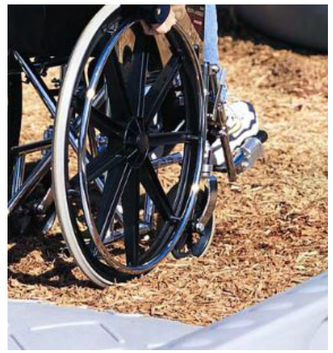

Loose Granite Fines

SPECIALTY


Tennessee Flagstone

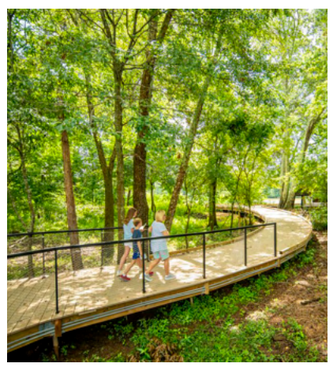

Decorative Naturalistic Concrete

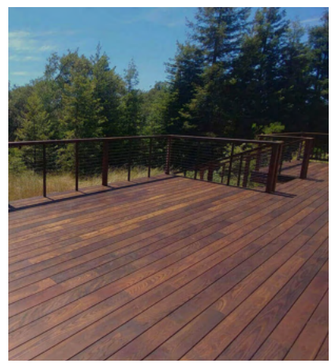

Exposed Aggregate Concrete

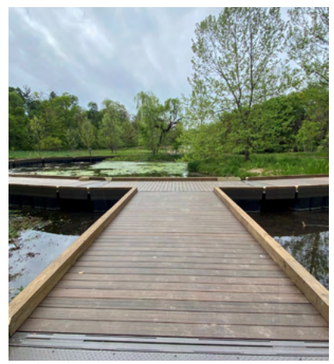

Engineered Wood Fiber


Bonded Rubber

BOARDWALKS


Black Locust


Thermally-modified Wood

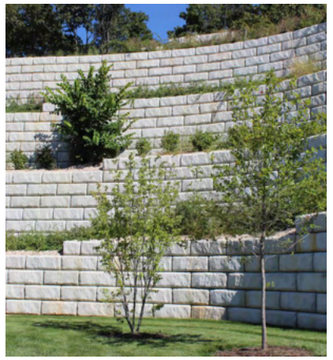

Synthetic Decking

Materials Palette

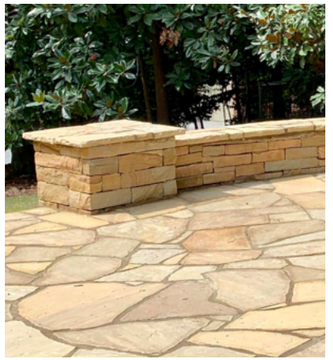
WALLS


Stone Veneer


Stone Slab


Gravity Block

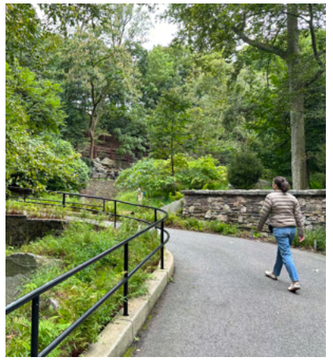

Cast-in-Place Concrete

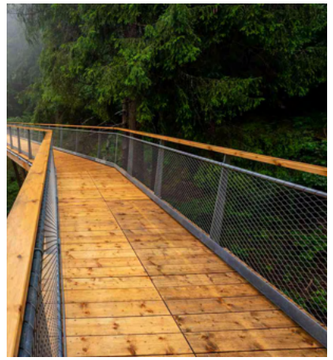

Stone Seatwalls

RAILINGS


Stacked Rail Fence


Split Rail Fence

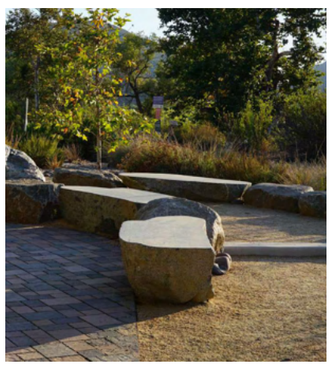

Tubular steel Handrail


Woven Wire Mesh Guardrail


Welded Wire Guardrail

SEATING


Wood Bench


Natural Boulders


Timber Benches


Timber Bench with Back

Stakeholders expressed a clear interest in using natural and local materials for site furnishings, fences, walls, and handrails. Overall, a preference emerged for a clean, contemporary aesthetic in keeping with the architecture of the Nature Center.

Fences with a simple yet ‘rustic’ character such as split rail and stacked rail fences were preferred.

For seating, a variety of materials such as timber benches and flat-topped boulders or stone slabs were preferred.

To ensure safety and separate visitor areas from animal habitats and the back of house a variety of fences, gates and handrails will be required. The height and mesh openings will vary depending upon the conditions.

Site walls will also be needed to create ADA accessible ramps and terraces for new viewing areas. Depending upon the location and visibility a variety of materials can be used from geotextile retained slopes to stacked boulders and cast-in-place concrete.

