RECONNECTING PEOPLE AND PLACE

A Comprehensive Plan for the Ebenezer Keyes Conservation Area | Gardner, Massachusetts

Prepared for North County Land Trust
by Claire Baglien & W. Kyle Finnell
The Conway School | Spring 2022

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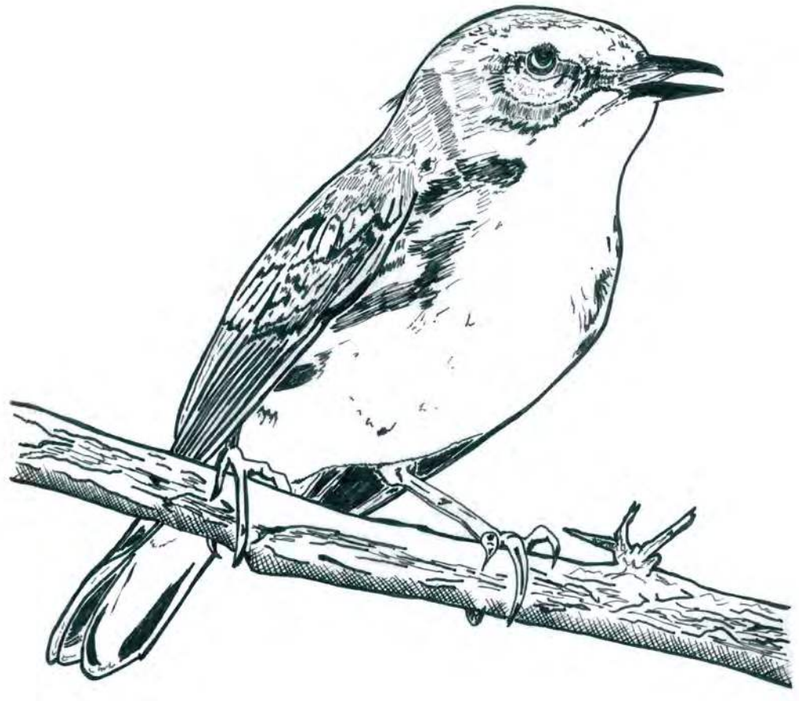


PROJECT OVERVIEW & SITE HISTORY

How can a regional land trust take a failed subdivision and meaningfully revive it as a resource for the community and the flora and fauna that call this area home?

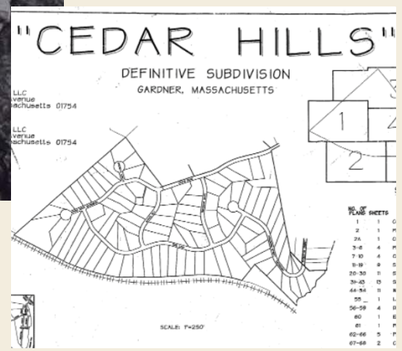
HISTORY OF SETTLEMENT AND RECREATION

North central Massachusetts is the traditional territory of the Pennacook, Wabanaki, and Nipmuc peoples, supporting different groups at different times. During colonization of the region, communities formed around the homesteads of European settlers. One such settler was Ebenezer Keyes, who built a homestead on a hilltop near the Otter River and went on to help found the community of Gardner in 1785. Gardner was a center for lumber production and furniture making in the nineteenth century, becoming the home of more than twenty chair factories and earning the nickname “The Chair City."

During the twentieth century, the former Keyes homestead property was owned by the Watkins family. The family operated the Simplex Time Recorder Company, a major employer in Gardner. Simplex Time Recorder employees organized a skeet club in 1947 and Simplex president Curtis G. Watkins supported the employee group by donating 120 acres on Keyes Road off West Street to the club. In 1952 the skeet club became the Simplex Country Club, which included a clubhouse, a separate game room, skeet range, ball fields, and later a horse barn and stables for the Simplex Horse Association. The property hosted regular meetings, social gatherings, and annual festivities such as the Christmas party for employees and their families and the Simplex Summer Outing, a two-day carnival.

In 2001, the Watkins family sold the former Simplex Country Club property and surrounding parcels to a subdivision development company. The design for the proposed Cedar Hills Subdivision included 103 lots on the 157-acre property. The first phase of site work began in 2008, which included clearing the land, grading, constructing a paved road (Watkins Way), and installing underground electric utilities, sewer lines, and stormwater retention areas. When the project failed financially and the permitted development window expired, the site sat abandoned with no residential buildings constructed. A community-scale solar development was proposed in 2018, but did not proceed. The property was donated to the North County Land Trust in 2020.

Aerial photo (left) from the annual Simplex Time Recorder Company summer carnival and the "Simplex City".



A Cedar Hills subdivision construction document (right) shows the intended 103 parcel development.

CLIENT

North County Land Trust (NCLT) is based in Leominster, MA, and works within sixteen municipalities in north central Massachusetts. Founded in 1992, NCLT currently owns more than 1,000 acres of conserved lands, holds conservation restrictions on an additional 475 acres, and maintains nine conservation areas accessible to the public. Its mission to conserve the landscapes that define the character of the region shapes three directives: to protect high priority natural resources; to preserve landscapes for future generations; and to promote understanding and appreciation by connecting people & nature. NCLT strives to meet its mission by practicing community conservation, which involves partnering with local communities to offer conservation and recreational programming that helps meet broader community needs. By engaging with neighbors, collaborating with community partners, and hosting a wide range of programming on site, NCLT helps connect people with place.

GOALS

COMMUNITY USE

Based on community input, recommend locations and develop conceptual designs for potential recreational uses.

TRAIL ACCESSIBILITY

Improve existing trails and consider siting new trails to increase recreational options. Where possible enhance connections between trails on site and potential links to the broader community and regional trails.

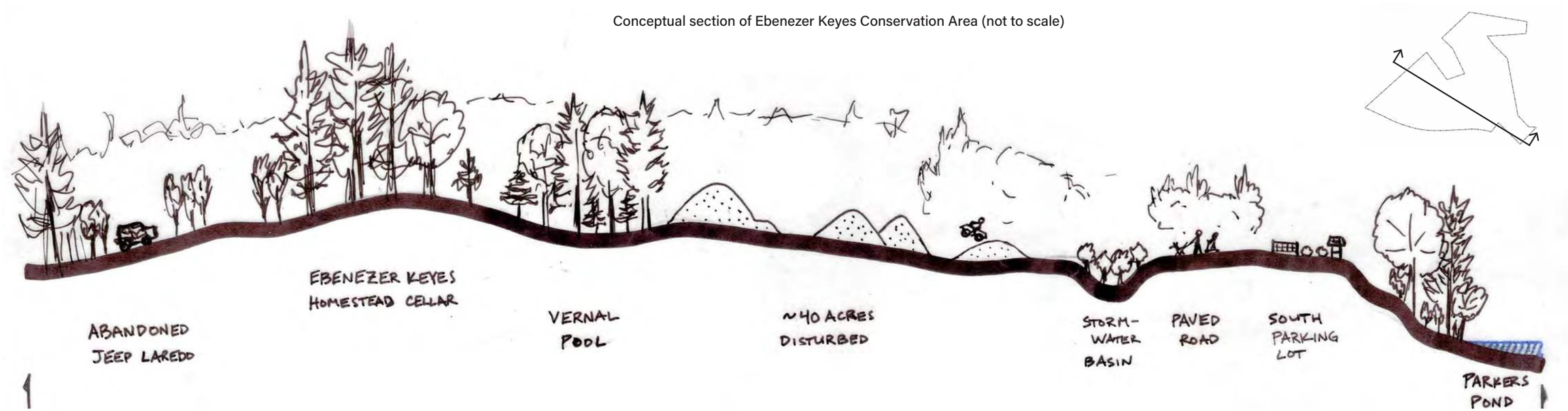
ECOLOGICAL FUNCTION

Promote ecological function across the site while prioritizing the restoration of the most eroded and degraded areas.

WILDLIFE HABITAT

Protect various habitats and enhance wildlife connectivity off site.

Conceptual section of Ebenezer Keyes Conservation Area (not to scale)



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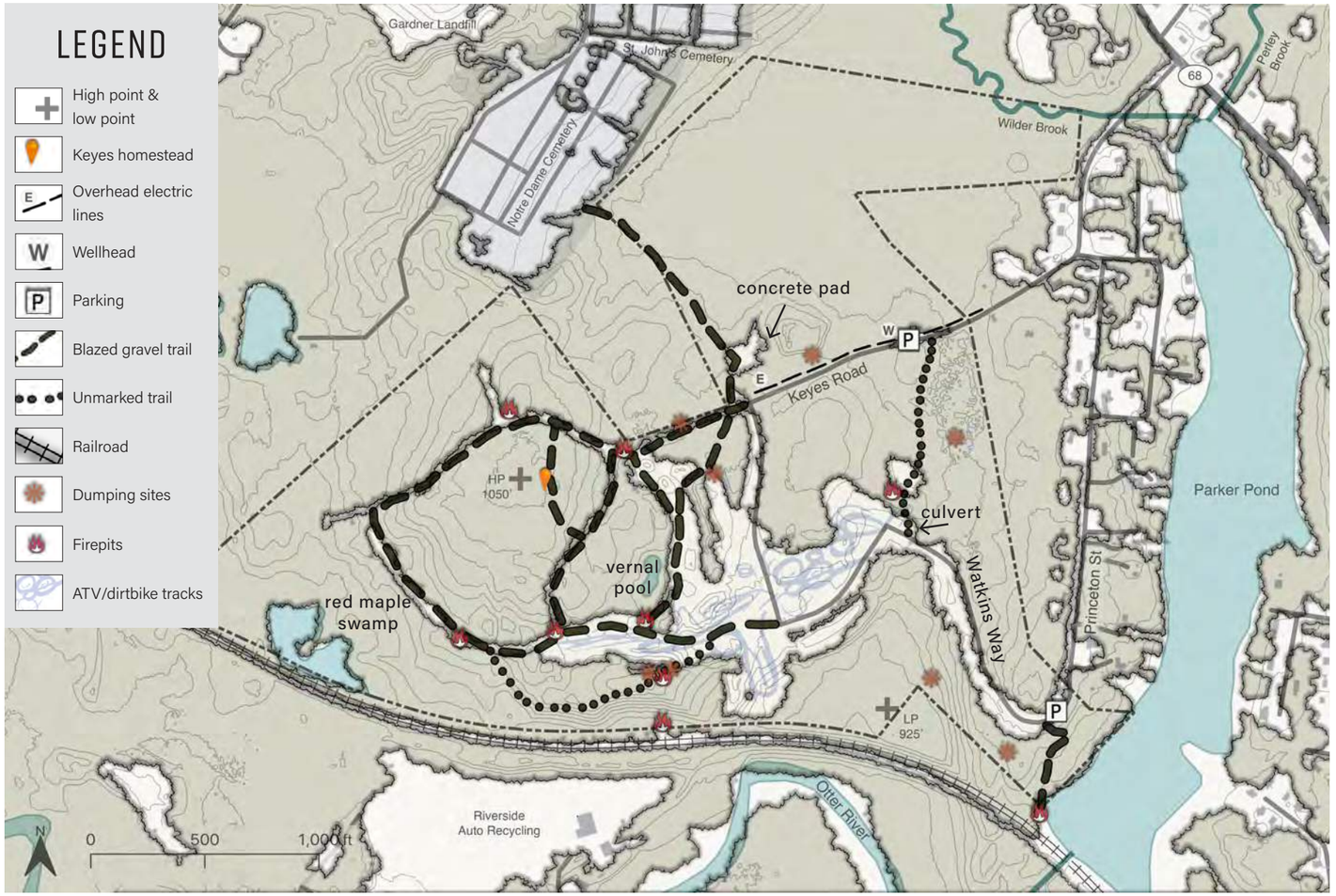
PROJECT OVERVIEW & SITE HISTORY

EXISTING CONDITIONS



The 157-acre property is bounded on the south by City-owned land and a railroad, on the west by a private abutter and the Notre Dame Cemetery, which extends along the northern boundary, and on the east by a neighborhood along Princeton Street and Parker Pond. The site has nearly 600 feet of waterfront along Parker Pond and provides the only point of public access to the water body. The site has a total change in elevation of 125 feet with a high point towards the west at 1,050 feet and a low point along the southern boundary at 925 feet above sea level. Near the high point sits the stone foundation of the historical Ebenezer Keyes homestead.

The site is primarily forested, with over 100 acres covered in mature trees. Nearly 30 acres of early successional species cover the areas disturbed during the Cedar Hills development. Approximately 20 acres of lightly-vegetated to bare soils cover the center of the site, including several large piles of sand and excavated materials from prior development. The correlating pattern of disturbance and land cover creates a strong sense of exposure in the center of the site while the mix of mature and young forest offers areas of enclosure along the site's boundaries. There are several wetlands scattered across the property, with a red maple swamp in the southwest corner and a certified vernal pool in the center of the site.

Infrastructure on site includes both overhead and below ground utilities. Overhead electric utilities enter the site along Keyes Road for 1,000 feet. A wellhead from prior ownership remains near the north parking area. Buried water/sewer and electric utilities follow Watkins Way and are inactive, having sat unused since initial phases of construction of the Cedar Hills development. There is one concrete culvert along Watkins Way that connects wetlands in the north and south of the property. A concrete pad (20 x 40 feet) sits north of Keyes Road.

The public accesses the site via two roadside entrances, both with parking and a welcome kiosk, to the north at the end of Keyes Road and to the south at the end of Princeton Street. Trails and paths on site follow a paved road (Watkins Way), gravel access roads, and compacted dirt paths. The blazed trail network is approximately 2.33 miles in total length.

Evidence of recent use on the site shows a pattern of heavy disturbance that includes graffiti on the paved road, unused utility boxes, and boulders; various dumping sites and abandoned vehicles; fire pits and former encampments; and the tracks of ATVs and other off-road vehicles.

Photos by Claire Baglien & W. Kyle Finnell

Ebenezer Keyes historic homestead foundation

View of Parker Pond looking north

Culvert under Watkins Way

Non-working fire hydrant

Road conditions on Princeton Street

ATV and dirtbike tracks on gravel piles

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EXISTING CONDITIONS

ENVIRONMENTAL JUSTICE COMMUNITIES & ACCESS TO OPEN SPACE

Most of the neighborhoods in Gardner qualify as environmental justice populations, which tend to have disproportionately less access to nearby recreational open space. The proximity of the site to these communities creates an opportunity to offer recreational amenities a that meet their needs.

WHAT IS AN ENVIRONMENTAL JUSTICE COMMUNITY?

The Commonwealth of Massachusetts designates a neighborhood as an EJ population depending on which of the following criteria it meets:

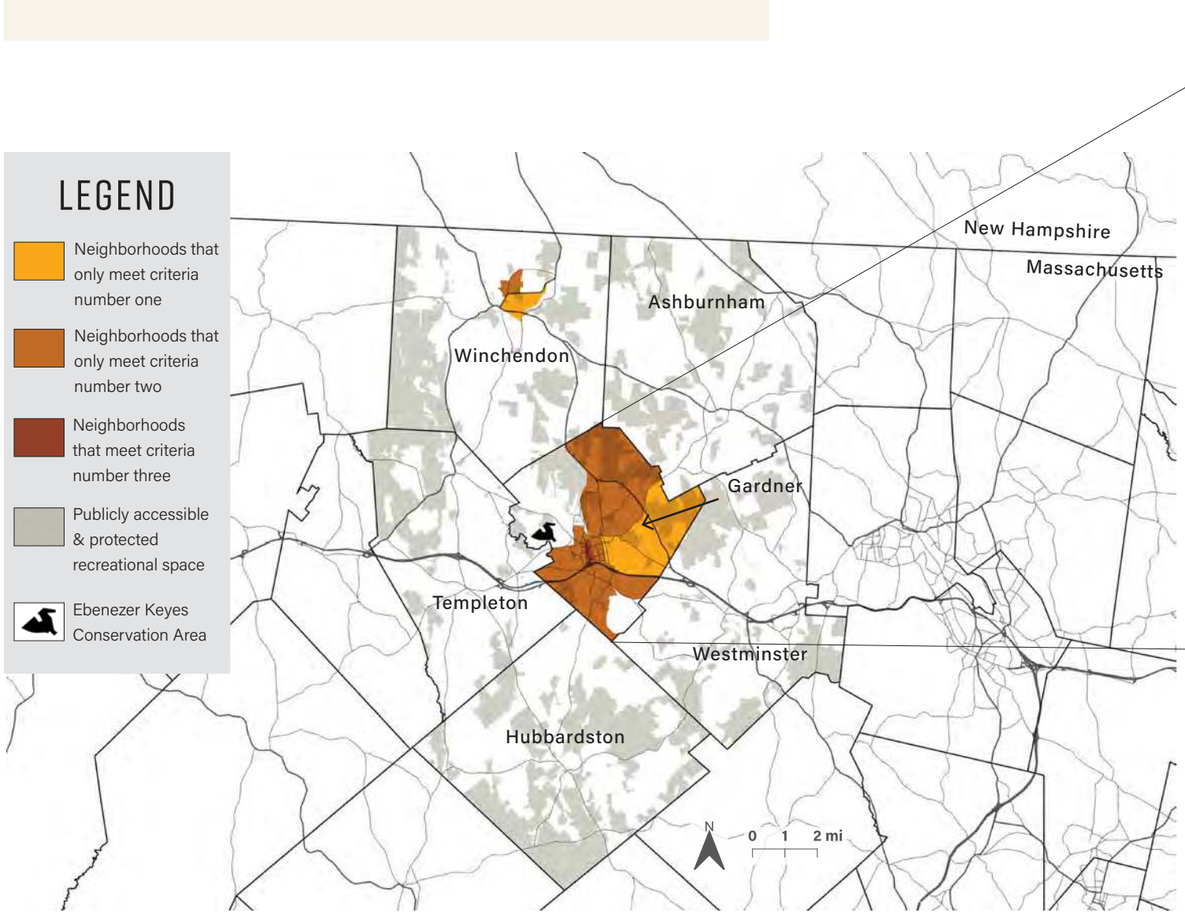
1. Annual median household income is 65% or less of the statewide annual median household income, which is currently $85,843.
2. >40% of the population identifies as part of a minority group.
3. >25% or more of the population identifies as a part of a minority group **and** the annual median household income of the municipality in which the neighborhood is located does not exceed 150% of the statewide annual median household income.

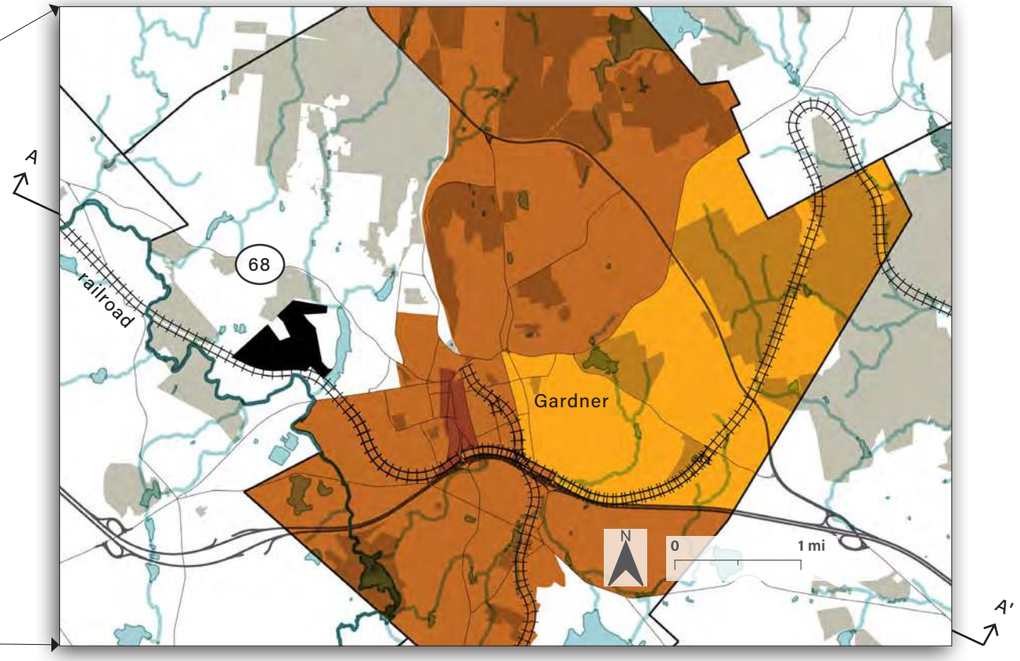
Of the towns nearest Ebenezer Keyes Conservation Area, Gardner has the highest population with 21,287 people according to the 2020 Census. Most of the region's environmental justice (EJ) populations are located in Gardner, with a small neighborhood identified in Winchendon.

According to the Massachusetts Office of Energy and Environmental Affairs' Environmental Justice Policy, EJ populations are "most at risk of being unaware of or unable to participate in environmental decision-making or to gain access to state environmental resources." Research shows that marginalized communities like EJ populations also tend to have disproportionately less access to nearby protected open space (Sims et al.).

Ebenezer Keyes Conservation Area is one of the closest recreational open spaces to EJ communities in Gardner, situated less than two miles from downtown neighborhoods. However, the site is most easily accessed by vehicle, limiting access for lower income households that may not have regular access to a vehicle. Public transportation is limited mainly to the downtown area. Parker Pond, which borders the property's eastern edge, prevents neighbors to the southeast from entering unless they cross a dam and an active railroad running parallel to the base of the pond. Regional trails and expanded public transportation options could increase access to Ebenezer Keyes Conservation Area by EJ communities.

Building relationships with EJ communities throughout this project and in the future could help determine how uses of the space could best reflect the wants and needs of the nearby community's values around open space and recreation. For example, those with less disposable income may not purchase recreational equipment like kayaks or canoes and may not have regular access to a car to transport it to Parker Pond. A site with a wide variety of recreational opportunities accessible to all income levels, abilities, and cultures will serve a broad and economically diverse population.





Section A-A': Parker Pond separates downtown neighborhoods from the site, unless they use Route 68 or cross the railroad and a dam. Conceptual drawing, not to scale.

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ENVIRONMENTAL JUSTICE COMMUNITIES & ACCESS TO OPEN SPACE

COMMUNITY ENGAGEMENT

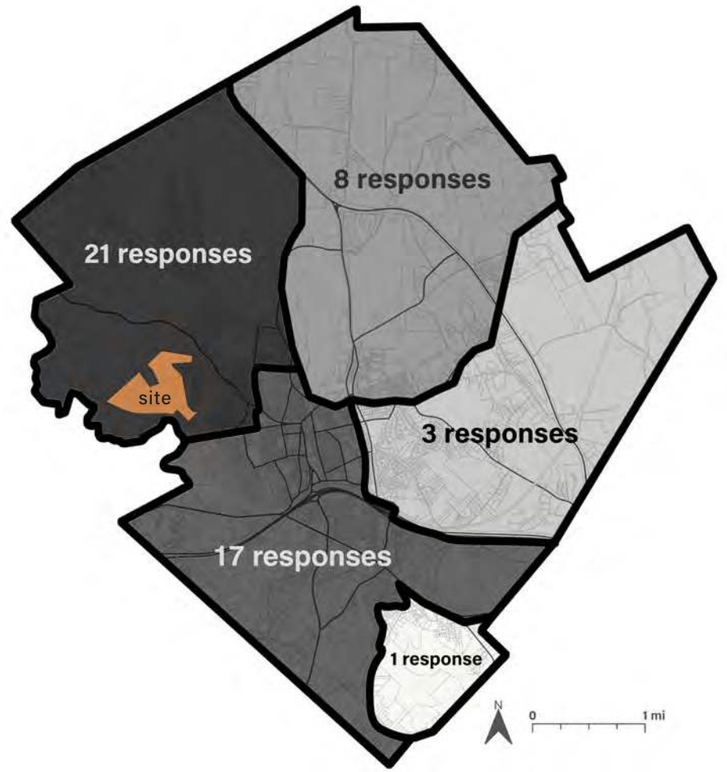
Input from an online survey and an in-person event highlighted interest by respondents in trails and a gathering area and programming centered on plant and animal identification. Further engaging nearby communities can inform the amenities and programming prioritized by NCLT at the Ebenezer Keyes Conservation Area.

Input from two types of community engagement informed the design process. On June 2, 2022, one community member and four NCLT staff and board members attended an in-person event at Ebenezer Keyes Conservation Area. The Conway team led two exercises to gather feedback. First, the group walked along the edge of Parker Pond and flagged areas they thought would work well for launching canoes or kayaks and fishing/gathering spots. After, participants walked along Watkins Way and were asked to silently observe the property. Then, the whole group shared their observations about views they appreciated or not, vegetation, and areas where they felt enclosed or exposed.

An online survey was also open for anyone between May 16 and June 5, 2022. Flyers were posted at some conservations areas managed by NCLT, a mailing went out to a couple hundred residents nearest the site, and the survey link was shared on social media. Aside from five people who indicated they do not live in Gardner, 74% of the 55 respondents live within two miles of the site. **50% of respondents live in neighborhoods with environmental justice populations.** Strengthening relationships between NCLT and residents of environmental justice communities would help the organization offer amenities and programming that reflect the diversity of nearby communities.

Responses can be further summarized as follows:

- 89% of people identified as white and not hispanic or latino and 9% chose not to self-identify.
- Respondents who live in households with children made up 34% of reponses.
- All but one respondent owns or has regular access to a vehicle.



CURRENT USES AND CONCERNS

Only half the people who responded to the survey (28 of 55 total) had been to Ebenezer Keyes Conservation Area. They shared the following when asked what they do when visiting the site:

71% walk on the paved roads and 61% on the gravel trails

35% ride their bike

Approximately 25% enjoy the scenic vistas, visit the vernal pool, and/or walk their pet

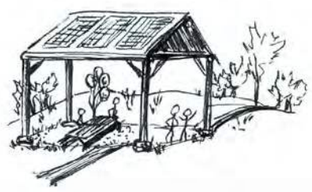
The same group also shared what they don't like. Common concerns included trails not being clearly marked or confusing, the graffiti (which includes offensive and derogatory slurs), and the leftover signs of an abandoned development including open holes from sewer or storm drains, utility boxes, and partially buried fire hydrants.

ENVISIONING THE FUTURE OF EBENEZER KEYES CONSERVATION AREA

The survey asked people to rank the amenities and programming they'd like to see made available by selecting "very interested," "neutral," or "not interested." The list of options came from NCLT. Illustrations by Claire Baglien.

AMENITIES WITH THE MOST INTEREST

87%
Clearly marked walking/hiking trails with informational signs about the site's history, plant communities, etc.



65%
Pavilion for picnics or other gatherings

52%
Canoe/kayak launch

PROGRAMMING WITH THE MOST INTEREST

63%
Plant identification walks

52%
Habitat restoration/ plantings

60%
Animal tracking/ identification

It's clear that respondents already enjoy using the existing trail system, especially the paved road, further justifying the need behind one of the primary goals of this project. A pavilion for gatherings would potentially increase use of the conservation area by groups of people. Increasing vehicle traffic and parking space could mean more pollutants and road salts brought into the site, as well as tires threatening amphibians crossing the road. Parking areas and the pavilion should avoid being located in regulated riparian buffers and perhaps limited to already disturbed areas on the site.

North County Land Trust strives to meet their mission through active community conservation. The community engagement efforts of this project build on relationships NCLT has already started cultivating with communities in the region they serve, but the work is ongoing. Ebenezer Keyes Conservation Area will better serve the needs of its neighbors the more deeply the community is involved in what happens on the site.

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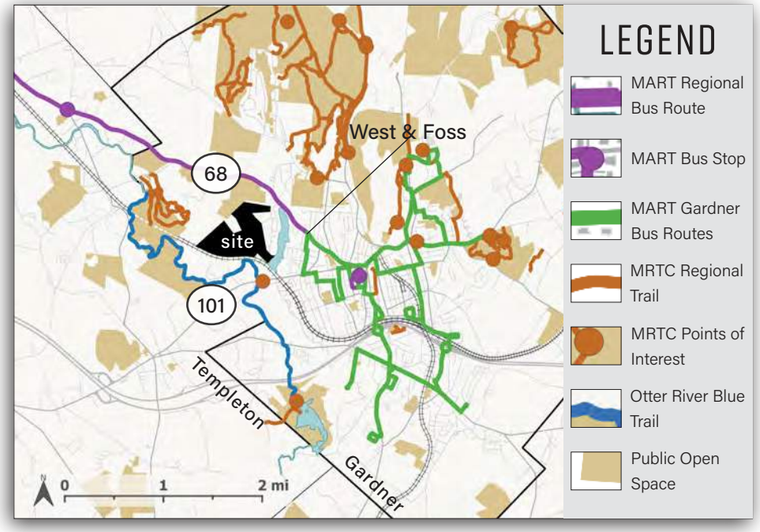
COMMUNITY ENGAGEMENT

ACCESS & CIRCULATION

Sitting between state Route 68 and 101 near the western border of Gardner, the Ebenezer Keyes Conservation Area is easily accessible via car; however, physical barriers including an active railroad line, the Parker Pond dam, and inconsistent pedestrian infrastructure limit accessibility for visitors without a personal vehicle.