Plant Palette

The plant palette for trees and understory including shrubs, perennials and groundcovers includes species native to the Appalachian Mountain ridge and valley geophysical province. This region has rich plant diversity as a result of the many microclimates that it supports.

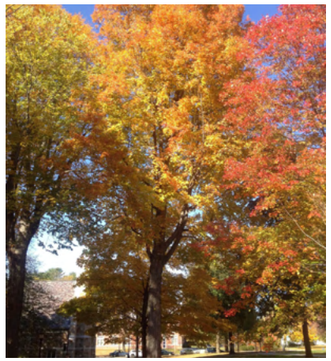
New plantings provide an opportunity to increase diversity at BMP that will provide ecological benefits and improve soil health and stability.

Visitors will experience four seasons of botanical interest raising interest and awareness of native plant communities. Experiential learning and opportunities for making connections between the plant and animal worlds will also be expanded.

Canopy and understory trees were selected to enhance seasonal interest and expand biodiversity throughout the site and across varying microclimates and moisture gradients.

LARGE TREES

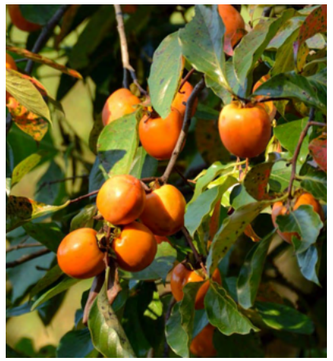
Acer rubrum
Red Maple



Acer saccharum
Sugar Maple

Betula nigra
River Birch

Carya glabra
Pignut



Diospyros virginiana
Persimmon

Juglans nigra
Black Walnut

Liriodendron tulipifera
Tulip Poplar

Pinus sylvestris
Scotch Pine

Platanus occidentalis
Sycamore

Quercus alba
White Oak

Quercus Montana
Chinkapin Oak

Sassafras albidum
Sassafras

Tilia americana
American Basswood

Tsuga canadensis
Eastern Hemlock

Legend

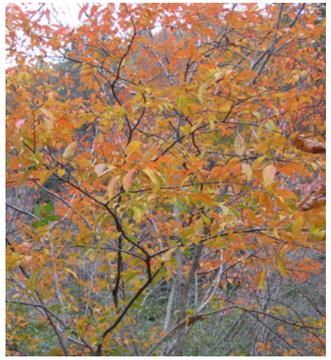
- Ridge
- Ancient Forests
- Lakeshore
- Arrival
- Knoll

Plant Palette

SMALL TREES

Amelanchier arborea
Serviceberry

Asimina triloba
Pawpaw



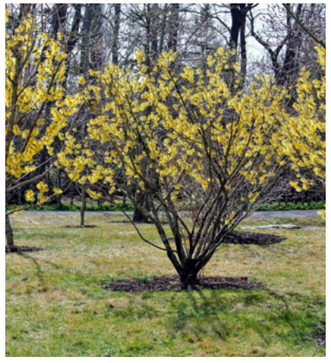
Carpinus caroliniana
Ironwood

Cercis canadensis
Redbud

Chlonanthus virginicus
Fringe Tree

Cornus alternifolia
Alternate Leaf Dogwood

Cornus florida
Flowering Dogwood



Hamamelis virginiana
Witch-Hazel

Junipers virginiana
Eastern Red Cedar

Magnolia virginiana
Sweetbay Magnolia

Legend

- Ridge
- Ancient Forests
- Lakeshore
- Arrival
- Knoll

Plant Palette

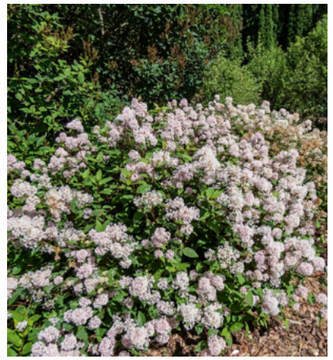
A diverse understory is essential to a healthy self-sustaining forest. Over the years, the biodiversity of the understory layer has been compromised at BMP. Each new project under the PIP is an opportunity to restore the biodiversity of the park.

The placemaking concept of multiple zones provides a framework for planting strategies for each. Once established, a more complex and varied landscape will improve site drainage and runoff, reduce erosion and maintenance and enhance visitor experiences.