MULTIPLE ENTRY POINTS, SOME MORE ACCESSIBLE THAN OTHERS

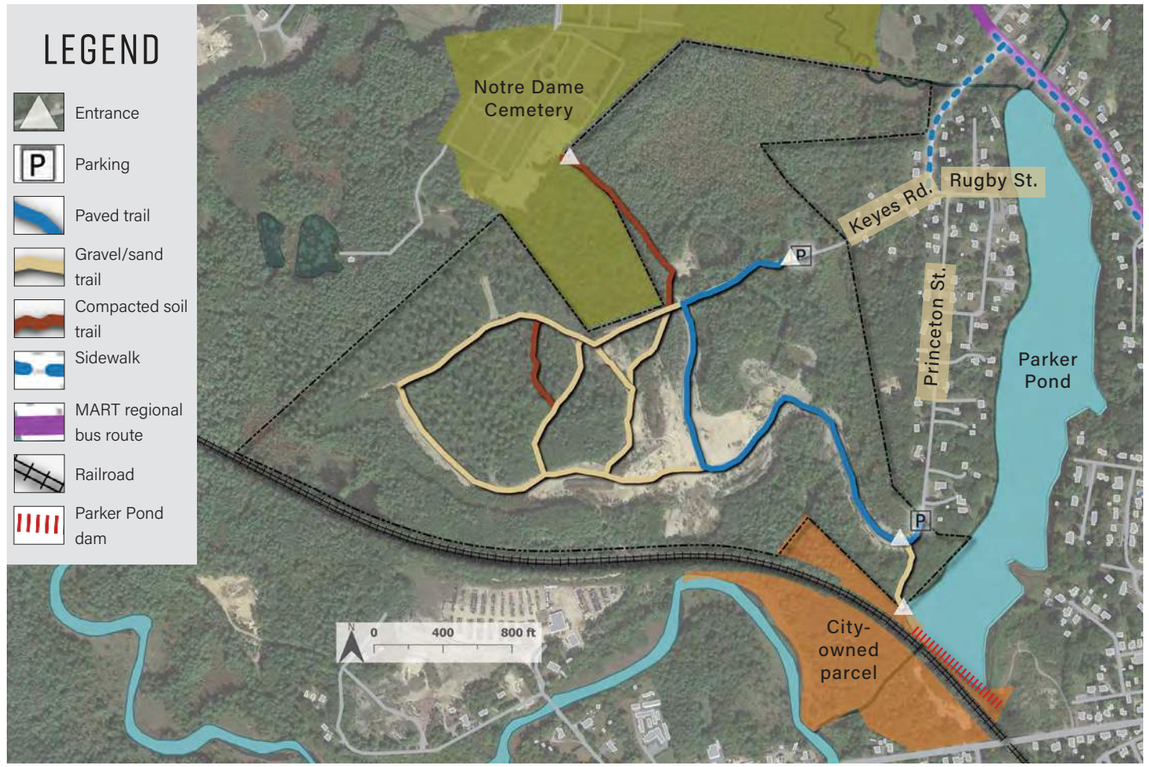
Visitors can access Ebenezer Keyes Conservation Area via four entry points. There are two primary entries along public roads: the Keyes Road entrance to the north and Princeton Street entrance to the south. The Keyes Road and Princeton Street entrances both have available parking, a small welcome kiosk, and a single bench for seating. The other two entry points to the property are accessible for pedestrians or cyclists via abutting properties. Visitors enter the site from the west by passing through the Notre Dame Cemetery. Alternatively, guests can enter the property passing through city-owned property along Parker Pond to the south. Accessing the property from the south via Parker Pond poses a degree of risk, as visitors must either use a narrow gangway along the Parker Pond dam or follow the active railroad bed. This entry is closest to the Environmental Justice populations in Gardner, yet the physical barriers of the railroad and Parker Pond discourage visitors from walking directly from those neighborhoods. Once on site visitors can enjoy an extensive trail network, the only amenity currently available at Ebenezer Keyes Conservation Area.



PUBLIC TRANSIT ACCESS AND REGIONAL TRAILS CONNECTIVITY

Montachusett Regional Transit Authority (MART) services Gardner and the surrounding region with bus and shuttle routes. The only route passing Ebenezer Keyes Conservation Area is the Gardner-Winchendon Link, which follows state Rt. 68 Monday through Friday between 6:30am and 3:30pm. Gardner's two city-wide bus routes both turn at the corner of West Street and Foss Road, eight-tenths of a mile from the site. Current public transit options in Gardner do not support community access outside of the typical work week schedule, limiting use for community members without access to a vehicle or with busy work schedules. Walkability is limited approaching the property as sidewalks end at the corner of Keyes Road and Rugby Street. Also, there is no sidewalk along Princeton Street, which is hilly and riddled with potholes. Although walkability is limited along the roads nearest the site, traffic patterns are calm in the Princeton Street neighborhood and residents there are comfortable walking to the site from their homes.

The Montachusett Regional Trails Coalition (MRTC) advances the connectivity of local and regional trail systems and community access to these recreational resources. Only a half-mile west of Ebenezer Keyes Conservation Area is a series of trails on city-owned property, which offer a future opportunity to partner with abutting landowners to integrate the trails at Ebenezer Keyes Conservation Area with other trail systems in western Gardner. To the south of the site is the Otter River Blue Trail, a recreational trail along the section of the Otter River waterway that forms the boundary between Gardner and Templeton. With the current state of the Parker Pond dam and outflows, connectivity with this recreational opportunity seems unlikely without significant planning and redesign of the Parker Pond outflow.



THE EXISTING TRAIL NETWORK

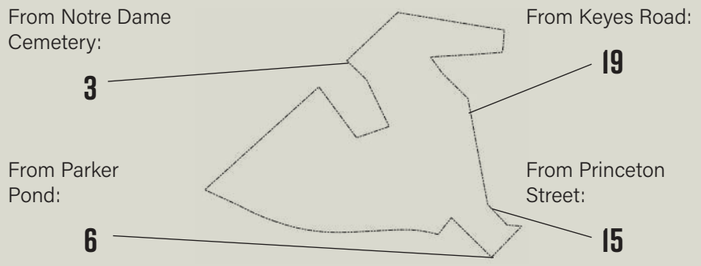
NCLT has blazed a network of nine trails that is approximately 2.33 miles in total length. The Watkins Way trail follows the paved roadway that connects the Keyes Road to Princeton Street entrances. This paved path creates an accessible loop for the closest neighbors and is a defining feature of the property that offers unique community uses due to its tread surface and uniform grade. Most of the trail network follows the graded access roads from the failed Cedar Hills development. Due to the instability of the tread surface, accessibility is limited along western trails. These trails offer a greater degree of difficulty for visitors seeking more challenging trails to hike, run, or hike; however, the western trails intersect with more of the natural areas on the property and their continued use poses potential risks of human disturbance to wildlife habitat.

COMMUNITY SURVEY RESPONSES

HOW DO YOU GET TO THE SITE?

by car	by foot	by bicycle
19	3	6

WHERE DO YOU ENTER THE SITE?



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ACCESS & CIRCULATION

SLOPES, SOILS & VIEWS

Views from a dominating southern ridgeline and large, centrally located sand piles show the long-term development and recent disturbance of sandy topsoils on top of glacial outwash and exposed bedrock. Sandy, quickly draining soils forming in nutrient-poor subsoils support a mosaic of unique natural habitats and some regionally uncommon natural communities.

SLOPES

Ebenezer Keyes Conservation Area has a varied topography influenced by post-glacial deposition of coarse materials and more recent excavation and re-grading from the failed Cedar Hills development. The highest point on site is near the historical Keyes homestead foundation at 1,050 feet and the low point of the property is in the southeast corner with an elevation of 925 feet. The topography undulates with higher hillocks sitting in the center of the site, a ridgeline along the southeastern boundary, and a broad, gentle slope toward the north of the site. The steepest slopes are along the southern ridge and among disturbed areas in the western half of the site. Several large sand piles and five engineered detention basins with slopes greater than 33% are in the site's center. Slopes greater than 33% are most susceptible to erosion and paths through these areas will be unsustainable unless construction or re-grading is involved. The existing trail network is mostly gently sloping with only a few steeper sections in the western part of the site. Watkins Way is the most accessible path with slopes averaging less than 5%. The trails that follow the gravel access roads have slopes mostly less than 8.3%, although there are several sections of the western most trails that have a greater than 10% slope. These sections greatly limit accessibility and create a risk of erosion along the paths.

WHAT ARE UNIVERSAL ACCESSIBLIITY STANDARDS?

In assessing trail accessiblity, universal accessibility standards outlined by the Americans with Disabilities Act (ADA), the Architectural Barriers Act (ABA), and the Forest Service Trail Accessibility Guidelines (FSTAG) are considered.

ADA Accessiblity Guidelines offer minimum guidelines for spaces offering public accommodations.

ABA Accessiblity Standards apply to facilities constructed with federal funds and limits running slopes of paths at 5%.

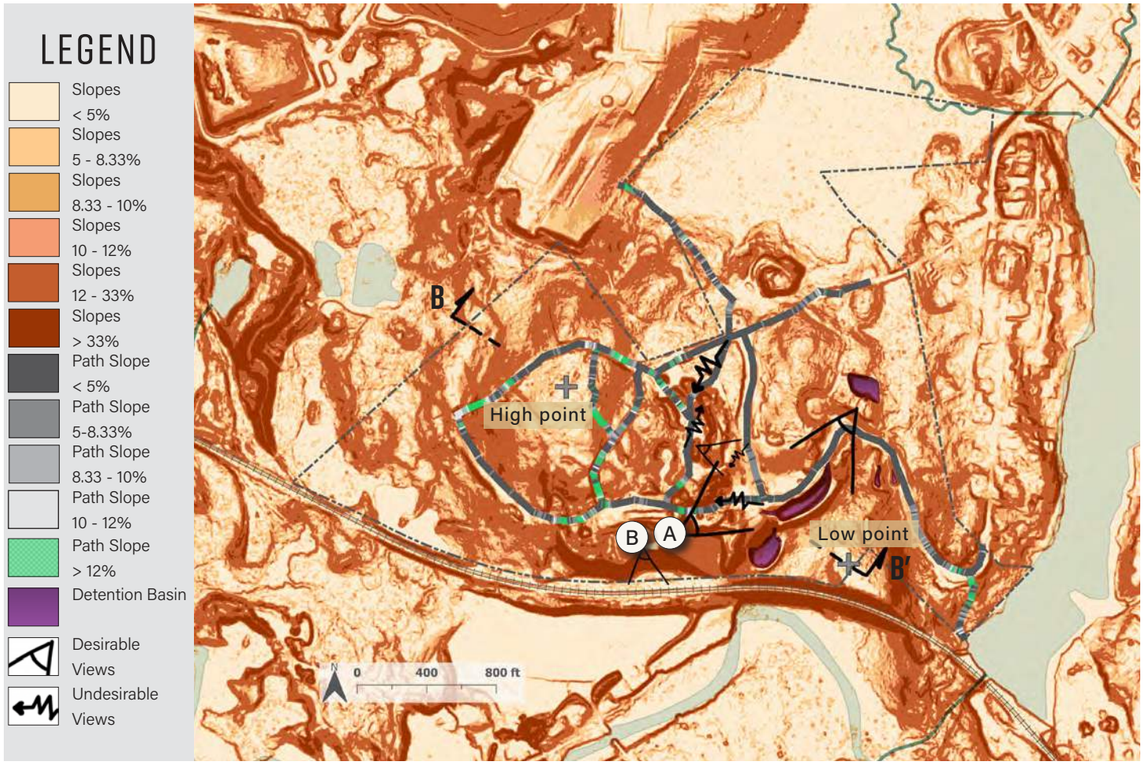
FSTAG apply to all trails constructed or altered within the Forest Service system and offer the most comprehensive standards.

Trail grade can be less than 5% for any length without resting.

Trail grade up to 8.33% slope for no more than 200 feet without rest.

Trail grade up to 10% slope for no more than 30 feet without rest.

Trail grade up to 12% slope for no more than 10 feet without rest.



VIEWS

With its varied topography and the disturbance from the failed Cedar Hills development, Ebenezer Keyes Conservation Area offers long views across and off the site. The longest view can be enjoyed from the southern ridgeline looking eastward over the disturbed center of the property and Watkins Way. Distant views off the site to the south can also be enjoyed from the southern ridgeline with seasonal veriability. These particular vantage points offer views of emerging natural communities and unique habitat while keeping visitors at a safe distance from sensitive habitat and preserving ecological functions on the property. Deposited sand and gravel in the site's center obstruct views of existing trails and create a sense of disorientation for visiting walkers and hikers. Addressing visibility issues along the trails will help create a more welcoming and pleasant visitor experience.

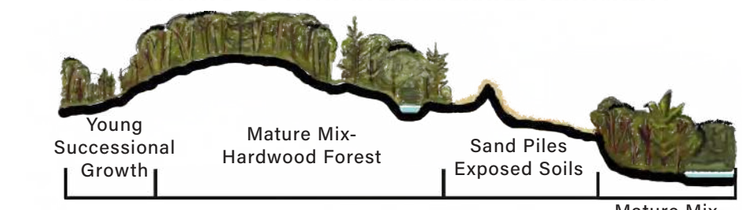
SOILS

The soils on site developed primarily from glacial outwash. As a result, most of these soils are sandy in texture, deficient in key nutrients, and strongly acidic with a pH of less than 6. Along the Parker Pond frontage are abundant outcroppings of exposed bedrock, which breaks the pattern of outwash towards the west. Postglacial organic (swamp) deposits in the north, southeast, and southwest corners of the site form slowly draining muck soils. Muck soils are not suitable for trail construction as they tend to be wetter and less accessible. Soils in the center of the site are quickly draining, while soils along the southern ridge are moderately draining. Exposed outwash can be seen along the southern ridgeline, demonstrating the depth of postglacial deposition. Recent disturbances such as excavation, grading, and extraction have left a large area of the site's center exposed, revealing the dry, sandy soils that could support uncommon natural communities such as sandplain grasslands.

Views from the southern ridgeline offer perspectives on the central disurbed area of the property and Watkins Way. Photo by Claire Baglien.

The southern ridgeline also offers scenic vistas to the south; selective timber harvests can broaden these vistas. Photo by W. Kyle Finnell.

SECTION B - B' WITH 4X EXAGGERATED VERTICALITY



Section B-B' shows the change in elevation across the site from the high point to the low point. Exaggerating the vertical axis helps reveal the natural depressions where vernal pools form as well as the dramatic presence of the sand piles in the center of the property.

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SLOPES, SOILS & VIEWS

WATER QUALITY & DRAINAGE

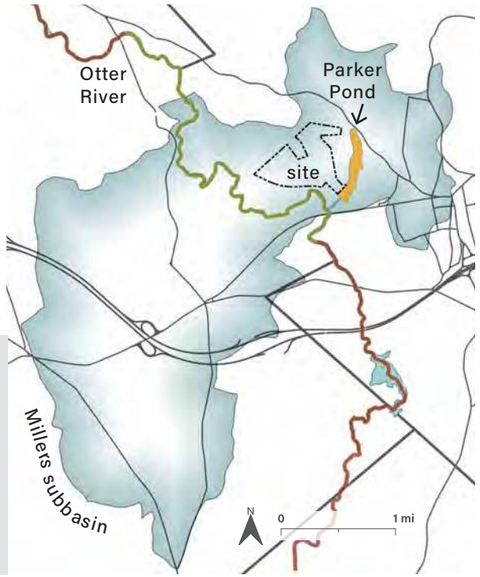
Water that doesn't infiltrate on site flows to Parker Pond and into the Otter River. Recreational amenities can reconnect people to Parker Pond.

WATER QUALITY OF PARKER POND AND THE OTTER RIVER

Ebenezer Keyes Conservation Area sits within the Millers subbasin, through which the Otter River flows west to the Connecticut River. The surface water quality of the portion of the Otter River into which the site drains was rated as Category 5 impaired until 2016 (MassDEP Integrated List of Waters), which requires the state to calculate the river's total maximum daily load (TMDL) to identify and address pollutants. Today, it is listed as a Category 2 unimpaired.

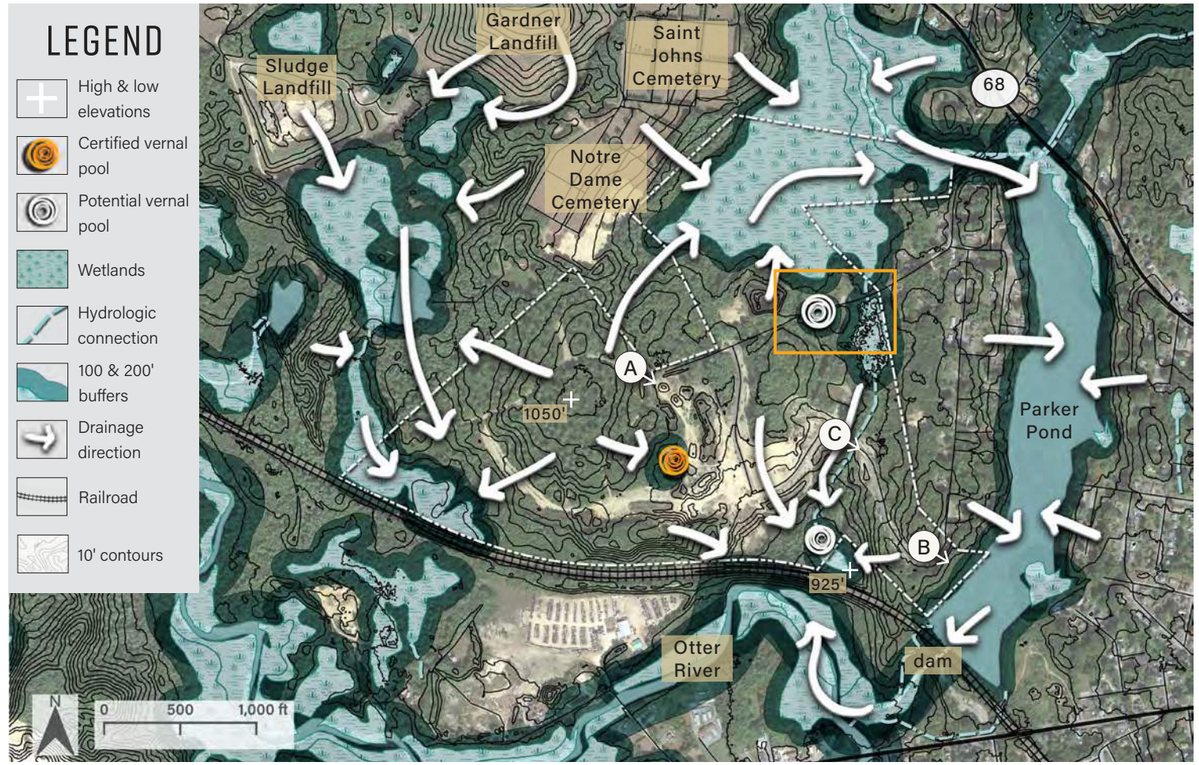
Parker Pond receives water flowing through the site's northern wetland and from nearby neighborhoods and conveys it into this now relatively healthy section of the Otter River. The surface water quality of the pond, however, is impaired and listed as Category 4A, likely due to excess phosphorus and historically dense growths of aquatic macrophytes (TMDLs of Phosphorus). Phosphorus might be polluting Parker Pond by way of surface water runoff picking up excess lawn fertilizers from surrounding residential areas, increasing the likelihood of algae blooms but not necessarily making the pond unsafe for recreational use.

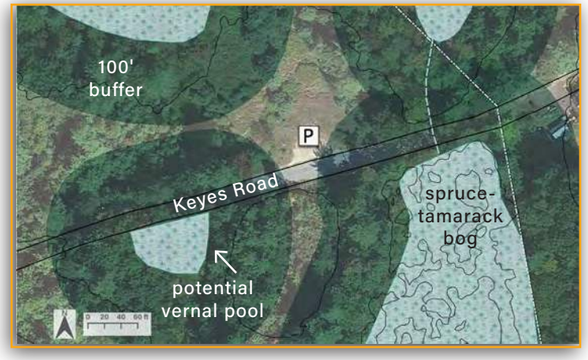
The only public access to Parker Pond is from the 600 feet of waterfront shared by the Ebenezer Keyes Conservation Area. By adding recreational amenities, such as a canoe/kayak launch and more accessible trails (the most popular ones from the online survey), North County Land Trust can increase access to the site and build a relationship between the broader community and the health of Parker Pond. Educational events and clean-ups could help to inspire more preventative action to curb phosphorus pollution from lawn fertilizers and other common sources community-wide.



DRAINAGE PATTERNS MAKE SOME TRAILS DIFFICULT TO TRAVERSE

The paved and gravel trails draw community into the conservation area; however, trails are sometimes flooded (above left) and showing signs of erosion where slopes are steep (above right), limiting accessibility. These trails could be prioritized for regrading or relocation, especially in areas where the slopes are greater than 33%. Additionally, sand and mud can be carried by surface runoff over some portions of the paved trail (below), making it difficult to traverse by visitors using wheels. Areas uphill of road washout spots could be prioritized for regrading or vegetating. Photos by Claire Baglien.





WATER MOVEMENT ON SITE

A large, intact forested wetland occupies the northern portion of the site and drains into Parker Pond. This wetland plays an especially important role. It filters chemicals traveling downhill from the cemeteries, helping to protect the quality of a couple dozen private wells providing drinking water for residents on the western side of Parker Pond. A small spruce-tamarack bog flows into a culvert under Watkins Way and eventually to a forested wetland in the southeast corner that hosts a potential vernal pool. Another swamp in the southwest corner infiltrates water flowing through a series of wetlands, which capture pollutants flowing from the active Sludge Landfill and capped and lined Gardner Landfill. Most of the site is either vegetated or on sandy, well-draining soils. Water that does not infiltrate on site eventually flows into the Otter River via a series of culverts.

One way to protect water quality is to limit human disturbance in wetlands and regulated buffers. The Wetlands Protection Act and Riverfront Protection Act regulate activity within 100-foot and 200-foot buffers, respectively, around wetlands and water bodies to preserve the roles they play as wildlife habitat and protection of water supplies. Buffers on the site are mostly vegetated with mature trees or woody shrubs, with some exceptions where there are paved roads and bare gravel. Any water flowing off the road almost immediately infiltrates into the well-draining sandy soils.

One section of Keyes Road (above), however, cuts straight through buffers of a potential vernal pool and the spruce-tamarack bog. An informal gravel parking area revegetating with raspberry and young trees skirts the buffers and fits five to six cars. The road and parking area coincide with mucky soils that don't drain well. This road was likely installed when the Watkins family owned the property, during which the land north of the road was cleared for an unknown use. To avoid adding pollutants from cars and road salt to the surface runoff from this area and harming the highly sensitive tamaracks, car traffic and parking could be eliminated, reduced, or moved.

Graduate Program in Sustainable Landscape Planning + Design
the ConwaySchool

DESIGNERS:
Claire Baglien
W. Kyle Finnell

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NORTH COUNTY LAND TRUST 30 YEARS 1992-2022

RECONNECTING PEOPLE AND PLACE
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VEGETATION

The center of the site has been exposed for decades (above) and used as a fairgrounds. Additional disturbance happened during construction of the Cedar Hills subdivision (below). Aerial photos from www.historicaerials.com/viewer

A history of disturbance resulted in various stages of succession, creating vegetation patterns that offer regionally uncommon habitat and educational opportunities.

Disturbance on the site in recent decades has resulted in a land cover matrix that is quite different from other undeveloped areas in Gardner. When the Watkins family owned this land, it supported a country club, horse stables and riding range, outdoor stage, and annual fair. From as early as the 1990s through 2005, the site remained almost entirely forested except for a few sandy, open areas.

After the property was sold to a developer, construction for a subdivision began in 2005. In addition to felling sections of mature forest, 105,929 cubic yards of "earthen product" was removed, leaving behind bare mineral soil and piles of gravel. Financial troubles and a significant amount of community pushback led the developer to abandon the project around 2008/2009, leaving the property as a playground for dirtbike and ATV riders and other uses until NCLT accepted the 157-acre donation in 2020. Over half the site experienced at least some disturbance, influencing the pattern, structure, and distribution on vegetation on the site.

A

Photo by Claire Baglien

SUCCESSIONAL FOREST EMERGING ALONG DISTURBED EDGES

Mature mixed hardwoods and white pines are dominant in uplands and wetter areas throughout the site. The edges of the exposed gravel center are filling in with early succesional trees, such as aspen (*Populus tremuloides*), birch (*Betula spp.*), fire cherry (*Prunus pensylvanica*) and white pine (*Pinus strobus*). Even though Massachusetts is almost entirely forested, only 5% of forestland in Massachusetts is in early succession (Massachusetts State Wildlife Action Plan 2015). Birds heard on site, such as the eastern towhee (*Pipilo erythrophthalmus*), field sparrow (*Spizella pusilla*), and prairie warbler (*Steophaga discolor*), utilize the shrubby structure of these young trees. Wildlife associated with the mature forests on site also rely on early-successional habitat for cover and food. To preserve this uncommon habitat, NCLT could selectively harvest more mature stands of young forest or mow down shrubby areas, restarting succession.

MOVING TOWARD AN INLAND SANDPLAIN GRASSLAND

Little bluestem (*Schizachyrium scoparium*) and curly oat grass (*Danthonia spicata*), foundational species of sandplain grasslands, grow among opportunistic autumn olive (*Elaeagnus umbellata*) and black locust (*Robinia pseudoacacia*) in the dry sandy area at the center of the site. The recent disturbances from development and dirtbike/ATV use kept succession at bay and soils exposed, creating a clean slate. These factors offer a unique opportunity for NCLT to manage this area as an inland sandplain grassland, which supports numerous rare or uncommon species of high priority for conservation and is listed as an imperiled natural community by the Natural Heritage & Endangered Species Program.

B

Photo by Claire Baglien

While less common in the Northeast, droughts could intensify because of increased evaporation from warmer temperatures and changes in when and how much precipitation falls due to climate change (Runkel et al.). Inland sandplain grasslands already adapted to drier conditions could thrive, protecting the biodiversity of flora and fauna that rely on this habitat. However, drought and variable rainfall may also reduce grassland plant seed production and germination rates, potentially negatively impacting the success NCLT may have establishing new plants from seed.

Rhododendron canadense

Drosera spp.

Photos by Claire Baglien

BOGGY AREAS OFFER EDUCATIONAL OPPORTUNITIES

Another imperiled natural community on this site is a spruce-tamarack bog, in which rhodora (*Rhododendron canadense*), tamarack (*Larix laricina*) and either red or black spruce (*Picea rubens; Picea mariana*) are growing. Rhodora is also present alongside sundew (*Drosera spp.*) and alder (*Alnus spp.*) in areas where bare sand interacts with the water table, forming potential bogs. The trail system could be expanded to feature these areas accompanied by educational signs that point out their unique plant communities, aligning with desires for more educational amenities expressed by the community.

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WILDLIFE

An east to west forested corridor dotted with wetlands sustains wildlife habitat and allows safe passage for terrestrial animals trying to avoid Route 68 and the railroad.

WILDLIFE CORRIDORS THROUGH FORESTS AND DIVERSE WETLANDS

Ebenezer Keyes Conservation Area and nearby lands offer a mosaic of habitat types supporting wildlife such as beaver, turkey, deer, grouse, turtles, songbirds, and insects. Prairie warblers (*Steophaga discolor*) and tiger beetles *(Cicindela spp.)* flock to the dry, sandy center of the site. The swath of intact forest spanning west to east creates a safe corridor for terrestrial animals to travel through toward the Otter River. The railroad and fast-moving traffic on Route 68 discourages or increases the chance of mortality for wildlife moving north and south, further prompting them to travel within this corridor.