SHRUBS

Aronia arbutifolia
Chokeberry

Callicarpa americana
Beautyberry



Ceonathus americanus
New Jersey Tea

Cephalanthus occidentalis
Buttonbush

Clethra alnifolia
Sweet Pepperbush

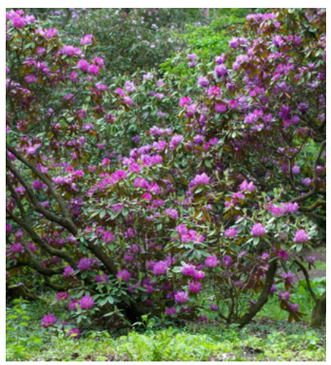
Fothergilla major
Fothergilla

Hydrangea arborescens
Wild Hydragea

Hydrangea quercifolia
Oakleaf Hydrangea

Rhododendron arborescens
Piedmont Azalea

Rhododendron cumberlandense
Cumberland Azalea



Rhododendron catawbiense
Mountain Rosebay

Rhus aromatica
Fragrant Sumac

Viburnum acerifolium
Mapleleaf Viburnum

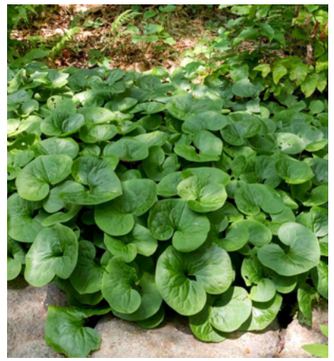
Viburnum dentatum
Possum Haw

Legend

- Ridge
- Ancient Forests
- Lakeshore
- Arrival
- Knoll

Plant Palette

GROUNDCOVERS



Asarum canadense
Canadian Wild Ginger

Carex cherokeensis
Cherokee Sedge

Carex flaccosperma
Blue Wood Sedge

Chasmanthium latifolium
River Oats

Elymus virginica
Virginia Wild Rye

Eragrostis spectabilis
Purple Love Grass

Mitchella repens
Partridge Berry

Muhlenbergia capillaris
Pink Muhly

Panicum virgatum
Switchgrass

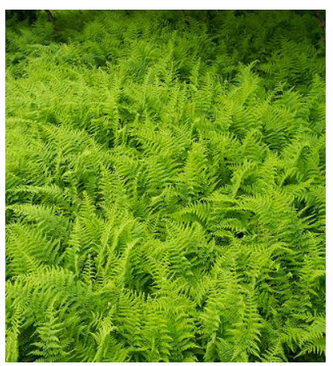
Rhus armoatica ‘Gro Low’
Grow Low Fragrant Sumac

Schizachyrium scoparium
Little Bluestem

Arctostaphylos uva-ursi
Bearberry

FERNS

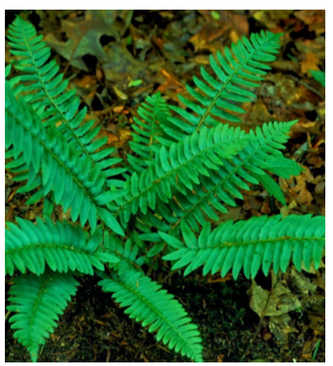
Athyrium filix-femina
Ladyfern



Dennstaedtia punctilobula
Hayscented Fern

Dryopteris spp.
Wood Fern

Osmunda cinnamomea
Cinnamon Fern



Polystichum acrostichoides
Christmas Fern

Woodwardia areolata
Chain Fern

Plant Palette

PERENNIALS

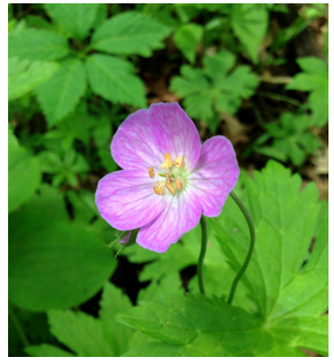
Arisaema triphyllum
Jack-in-the-Pulpit

Asclepias tuberosa
Butterfly-weed

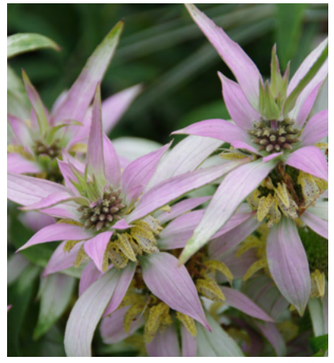
Echinacea purpurea
Purple Coneflower

Eupatorium spp.
Joe-Pye Weed

Heuchera americana
Alumroot



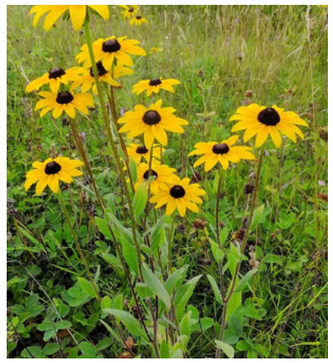
Geranium maculatum
Wild Geranium



Monarda spp.
Bee Balm

Phlox divaricata
Creeping Phlox

Polygonatum biflorum
Solomon's Seal

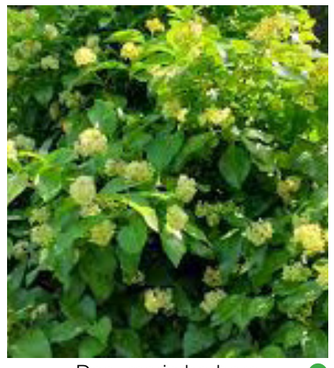


Rudbeckia hirta
Blackeyed Susan

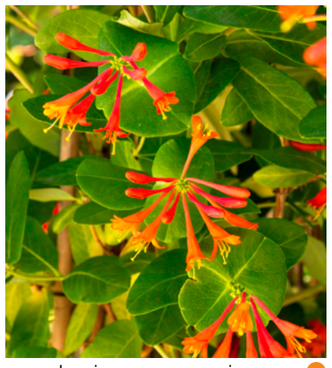
Trillium cuneatum
Sweety Betsy Trillium

Tiarella cordifolia
Foamflower

VINES



Decumaria barbara
Climbing Hydrangea



Lonicera sempervirens
Coral Honeysuckle

Parthenocissus quinquefolia
Virginia creeper

Legend

- Ridge
- Ancient Forests
- Lakeshore
- Arrival
- Knoll

Process & Analysis

The PIP kicked off in April 2023 with commissioning a site survey and a park user survey. The Design Team worked with BMP staff to create questions geared toward eliciting input for the PIP. Several questions specifically asked about visitors' current and future expectations relative to the animal habitats.