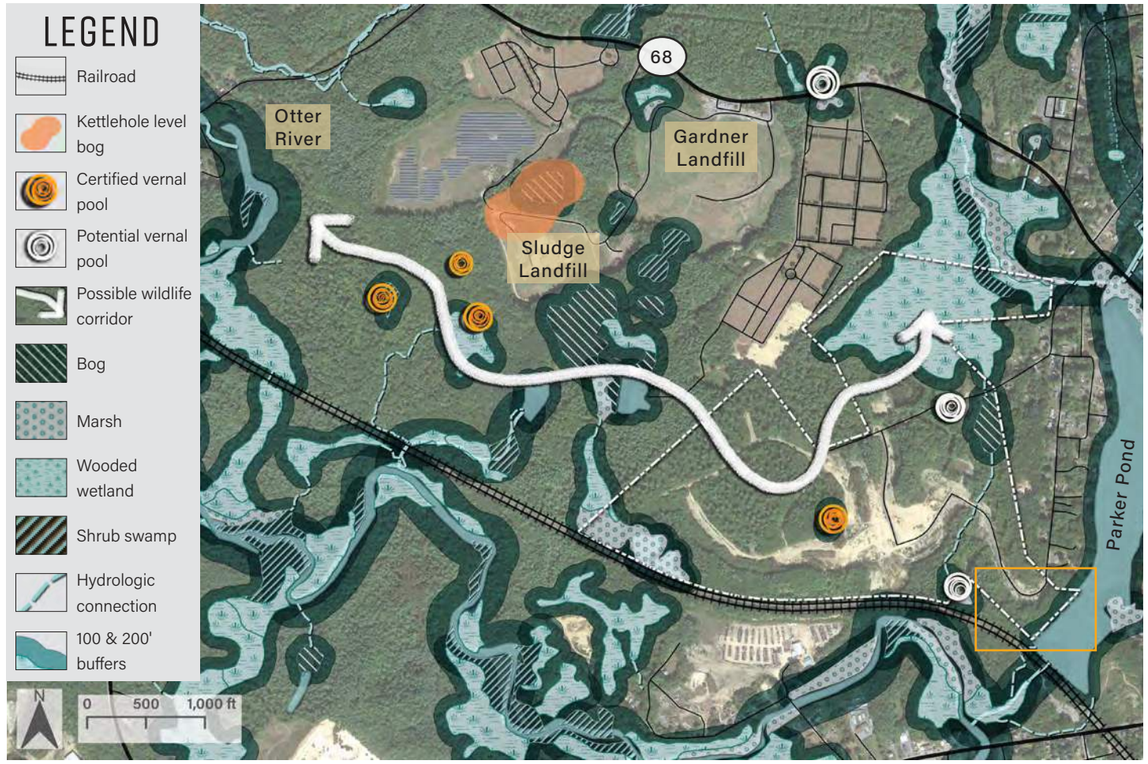
There is a diversity of wetland types on site and nearby, including a kettlehole level bog to the west. Although it's adjacent to the Sludge Landfill, NHESP reports this particular bog is in good condition with a well-developed bog mat. BioMap2 also lists this type of bog as a priority natural community of great conservation concern that may support rare or uncommon species. In the event that the Sludge Landfill contaminates vernal pools, wetlands and/or the kettlehole level bog, protecting the east/west corridor for species to migrate to similar suitable habitats on site could be crucial to their survival.

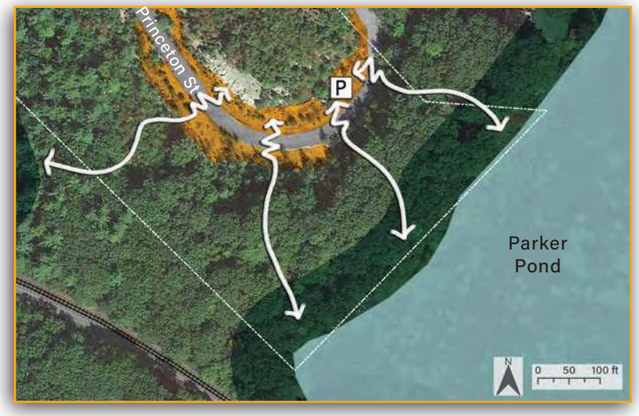
MULTIPLE VERNAL POOLS

Species such as wood frog (*Rana sylvatica*) and spotted salamander (*Ambystoma macultum*) are obligate vernal pool species, meaning they must use a vernal pool for some part of their life cycle. They likely call the certified vernal pool or one of two potential vernal pools on site home. Another cluster of three certified vernal pools is located offsite about a half mile west.

Vernal pool habitat includes upland areas 100 feet from the boundary of the pool, according to protections afforded by the Wetlands Protection Act (WPA) (Section 10.57(2)(a)6). Wetland protections in Gardner's City Code prohibit alterations within the 100-foot buffer of vernal pools whether or not they are certified (Section 650-7). Some species that rely on vernal pools for breeding also rely on undisturbed upland habitat for overwintering, foraging, and migration. For example, adult spotted salamanders spend most of their lives in the forested areas within a half mile of a vernal pool. Forested upland habitat near pools on this site is mostly intact, but the sunny, exposed gravel areas in the center where they could become especially visible to predators creates a no-travel zone between them. Maintaining upland areas as forests enhances obligate species' change of survival. Human disturbance, such as removing significantly more trees, relocating parking, building a pavilion, or forging new trails in upland areas near vernal pools, should be done in accordance with WPA and local regulations.

Wood frogs rely on vernal pools and surrounding upland habitat at various points in their lives. Illustration by Claire Baglien.





Good turtle nesting spots

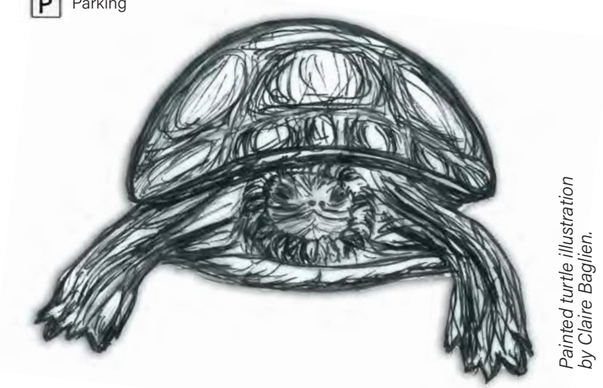
Paths turtles may take to nesting areas

P Parking

SAND & TURTLES

When it's time to nest, turtles crawl from wetlands, ponds, and streams to seek out sunny, sandy spots with little tree canopy. One such area abuts the parking lot and hugs Princeton Street on both sides (left). The survival rate for young turtles is low due to predators and other difficulties, so those that make it to adulthood need to reproduce many times for their populations to persist.

Cars are stopped from driving into the site beyond the parking area by large boulders blocking the road. Moving parking area and allowing vehicles to drive farther into the site could be fatal to turtles crossing the road to nest.



Painted turtle illustration by Claire Baglien.

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W. Kyle Finnell

SUMMARY ANALYSIS

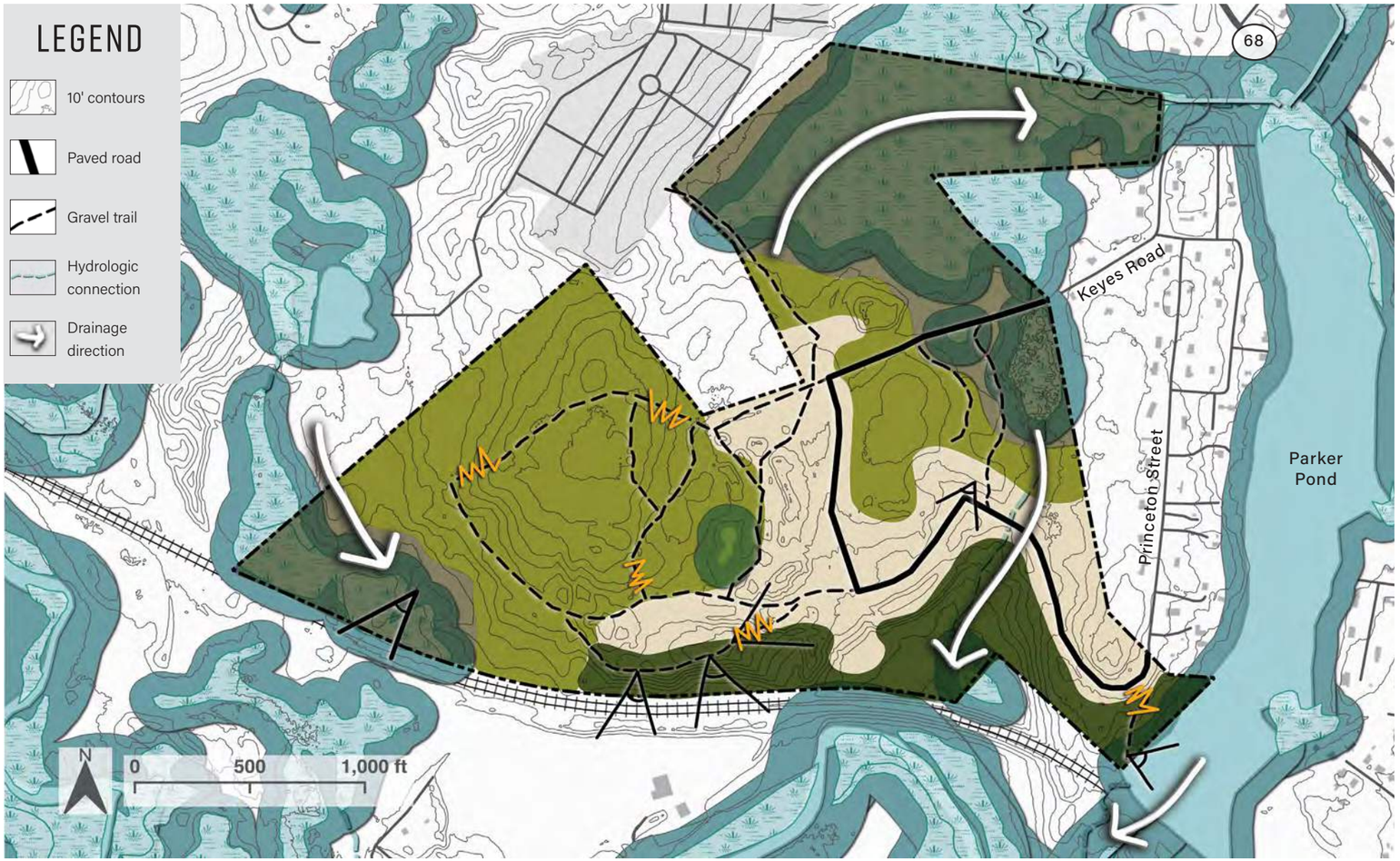
The site of an abandoned subdivision has over fifty years of history with nearby communities. Ebenezer Keyes Conservation Area hosts multiple species of conservation concern and supports multiple regionally uncommon habitat types. The recreational legacy of the site and its conservation value is an asset to the broader community and presents North County Land Trust with the opportunity to reconnect people and place.

PEOPLE: REVIVING A CONNECTION

Environmental Justice (EJ) communities tend to have disproportionally less access to open space. The proximety of Ebenezer Keyes Conservation Area to EJ communities creates an opportunity to offer recreational amenities and programming that meet their needs. However, physical barriers including an active railroad line, the Parker Pond dam, and inconsistent pedestrian infrastructure limit accessibility for visitors without a personal vehicle. An online survey and an in-person event highlighted community interest in improved trails, a gathering area, a canoe and kayak launch, and programming centered on plant and animal identification. Responses from people who use the site indicate the trails are used often but are confusing and poorly marked. Further engagement with nearby communities can inform the amenities and programming prioritized by NCLT at the Ebenezer Keyes Conservation Area.

PLACE: INTERACTING SOILS, WATER, AND BIOLOGY

Varying topography directs water that doesn't infiltrate on site to Parker Pond and low spots in the southern part of the site. The large, undisturbed wetland in the north provides an essential ecological function, filtering potential pollutants. Multiple wetland types on site and nearby offer a patchwork of habitats that support species of conservation concern. Plant and animal species and sandy quickly draining nutrient poor soils are characteristic of sandplain grasslands, a natural community emerging in the property's center. The pattern of disturbance has created a mixture of mature forests, young successional trees and shrubs, and bare open areas.



PROJECT GOALS

- Community Use
- Trail Accessibility
- Ecological Function
- Wildlife Habitat

WOODED, WET

To best meet the project goal for Wildlife Habitat, wooded, wet areas should be protected from human recreational activities by keeping trails to the edges of these areas, ensuring minimal future disturbance.

WOODED, DRY

To best meet the project goals for Community Use, Trail Connectivity, and Wildlife Habitat, wooded, dry areas with mature canopy cover are comfortable for trails and could offer viewing of the certified vernal pool while keeping visitors distanced from the more sensitive habitats.

WOODED, STEEP

To best meet the project goal for Community Use, wooded, steep areas present opportunities for a ridgeline trail with great views across the site while providing different levels of trail difficulty and mixed uses.

EXPOSED GRAVEL, SUNNY & HOT

To best meet all four project goals, the exposed gravel center that gets both sunny and hot and has a history of disturbance offers a template from which to manage for a sandplain grassland, an uncommon and imperiled habitat that can be viewed from within along Watkins Way or from new trails along the edges of this area.

STEEP, ERODING TRAILS

To best meet the project goals of Community Use and Trail Connectivity, the sections of steep, eroding trails should be prioritized for relocation, granting greater access to the site while meeting community wishes for clearly marked walking and hiking trails.

VIEWS

To best meet the project goal for Community Use, views across and beyond the site should be made more accessible via trails along the southern ridgeline which grant scenic vistas of the Otter River and overlooks the center of the propery, offering a non-disruptive viewing experience for visitors.

DRAINAGE & WETLAND BUFFERS

To best meet the project goals for Ecological Function and Wildlife Habitat, areas of drainage and wetland buffers along the eastern boundary should be protected by eliminating, reducing, or moving the parking on Keyes Road away from sensitive habitats and hydrological connections emptying into vernal pools, thereby avoiding car pollutants and road salt from reaching the highly sensitive spruce-tamarack bog.

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SUMMARY ANALYSIS

DRAFT DESIGN ALTERNATIVES

Three design alternatives were presented during works-in-progress presentations on May 27, 2022. Feedback received informed the final design. Two alternative designs for the pavilion and gathering area were developed futher.

All designs feature a canoe/kayak launch that meet universal design standards for accessibility and trails to Parker Pond that meet Architectural Barriers Act (ABA) standards (5' wide paths with a firm and stable surface and an average that does not exceed 8.3% slope).

BUILD ON EXISTING PATTERNS

This design seeks to build on existing patterns, first by adding stairs and boardwalks where trails are flooded or steep to address erosion, degradation, and accessibility issues. Some new spurs are added to feature additional points of interest, such as the certified vernal pool. Succession toward forest in the most disturbed areas is encouraged with minimal management needed except for removing opportunistic species like autumn olive. New, fast-growing canopy trees are planted along Watkins Way to shade walkers, bikers, and hikers. A pavilion and gathering area added near the Keyes Road entrance results in the parking area being relocated close to the pavilion.

BRINGING PEOPLE IN

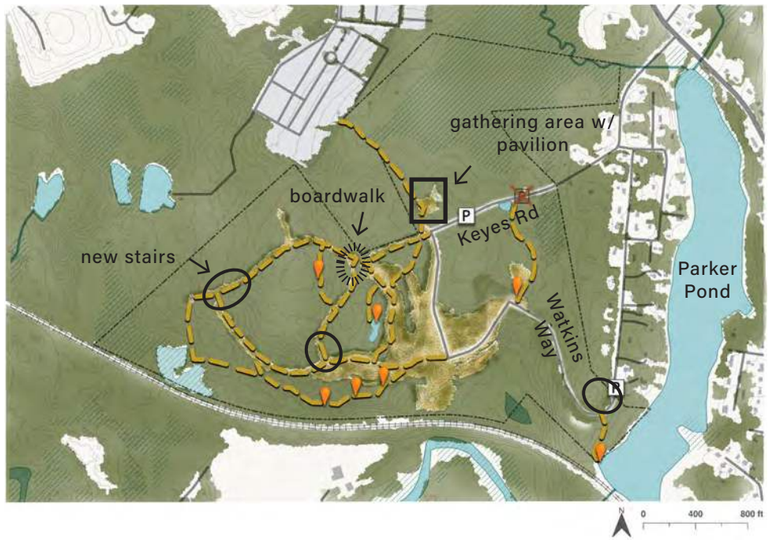
Trails are rerouted or closed where most susceptible to erosion or flooding; new spurs are added to feature a potential bog and a possible high point with a view of Parker Pond. Young successional forest is encouraged along mature forest edges to provide regionally uncommon habitat. A couple acres of inland sandplain grassland is seeded within the site's center after minor grading is done to improve sightlines and remove invasive woody shrubs and trees. Gathering areas with picnic tables, instead of a central pavilion, are accessible via trails throughout the site.

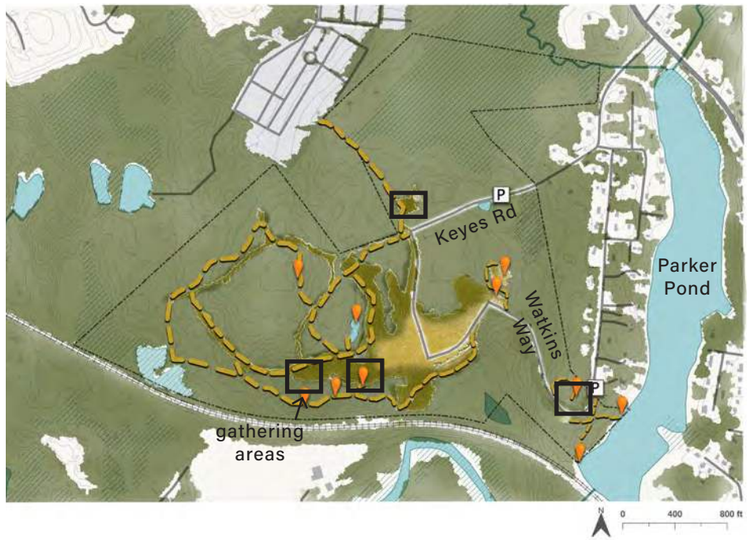
A NEW PATH FORWARD

New trails are blazed instead of following existing roads leftover from development. A path that meets ABA standards hugs the forest edge, replacing a section of paved road that previously jutted out into the center of the site. A new spur to the western property boundary is added for any potential future trail connections. A section of mature white pine are removed from what is now the northern section of an inland sandplain grassland. Extensive grading and gravel removal drastically improves visibility into the site and across the sandplain grassland. A pavilion and gathering area is added at the Princeton Street entrance with additional parking to accommodate groups.

LEGEND

Parking | Paved trail | Gravel trail | Points of interest | Wooded | Wetlands





PROS

- Existing trails retrofitted to prevent further erosion and increase accessibility, eliminating need to cut new trails and disturb habitat.
- Pavilion makes use of existing concrete pad as a foundation, reducing building costs.
- Utilities along Keyes Road are close enough to easily hook up the pavilion and other potential amenities to electricty.

CONS

- Relocating parking further into the site would require removal of current boulders (which neighbors put in place to block access for ATVs and dirtbikes) on Keyes Road. Neighbors do not want boulders moved.
- Design preserves vestiges of failed subdevelopment, perpetuating abandoned feeling that sometimes makes visitors feel unsafe.

PROS

- Less labor required to retrofit trails with expensive buildouts, such as boardwalks.
- Mosaic of regionally uncommon habitat encouraged within the site, maximizing habitat and educational opportunities.
- Gathering areas across the site bring more people beyond main entrances.

CONS

- More maintenance needed to reroute some areas of the trail system.
- Harder to maintain gathering areas scattered throughout the site than if there was one central location.
- Regular maintenance is needed to encourage sandplain grassland habitat and manage invasive plants.

PROS

- The ABA path that replaces the paved road follows the forest edge, providing more shade and keeping visitors from disturbing the sandplain grassland restoration in progress.
- Timber harvest offers revenue and construction materials for design components, such as the pavilion.
- Gathering area near Parker Pond provides views and encourages use of this community resource.

CONS

- Expensive to regrade approximately 10 acres and remove a portion of the paved road.
- Managing for an imperiled natural community and uncommon habitat like a sandplain grassland requires a long-term commitment and resources.

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NORTH COUNTY LAND TRUST 50 YEARS 1972-2022

RECONNECTING PEOPLE AND PLACE
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DRAFT DESIGN ALTERNATIVES

FINAL DESIGN: OVERVIEW

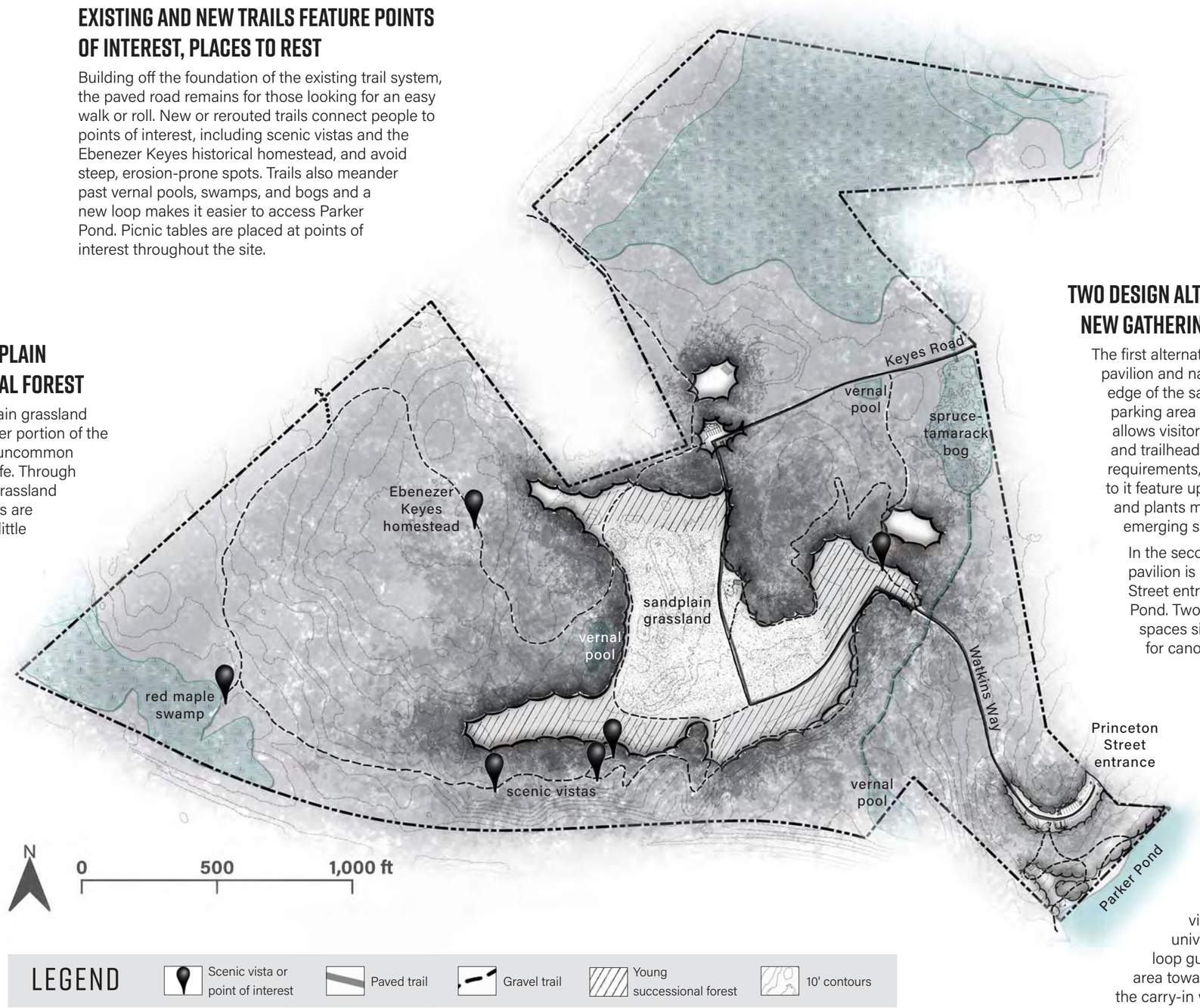
EXISTING AND NEW TRAILS FEATURE POINTS OF INTEREST, PLACES TO REST

Building off the foundation of the existing trail system, the paved road remains for those looking for an easy walk or roll. New or rerouted trails connect people to points of interest, including scenic vistas and the Ebenezer Keyes historical homestead, and avoid steep, erosion-prone spots. Trails also meander past vernal pools, swamps, and bogs and a new loop makes it easier to access Parker Pond. Picnic tables are placed at points of interest throughout the site.

MANAGING FOR AN INLAND SANDPLAIN GRASSLAND & EARLY SUCCESIONAL FOREST

A notable feature of the site is a sandplain grassland emerging from the most disturbed center portion of the site. The grassland provides regionally uncommon habitat and sustains a diversity of wildlife. Through a phased management approach, the grassland exapnds year after year. Invasive species are weeded out and perennial grasses like little bluestem become dominant instead of young trees and shrubs.

Replacing drastic edges where bare sand suddenly erupted into forest, young trees and shrubs are encouraged along the sandplain grassland edges. This subtle transition provides habitat and cover for wildlife.



TWO DESIGN ALTERNATIVES FOR A NEW GATHERING SPACE

The first alternative sites a timber frame pavilion and natural play area on the eastern edge of the sandplain grassland. A new parking area with two accessible spaces allows visitors to park closer to the pavilion and trailheads. Meeting ADA accessibility requirements, the pavilion and short walk to it feature up close views of the wildlife and plants making their home within the emerging sandplain grassland.

In the second alternative, a timber frame pavilion is sited near the Princeton Street entrance overlooking Parker Pond. Two new accessible parking spaces sit next to a boat rinse station for canoers and kayakers.

WATERFRONT ACCESS TO PARKER POND

A spot for launching canoes, kayaks, or paddleboards awaits visitors at the bottom of a new universally accessible trail. The trail loop guides people from the parking area toward the pavilion, fishing spots, and the carry-in watercraft launch.

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FINAL DESIGN: OVERVIEW

DESIGN DETAIL: TRAIL NETWORK

A reimagined trail network departs from the degraded Cedar Hills access roads, forming four interlinking or stacked loops that offer accessible routes for all visitors along Watkins Way with more challenging and immersive routes around the periphery.

WATKINS WAY REMAINS CENTRAL

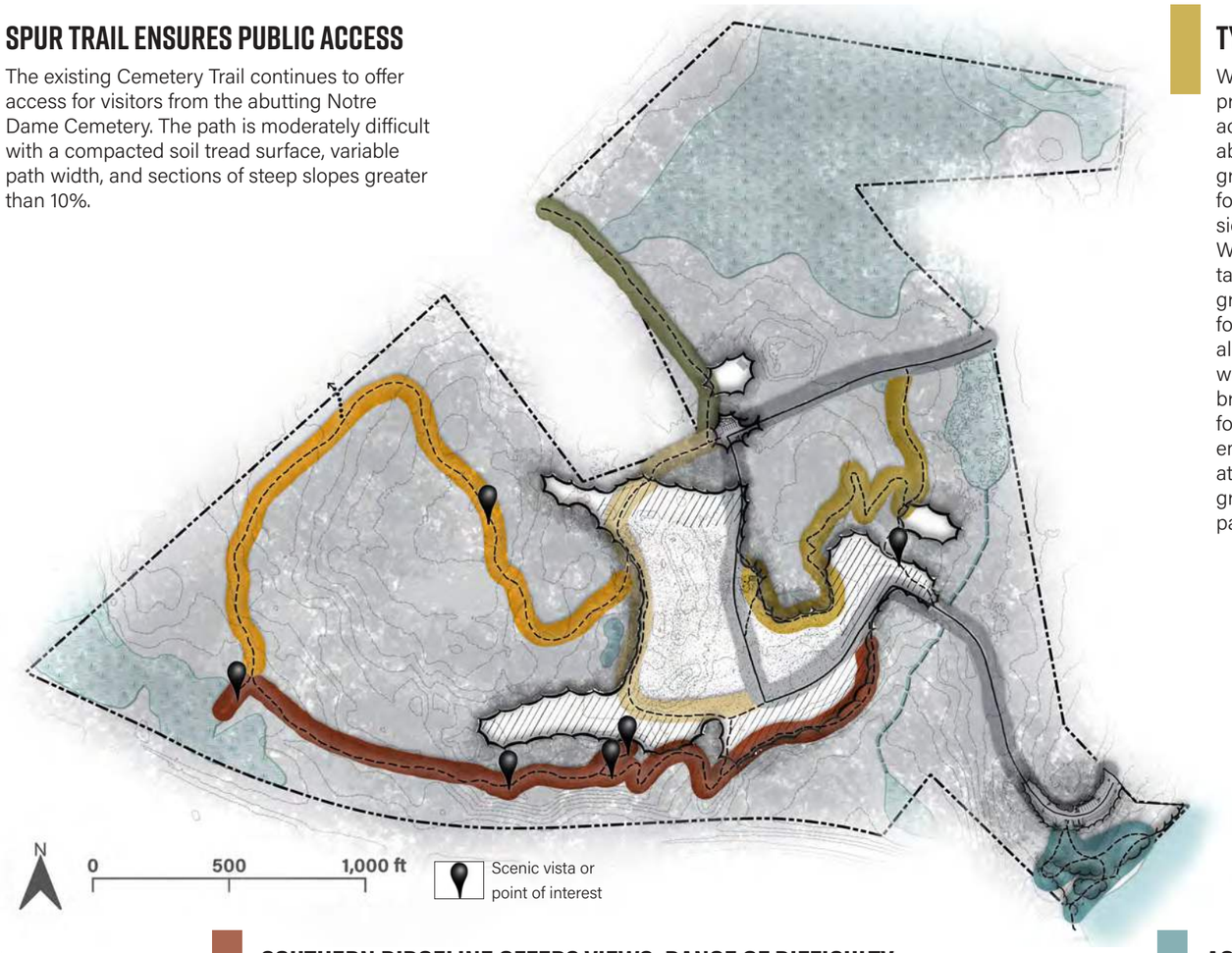
Watkins Way remains a defining feature for the reimagined trail network that builds off the central paved road connecting the Keyes Road and Princeton Street entrances. The asphalt roadway anchors a network of stacked loops that grants access throughout the site. Watkins Way grants the greatest accessiblity with a paved surface and a gentle slope averaging less than 5%. New amenities are sited along Watkins Way to ensure universal access.