Survey questions and responses related to the animal habitats included:

1. Improvements to animal habitats that add value to the park experience: viewing, interpretive/signage, resting areas, connectivity between habitats.
2. Favorite Animal: wolves followed by in descending order: bobcat, birds, herps, red fox, turtles
3. Preferred new animals in order: river otter, red panda, large carnivores, hoofstock, small mammals, birds of prey
4. Improvements that would motivate more visits: new animals, improvements to existing animals, nature play, new trails, wildflower/ pollinator gardens, food and beverage

<u>A summary of priorities related to play included:</u>

- Nature play that appeals to children of different ages and allows parents to participate in play was identified as the preferred approach.
- Top play elements include: interactive elements with animal habitats, dig and natural play, rock wall, ropes and climbing.
- Elements for a nature play area: proximity to restroom, places to eat, and elements for children with different abilities.

Once the survey results were reviewed the Design Team was able to craft a visioning workshop which was held July 13, 2023. Two sessions were attended by members of the Commission, the Association, and staff. The Design Team listened to stakeholder insight into the park, its identity and meaning in community, learning take-aways for visitors and goals for the PIP.

Preliminary assets and challenges were presented to initiate discussion and response from stakeholders. At the close of the visioning session, the Design Team presented an initial concept plan based on survey results for feedback from stakeholders.

A closing exercise asked participants to respond to character imagery by placing post-it notes and comments as follows: green = like; red=dislike; blue=neutral. Follow-up discussion resulted in a better understanding of stakeholder preferences for materials and the 'look and feel' of a variety of future park improvements.

Concurrent with interactive workshops with Stakeholders, the design team created a series of diagrams that analyzed the physical site so that programmatic opportunities and constraints could be matched with existing conditions.

Plan Assets

In visioning sessions with stakeholders when asked ‘What makes Bays Mountain Park special?’ participants responded passionately with answers that included: a community heirloom, a beacon for the City, a place associated with lifelong memories and multi-generational experiences, and a destination for fishing, hiking, biking, and learning.

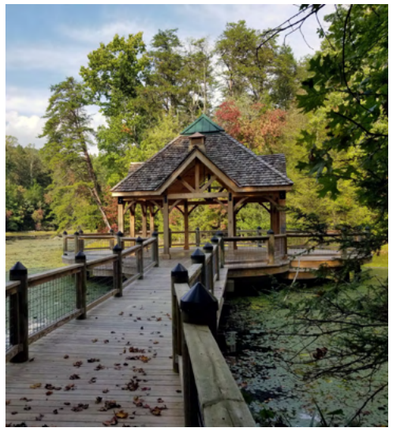
With this insight and more (see Appendix B for meeting notes), the Design Team identified eight key assets to protect and build on in work related to the PIP. These include: Bays Mountain Lake and the lakefront setting, lakeside activities, the Nature Center, the natural site (topography and forest), the Herpetarium, the gray wolf program, and an experienced in-house team.

Reservoir - lakefront setting and panoramic views

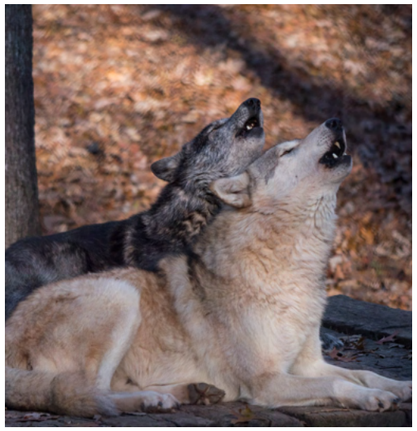
Nature Center - unique architecture, sited on hill overlooking reservoir, strong educational exhibits, orients visitors

Natural Site - interesting topography of ridges and valleys, plenty of large trees

Herpetarium - centrally located rest station with great exhibits



Lakeside Opportunities - Lily Pad Pavilion & Barge activities, unique



Wolf Habitat - large habitat and pack, unique management for range of ages

Graphics & Signage - experienced in-house exhibits team for interpretation

Plan Challenges

Animal Viewing - continuous viewing along habitat perimeters create similar experience throughout

Accessibility - complex topography and forests are a challenge for ADA access

Wayfinding - dense forests and lack of clarity in visitor circulation make orientation difficult

Landscape Variation - ubiquitous tree cover leads to monotonous landscape experience

Maintenance & Staff - need to plan for long-term maintenance of park and on-going care for animals (present & future)

Perimeter Fence - Locating required AZA fence is challenging due to openness of park

Challenges were identified in terms of the physical site and animal/visitor experience. Challenges related to the physical site include ADA accessibility due to the topography, replacement of aging infrastructure, and making sure that long term plans consider park staffing and maintenance resources. A perimeter fence which is a requirement of AZA is also identified as a challenge and is addressed in the PIP.

In terms of visitor experience the greatest challenge is a lack of trail clarity and hierarchy which leads to a challenges in wayfinding. Added to this, there is a ‘sameness’ to the animal viewing experiences (looking through fences or looking down) and forest landscapes (lacking biodiversity and some understory layers).

All of these challenges are addressed integrally as part of the PIP.

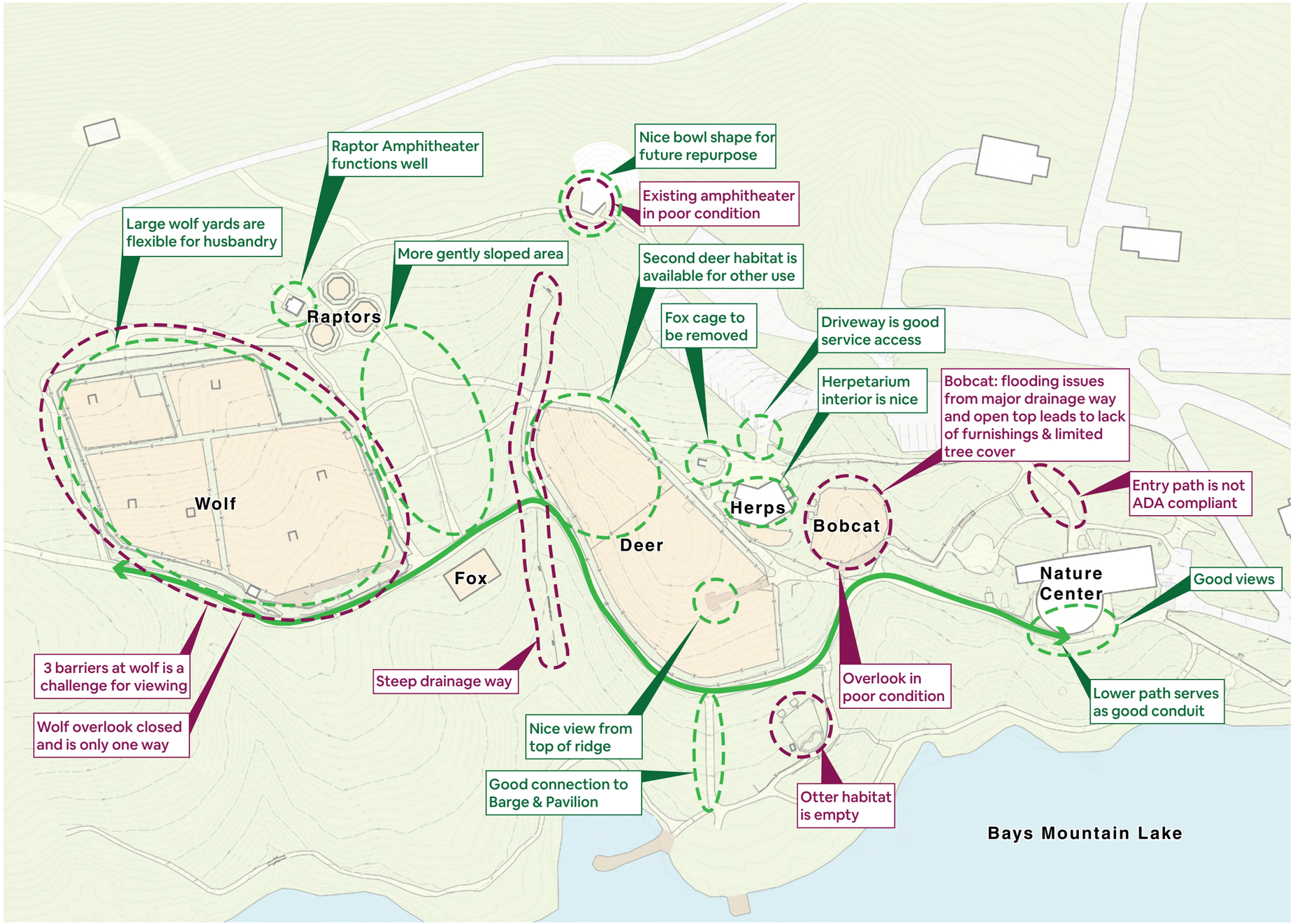
Opportunities & Constraints

Opportunities are ideal or positive conditions that lead to possible design interventions which can be incorporated into a cohesive long-term plan. Constraints are non-ideal conditions, challenges, or issues to be addressed in the long-term plan.

Aging physical infrastructure including degraded visitor boardwalks and viewing platforms and paths in poor condition are constraints in the short-term because they present challenges in terms of visitor access and safety.

Many of the site constraints originate from the steep topography and drainageways resulting in paths that are non-ADA compliant, erosion and flooding in some areas.