LOOP ENCIRCLES SANDPLAIN GRASSLAND

A gently sloping trail encircles the western half of the central sandplain grassland. The path connects Keyes Road to Watkins Way, following the edge of the western mature upland forest. The path is shaded in the north by lonely white pines and young successional growth. The trail follows the ecotone between habitat and offers great birding opportunities. With a firm and stable surface and slope averaging less than 8.33%, the trail meets ABA standards for universal accessiblity.

SPUR TRAIL ENSURES PUBLIC ACCESS

The existing Cemetery Trail continues to offer access for visitors from the abutting Notre Dame Cemetery. The path is moderately difficult with a compacted soil tread surface, variable path width, and sections of steep slopes greater than 10%.



TYKE HIKE ALONG WOODED ECOTONES

Winding along the central hillock of the property, the Tyke Hike offers a universally accessible path for peoples of all ages and abilities. Families with kids can follow the new gravel trail with 5% maximum grade along the forests's edge. The loop connects the eastern side of Keyes Road to the northern side of Watkins Way, passing alongside the spruce-tamarack bog, a potential bog, the sandplain grassland, and the upland mature pine-oak forest. Educational signs teach little ones about all the different habitats they pass through and what animals call them home. A small ABA trail branches to the eastern section of Watkins Way for visitors entering from the Princeton Street entrance. The western side of the loop pauses at the giant chair to overlook the sandplain grassland before ending at the northern pavilion.

WESTERN LOOP CLIMBS TO PROPERTY'S HIGH POINT

Branching off the Central Grassplain Loop, this long, wooded trail offers quick ascents between the certified vernal pool and the historical foundation of the Ebenezer Keyes homestead. The western half of the trail descends from the highest point on the site toward the red maple swamp. The path changes elevation dramatically, yet with enough overall length can maintain FSTAG standards for accessibility with regular resting areas. This trail is well shaded as it winds and rolls along the topography under mature forest canopy and among pockets of young succesional growth. The canopy opens at the resting area overlooking the swamp. A potential spur to the west could follow an old cart path and eventually link to regional trails.

SOUTHERN RIDGELINE OFFERS VIEWS, RANGE OF DIFFICULTY

Imagined as a mixed-use trail offering a variety of grades and surfaces for the occasional hiker, experienced trail runner, or even the adventurous mountain biker, the Southern Ridgeline Trail branches off Watkins Way and follows the southern embankment of a detention basin. The trail rests briefly at a natural terrace offering a view to the south across the railroad and a short branch back to the southern end of the Central Grassland Loop. The trail then climbs steadily at an average slope of 10% to the top of the southern ridgeline, offering the greatest degree of difficulty along all trails. Designated viewing areas along the ridge offer views across the property and off site. A short spur takes visitors to the central viewing area, where visitors can look out over the sandplain grassland and forested hillocks. Nearby is another viewing area facing south with views down the Otter River towards Templeton. The trail descends steadily with less than an 8.33% slope to the red maple swamp.

ACCESSING PARKER POND

A universally accessible trail grants easy access from the parking area to a public canoe/kayak launch at Parker Pond. The shoreline loop branches to the north and guides visitors to designated fishing areas before reconnecting near the canoe/kayak launch. The path toward the Parker Pond dam remains as an informal entrance for community members approaching from the southeast, where Gardner's EJ populations reside.

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DESIGN DETAIL: TRAIL NETWORK

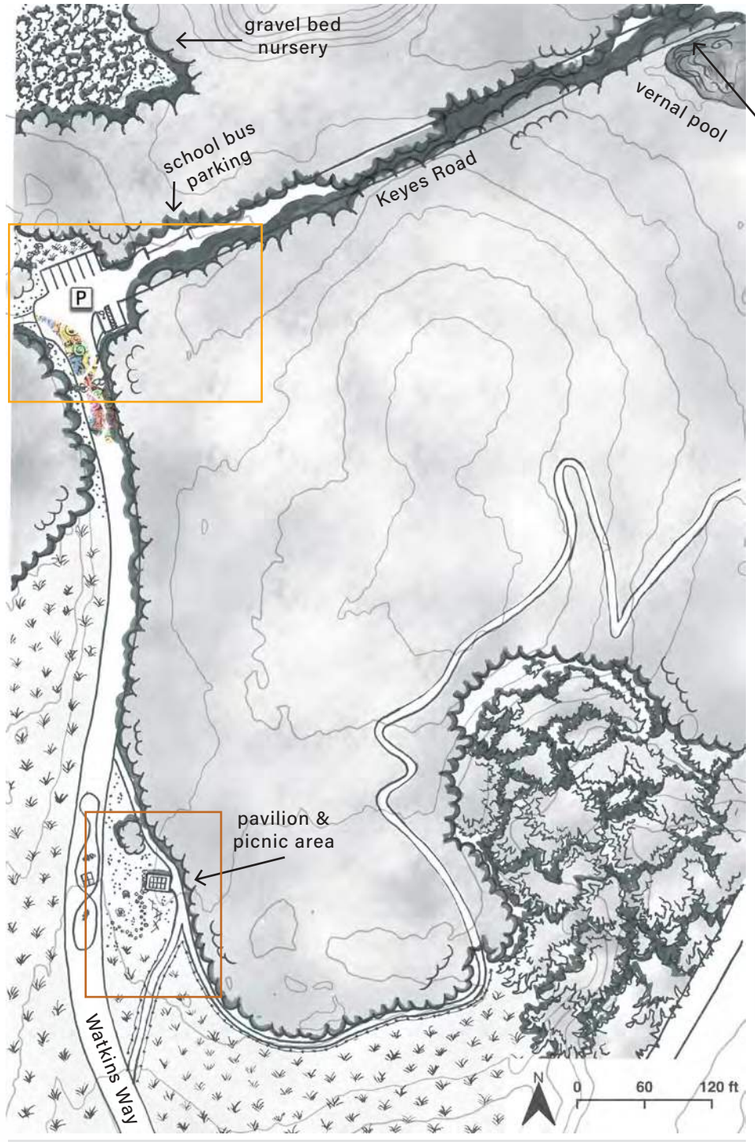
DESIGN DETAIL: NORTHERN PAVILION & PLAY AREA

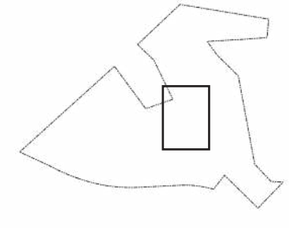
GRAVEL BED NURSERY

The open, sandy area north of the parking lot is used as a gravel bed nursery by the City of Gardner's urban trees program. City vehicles picking up trees to transplant can access the nursery via the cemetery trail. The existing concrete pad could house an equipment shed.

NEW ENTRANCE & PARKING

A new parking area with seven spots includes an accessible spot closest to the trailhead. North of the lot, a mini sandplain grassland planting is a subtle nod to what's to come. A designated parallel parking area for a school bus is situated to give the driver enough space to do a T-turn. Before hitting the trails, visitors check out the kiosk to view a trail map. Those heading to the pavilion walk through the entrance designated by large boulders, which keep cars from driving into the center of the site. NCLT could contract with a local artist to paint the pavement in sweeping patterns that bring people toward each trailhead, an ode to the graffiti on the pavement, now painted over elsewhere.



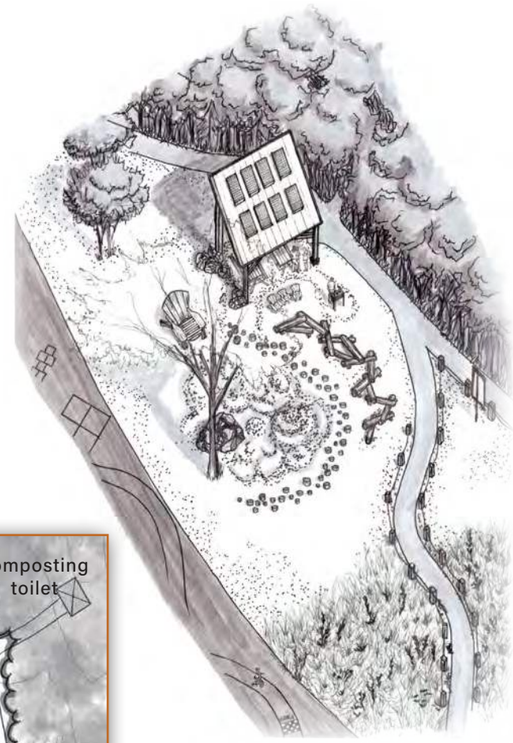


LEGEND

- 5' contours
- Gravel trail
- Sandplain grassland
- Parking
- Young successional forest

WILDLIFE CROSSING

Because Keyes Road cuts through wetlands and runs parallel to a potential vernal pool, signs visible to cars entering and exiting let drivers know to watch for wood frogs, spotted salamanders, and turtles that might be crossing the road.



PAVILION ALTERNATIVE #1 & NATURAL PLAY AREA

The existing asphalt road serves as a universally accessible path (5% or less slope) into the site. Visitors walking, rolling, or biking south along the now canopy-covered road are greeted by a stunning view of the emerging sandplain grassland as they head toward the pavilion for a picnic. The 20' by 15' timber frame structure, built with white pine harvested from the site, is equipped with rooftop solar panels.

Two, eight-foot long picnic tables, one of which is wheelchair accessible, fit under the pavilion. Additional informal seating is provided by large boulders placed along parts of the pavilion's western edge. There's a grill for family BBQs and a universally accessible path to a composting toilet east of the pavilion.

Paying homage to Gardner's recognition as the "chair city of the world," an two-and-a-half foot tall adirondack chair measuring six feet wide and eight feet deep, plus a few moveable human-sized ones, look out over the natural play area. Following a gentle arc of stepping stumps and log balance beams, kids (and adults) play in a 30'x40' sand box. The sand box opens out onto the pedestrian-only road, complete with hopscotch, four-square, and a bike race track painted on the asphalt. Kids interested in a tyke hike can walk along the gravel trail with their parents.

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DESIGN DETAIL:
NORTHERN PAVILION

DESIGN DETAIL: PARKER POND

NEW AMENITIES AT PARKER POND

In this design detail, public access to Parker Pond is spotlighted. New amenities offer universal accessibility to Parker Pond and multiple features for a variety of community use.

EXPANDED PARKING

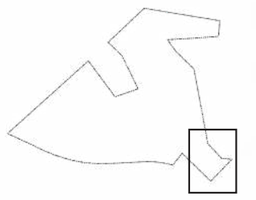
Parking remains where it was to minimize impacts on sensitive habitat. Existing parking is landscaped with native tress and shrubs to offer shade and defined spots for seven vehicles. Two accessible spaces are located next to the trailhead to Parker Pond. A new turn-around large enough for a school bus allows for the occasional school group. A gate to Watkins Way is sited further into the property to allow for this turn around feature. A welcome kiosk informs visitors of the trail to Parker Pond and other amenities close to the parking area and trailhead.

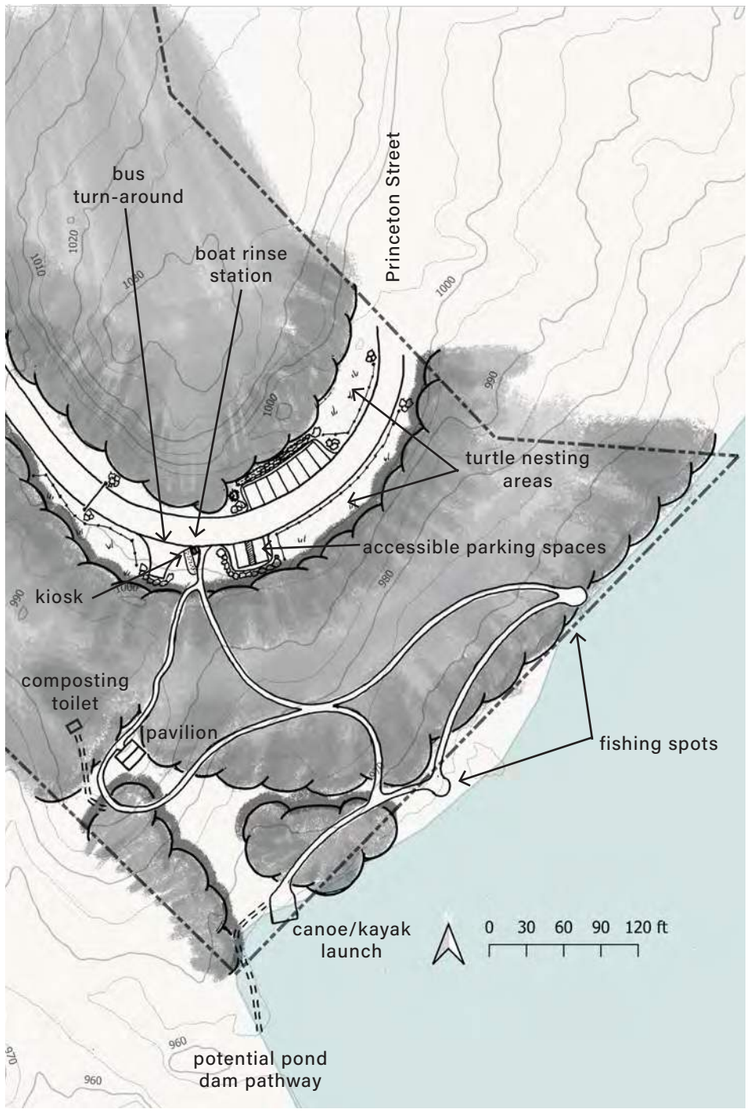
PROTECTED HABITAT FOR TURTLES

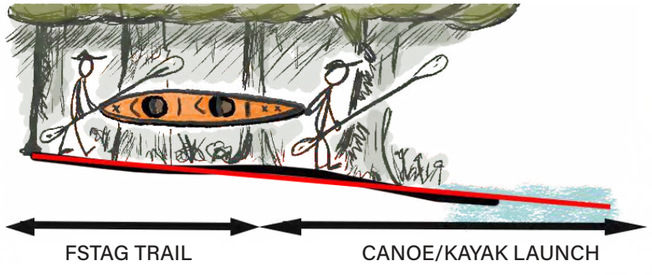
Exposed sandy soils with little-to-no shade are preferred areas for turtle nesting. Two areas along the Princeton Street parking lot are defined and protected by wildlife crossing signs and rope fencing. Disturbance is welcome outside nesting season to preserve the exposed soils the turtles need. Woody vegetation is discouraged and actively removed to keep areas as sunny as possible for future turtle nesting.