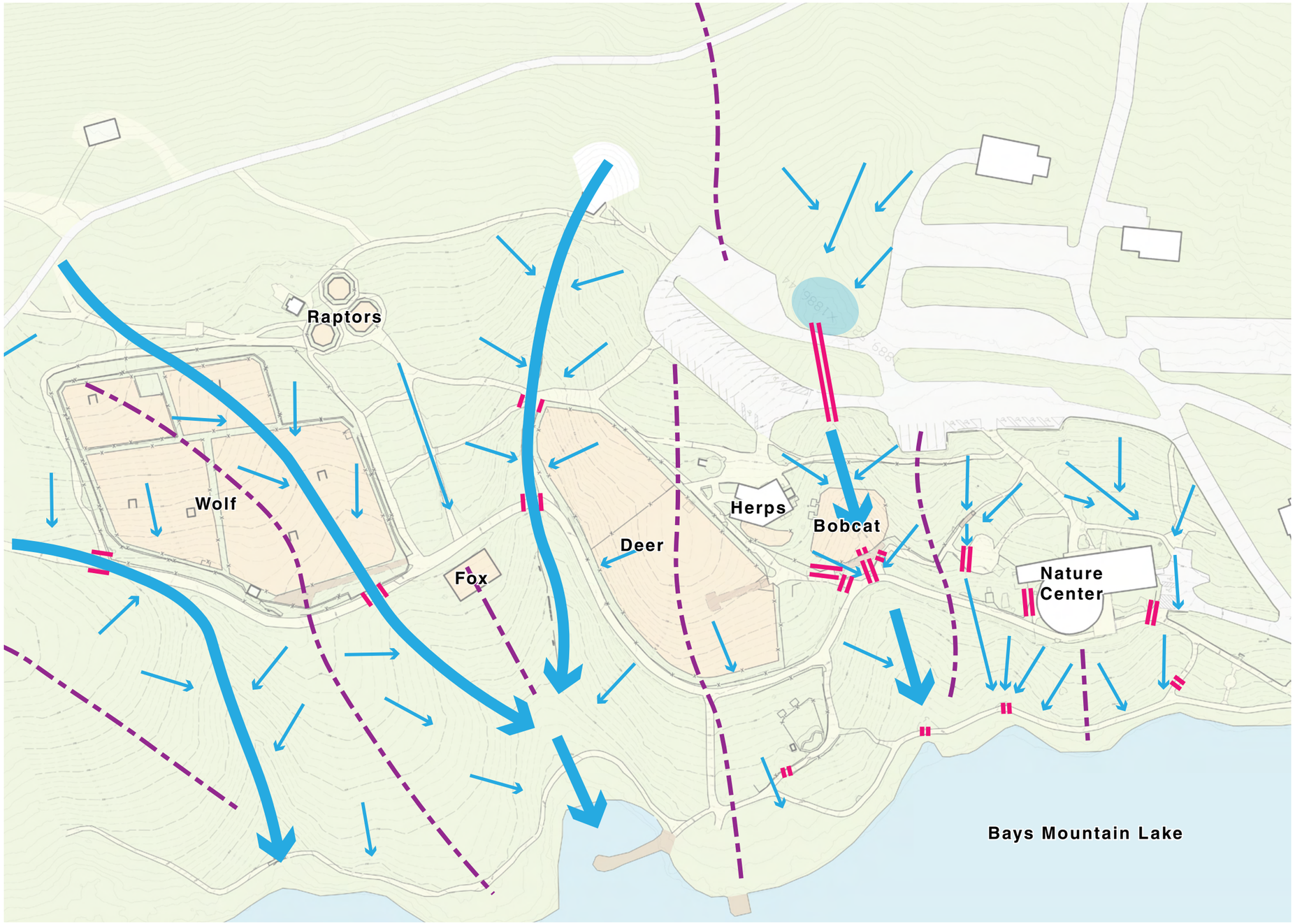
While a challenge, the topography is an asset and opportunity to create more variety in the visitor experience (trails atop ridges and crossing valleys) and animal viewing and observation that takes advantage of breathtaking views of the forest and lake.



Legend

- Opportunity
- Constraint

Hydrology



Hydrology is the movement of storm water on the surface of the site as well as underground. The site is sloped and made of ridges and valleys that form surface drainageways carrying runoff to Bays Mountain Lake.

The diagram illustrates the need to relocate the Bobcat Habitat from the middle of a major drainageway. Future development should be located in a way that does not impede natural surface flow.

In several areas surface flow is captured in infrastructure (drains and pipes) and or channeled toward the Lake under pathways. Removal of existing subsurface drainage as a result of removing or relocating trails should be considered on case-by-case basis.

Legend

- Major/ Minor Stormwater Flow
- Ridge
- Subsurface Drainage Pipe

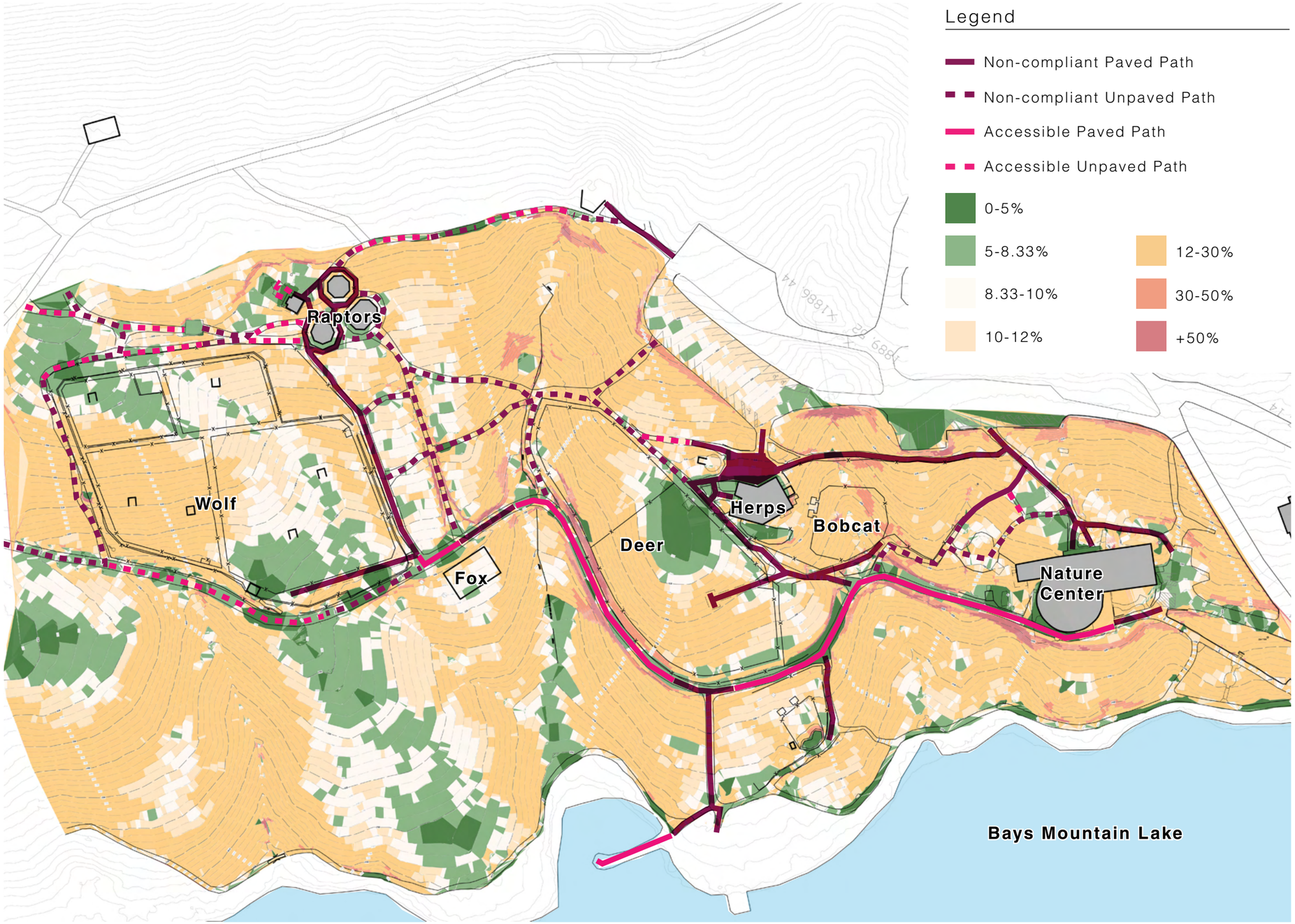
Slope & Trail Accessibility

Using the detailed site survey commissioned for the PIP, the Design Team evaluated the range of slopes on the site as well as ADA compliance of existing trails. Slopes range from less than 5% on the tops of some of the ridges (Herpetarium, raptor center and wolf habitat) to more than 50% along the embankments of the main path in a few locations. The majority of the site has slopes that range from 12-30% which can be developed with cut/fill terracing for structures and ramps or switchback paths for trails.