PAVILION ALTERNATIVE #2

A universally accessible and nearly level path leads visitors 200 feet into the upland forest towards a new pavilion and gathering area.







A NEW PATH TO THE POND

A serpentine trail leads boaters from the parking lot to the canoe/kayak launch approximately 425 feet downhill. A branching ADA path (staying < 5%) leads to the new pavilion. Halfway down the trail the path branches again, creating a loop to the designated fishing areas. Visitors can follow the trail directly to the canoe/kayak launch at a moderate slope less than 8.33% or meander along the gentler shoreline loop averaging a 5% slope. The loop trail circles back upslope towards the new pavilion, maintaining FSTAG accessibility standards.

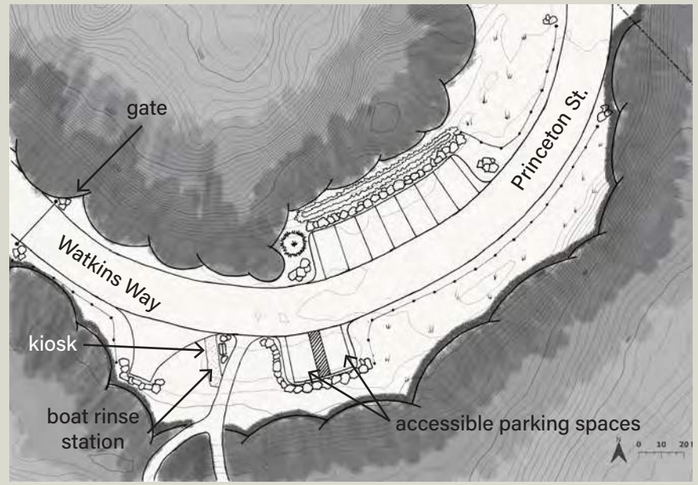
DESIGNATED FISHING SPOTS

Anglers are invited to use one of two designated fishing spots 150 feet apart along the Parker Pond shoreline. Each area is 15 feet wide and offers space for two visitors to fish side-by-side. Fishing spots are a level, natural surface with benches for seating, minimal obstructions by tree branches, and a shoreline free of debris.

CANOE/KAYAK LAUNCH

With a natural surface of crushed gravel, the canoe/kayak launch (20' by 20') grants sustainable access to Parker Pond. Minor grading is needed for the desired slope less than 8.33%. Fill from regrading will need to continue the desired grade into Parker Pond, ideally to a depth of two feet for boaters. With a gentle grade and the pond's calm waters, the natural surface will stabilize the bank.

Grading detail for canoe/kayak launch.



CLOSE UP: PARKING AND TRAILHEAD

The northern parking lot is protected from exposed bedrock with a boulder retaining wall and vegetation to stabilize the embankment. Two accessible spots are reserved closest to the new trailhead and welcome kiosk, where there is also a water spigot for boaters to rinse canoe/kayak(s) after enjoying Parker Pond.

CLOSE UP: PAVILION

The new pavilion sits atop the ridgeline overlooking Parker Pond. A selective timber harvest opens the southeast forest canopy, granting new views of Parker Pond to the east and the Otter River to the south. Harvested hardwoods have potential as either building materials for new amenities or as a source of revenue for NCLT. Solar panels make the pavilion more sustainable, generating enough electricity for visitor gatherings. An accessible outhouse with composting toilet is located fifty feet from the pavilion, nestled into the forest for added privacy.

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DESIGN DETAIL: PARKER POND

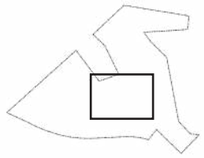
SANDPLAIN GRASSLAND: MANAGEMENT & PHASING

Sandplain grassland establishment can be done in phases. Phase 1 is an area with fewer trees and shrubs and doesn't require much (if any) grading. Phases 2 and 3 could include both grading and timber removal to improve sightlines, remove invasive species, and take out young saplings.

Sandplain grasslands are dry, nutrient-poor sandy areas that are dominated by grasses and forbs. Relatively rare and home to a diversity of plant and animal species of conservation concern, coordinated, long-term management is needed to preserve these uncommon natural communities. NCLT has an opportunity to manage the interior 10+ acres of Ebenezer Keyes Conservation Area as an inland sandplain grassland.

Management goals should be determined by NCLT in collaboration with a restoration professional before taking action. One goal could be to increase native grasses and forbs through seeding and reducing woody and invasive plants. Selection of grasses and forbs may be influenced by the types of birds, insects or mammals, common or rare, to prioritize habitat for. Recommended management approaches differ among natural communities. Setting clear conservation and management goals will guide decisions around short- and long-term monitoring and management.

Sandplain grasslands require regular disturbance to prevent forest succession and create conditions for characteristic plant and animal species to flourish. Management techniques could include prescribed fire, mowing, grazing, and/or vegetation removal. According to the Sandplain Grassland Network, the source of most of the information on this page, **no studies found one technique alone to be a viable long-term management solution.** A combination of techniques will likely be needed to reach management goals.



The site of an abandoned sand extraction operation in Lancaster, MA, Bolton Flats WMA now functions as a biodiversity-rich sandplain grassland complex. In 2014, the 130-acre Pine Hill section of the state-owned property was selected for management as a sandplain grassland because of its dry, sandy soils and associated vegetation. At the beginning of the treatment plan, the site had a mosaic of bare sand, stands of little bluestem, and pitch pine stands of varying densities. Initial restoration began in 2014 during which mowing was used to reduce tree regeneration and top-kill invasive, non-native species. The longer term management of the site started in 2015 and focused on establishing and maintaining desired plant communities by seeding sandplain species that may take too long to pioneer, controlling vegetation through treatment of new sprouts and invasives, use of prescribed fire and mowing to limit woody species establishment, limiting disturbance from off-road vehicles, and monitoring characteristic sandplain grassland species. Seven years later, Bolton Flats WMA provides habitat for several bird and invertebrate species of conservation concern, and is an important destination for bird-watchers and walkers.

MANAGEMENT OPTIONS

FIRE

ECOLOGICAL BENEFITS

- Reduces fuel that could otherwise ignite during wildfires.
- Exposes mineral soils, promoting the establishment of some grassland species.
- Favors less common and fire-adapted vegetation, increasing regional biodiversity.

DRAWBACKS

- Local air quality could be impacted and harmful for neighbors with sensitive respiratory systems.
- Higher cost to hire professionals to plan, implement, and monitor effectiveness of prescribed burns.
- Unpredicatable weather can cause delays.

CONSIDERATIONS

- To provide refuge for wildlife that can't escape fire, may need to burn only patches at a time.
- When and how often to burn depends on vegetation and fuel types, and the specific management goals:
  - "As a general rule of thumb, early growing season burning in sandplain grasslands favors warm-season native grasses that are fire tolerant, and discourages non-native cool-season grasses that are fire intolerant." (C. Buelow, J. Carlson, T. Simmons, Interview).
  - Multiple studies show that summer burns, especially during drought conditions, are generally most effective at reducing woody vegetation.
  - The frequency of prescribed fire is dependent on specific conservation targets. Woody plants may increase if prescribed fires occur only infrequently.

MOWING

ECOLOGICAL BENEFITS

- Effective at top-killing woody vegetation, especially if done frequently in the summer.
- Able to choose height of cut vegetation to reduce flowering or fruiting of species depending on goals.

DRAWBACKS

- Adds more litter to soils, which may create growing conditions less suitable for target species.
- If not done frequently, undesired vegetation regrowth can quickly outpace mowing equipment capacity.

CONSIDERATIONS

- Timing, frequency, and location of mowing favors different plant communities and habitats. More research is needed, but rarer forbs might not flourish as much as grasses like little bluestem if the same area is mowed several times a year.
- Less logistically complicated than fire; requires only equipment and operators don't need specialized training.

GRAZING

ECOLOGICAL BENEFITS

- Reduces regrowth of woody vegetation and increases biodiversity.
- Hooves disturb the soil, promoting growth of native species in soil seed bank.

DRAWBACKS

- Need to hire professionals to create grazing plan and select animals based on existing vegetation, manage animals, and return to site when additional grazing is needed.
- Animals are not selective, they could destroy existing rare plant communities if grazed intensively.

CONSIDERATIONS

- Outcomes are influenced by grazing intensity and timing and type of animal used.
- Goats are best for controlling woody vegetation, cows for grasses, and sheep if it's a mixture.

VEGETATION REMOVAL

ECOLOGICAL BENEFITS

- Mechnical treatments and herbicides are effective at reducing invasive species, which may allow for an increase in sandplain grassland species.
- Able to specifically target individual plants.

DRAWBACKS

- Mechanical removal (cutting, digging, shading, or pulling by hand) is labor intensive and may not effectively remove all parts of a targeted plant, allowing it to regrow.
- Herbicides can kill non-target species and have potentially negative impacts on fauna (although more reserach is needed).
- There can be public concern about use of chemicals.

CONSIDERATIONS

- According to a review of available literature performed by the Sandplain Grassland Network, there is limited research on how herbicides impact ecosystems within sandplain grasslands.
- Usually not a long-term management technique.
- Near gathering areas on site where young children or pets may play in the sand, avoid using foliar sprays or other herbicides that may persist on surfaces.
- Autumn olive (*Elaeagnus umbelata*) is well-established on the site, so a combination of mechanical removal and herbicide treatment could be used. The ultimate goal is to kill the root system, since new growth can sprout if it's left viable.
- Black locust (*Robinia pseudoacacia*) fixes nitrogen, conflicting with the nutrient-poor soil conditions required by many sandplain grassland species. Because it can aggressively spread by seed and vegetatively, remove it nearest where sandplain grassland is established.

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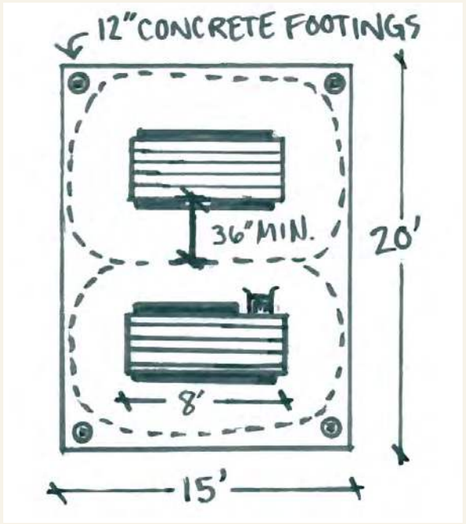
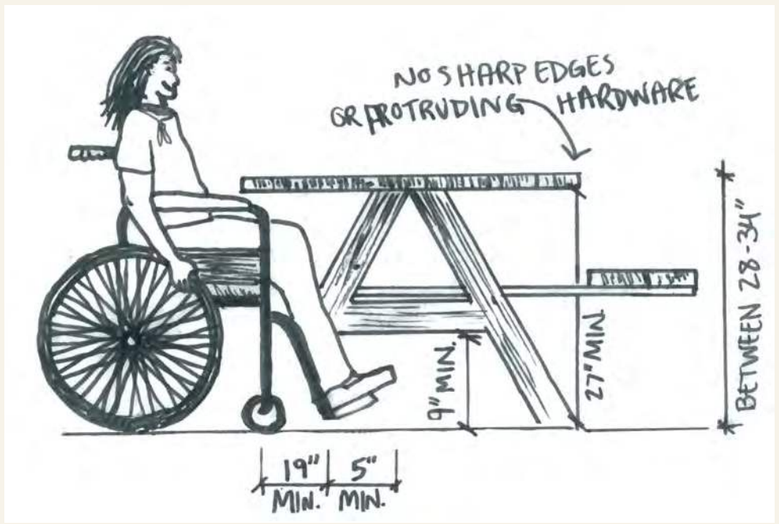
COST ESTIMATE, MATERIALS & PRECEDENTS

SIZING A PAVILION FOR ALL VISITORS

Sizing a space to universal accessibility standards includes considering the space needed to safely manuever a wheelchair. The final design details size the proposed pavilions as 15 feet by 20 feet, which can accommodate two accessible picnic tables with additional space to allow for universal accessiblity. Illustrations by Claire Baglien.





Two roof styles could be considered to optimize the potential number of solar panels. Photos from Vermont Timber Works.

Timber frame pavilion with gravel instead of a concrete pad for a base may be less expensive. Photo from Richard Gallow.

The following cost estimations are based on conceptual components of the final design and focus on features and amenities new to NCLT, as per the client request.

AMENITY	MATERIALS	QUANTITY	UNITS	COST/UNIT	TOTAL COST
Pavilion (20'x15')	Timber-framed structure	300	Sq Ft	$40	$30,000
	Gravel Pad	300	Sq Ft	$50	$1,500
	Concrete Footers	4		$80	$800
Canoe/kayak launch	Excavation/Grading	400	Sq Ft		$5,000-6,000
	Water berrier	1			$1,000
	3/4" Crushed Stone (20'x20'x6")	8	Cu Yd	$55	$1,100
Restroom facility	Composting Toilet System	1			$5,000-7,000
	Structure (6'x5')	30	Sq Ft	$50	$3,750
Timber harvest	Selective Thinning	2	Acre		$10,000
	Clear Cutting	2	Acre		$6,000
	Milling (on site)	2	Day (8hrs)	$500	$2,500
Solar PV system	Solar Panels (5'x3')	8	Panels	$800-1,000	$6,400 - 8,000

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REFERENCES

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