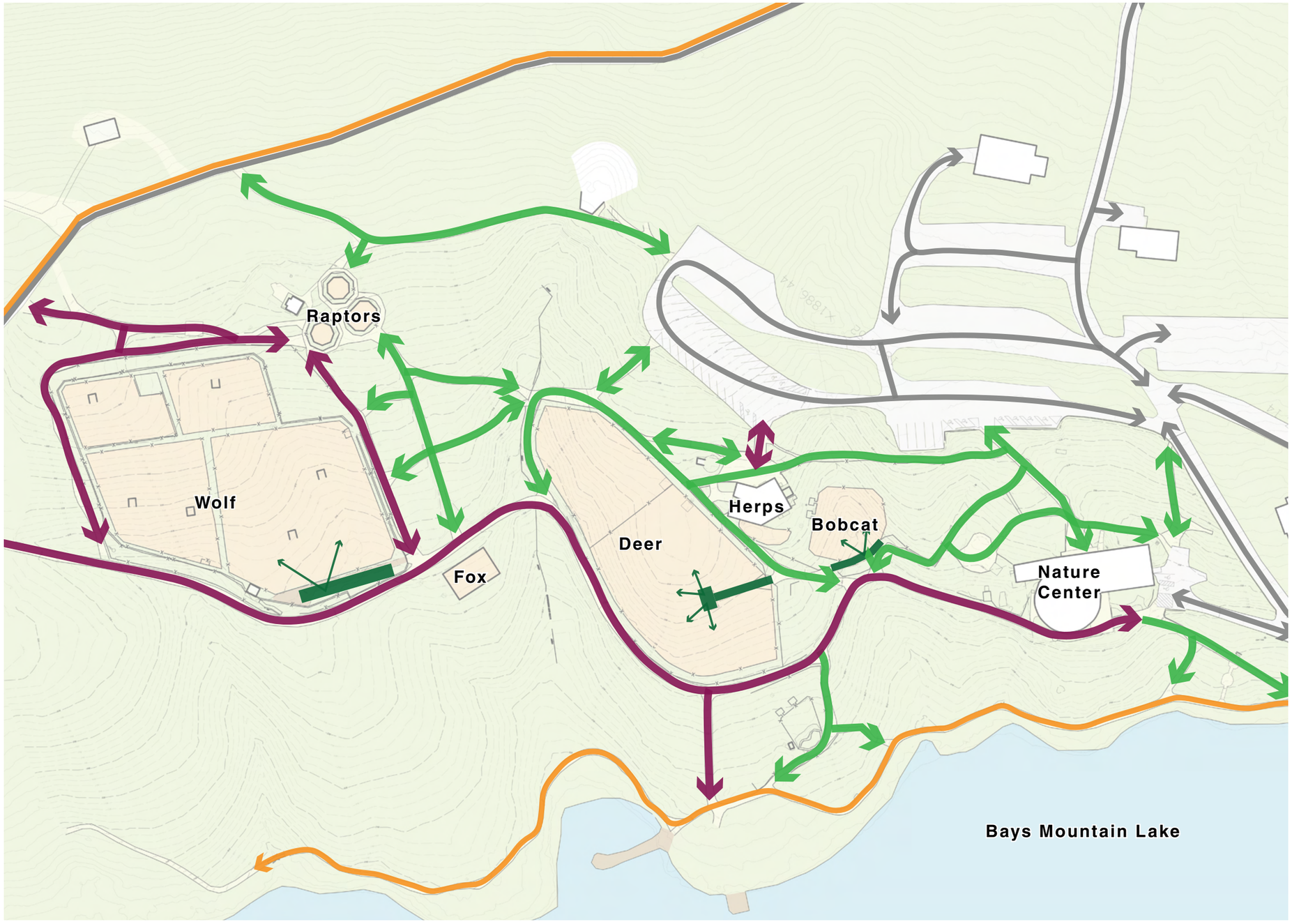
An evaluation of the existing trails was completed, a majority of the pathways are non-compliant with ADA.

The strategy to address this is: re-construct trail sections that are vital visitor connections; remove pathways not vital to visitor flow; and convert some pathways to service only where appropriate.

The shared visitor & service road that leads from the Nature Center to the Wolf habitat is mostly ADA-compliant and a valuable asset. Portions of the uppermost pathway between the amphitheater and the Raptor Center are compliant as well as portions of the trail along the upper wolf areas.



Circulation



Vehicular arrival is through the parking areas with no clear sense of arrival or wayfinding to the Nature Center. Navigating to the Nature Center is made more difficult by the fact that building is sited downslope and only the roof is visible from the parking lot. Visitor movement into the park from the parking lots is through multiple radiating paths, to the Herpetarium along a shared vehicular path and to the west toward the amphitheater.

Once inside the park, the main circulation route is a shared visitor/ service path that runs from the Nature Center to the Wolf habitats parallel to the lake edge. Many informal trails or “cow paths” throughout the site make wayfinding challenging.

Many of the habitats are surrounded by visitor paths along the fence lines on all sides which in some cases limit areas of refuge for the animals.

Legend

- Habitat Area
- Visitor Viewing Area
- Vehicle/Service Circulation
- Shared Visitor/Service Circ.
- Visitor/ Pedestrian Circulation
- Park Trails

Utilities

The known limits of surface and subsurface utilities are based on current and past surveys provided by BMP and public utility maps. These utilities include electrical, sanitary sewer, and water. Information about storm drainage was not available and site conditions indicate that the majority of storm water is managed as overland flow with the occasional use of culverts or underground pipe to direct water under paths or toward the lake.

Potable water is pumped from a well through a chlorination system and then stored on site in a tank. Consumption is typically 5,000 gallons/day at peak times.

Given the topography and potential for subsurface rock, the PIP considers locating new visitor services and animal habitat infrastructure in the vicinity of areas already well serviced by utilities. The two main areas are the Nature Center and Herpetarium.

Based on existing information it appears that sewer, power and water lines do extend to the wolf habitats and Raptor Center.

Legend

Surface Utility	Utility Line	
*	—	Electrical
*	—	Sanitary Sewer
*	—	Water