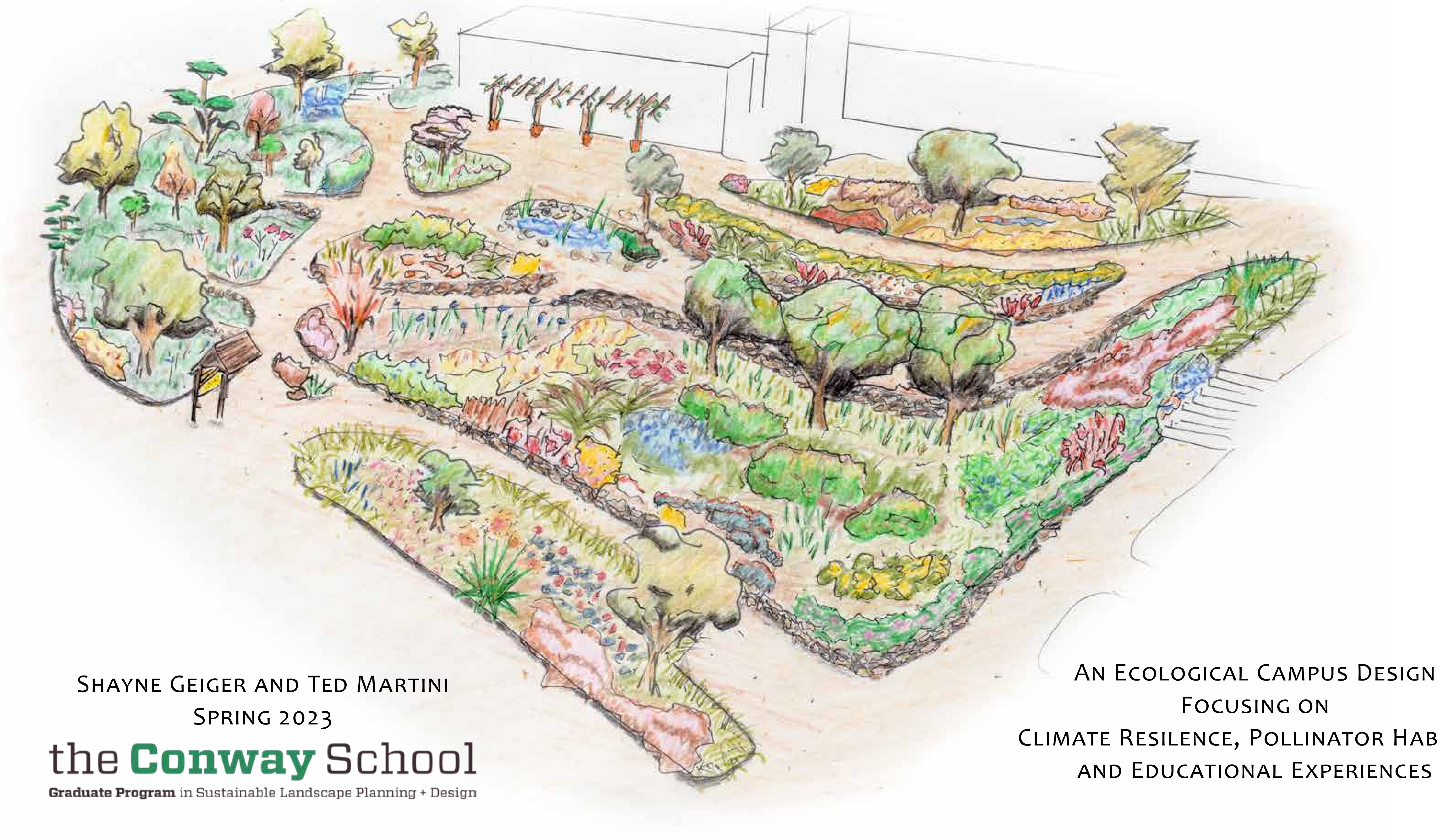
A Living Laboratory on the Learning Landscape at Berkshire Community College



Shayne Geiger and Ted Martini

Spring 2023

the Conway School

Graduate Program in Sustainable Landscape Planning + Design

An Ecological Campus Design
Focusing on
Climate Resilence, Pollinator Habitat,
and Educational Experiences

Project Introduction

The Berkshire Community College Campus

A Living Laboratory for Climate Resilience and Pollinator Habitat

In the face of our current environmental challenges, Berkshire Community College recognizes the importance of educational institutions taking the lead in developing and presenting models for sustainable practices and innovation related to land management and the design and planning of landscapes and gardens. This college's property is currently home to a wide spectrum of woodlands, wetlands, meadows, and other naturalized ecosystems and habitats that are greatly valued by the campus population and serve the academic curriculum. By further enhancing the BCC campus with interventions that focus on climate resilience and pollinator habitat, BCC will enrich a vibrant ecosystem that increases biodiversity. By creating interesting and information-rich public spaces, BCC will provide invaluable learning opportunities for students, faculty, and the surrounding community.

Project Goals:

- ***Create a landscape design that integrates pollinator habitat and climate resilience into a full campus plan.***
- ***Include opportunities for educational experiences for the BCC population and the broader Berkshire community.***
- ***Recommend improvements for existing woodland and wetland trails and all open spaces.***
- ***Explore opportunities to improve the infiltration of stormwater runoff.***
- ***Research relevant organizational collaborations and partnerships that might provide support for plan implementation.***

Improving Climate Resilience

A campus designed for climate resilience is one that minimizes its ecological footprint, strives to make use of renewable energy sources, and adopts ecologically sustainable practices and infrastructure. This project explores ways that the energy generated by the solar panels that are installed on the rooftops might be augmented, how stormwater that currently runs off-site into sensitive wetlands can be better managed. It also recommends alternatives to the large areas of turf to reduce stormwater runoff and promote a cooler and healthier more enjoyable campus environment that sequesters more carbon.

Based on analyses of existing site conditions, this document makes recommendations to improve green infrastructure, expand tree and forest canopy, and manage the forested areas of the property to address the expected environmental developments due to climate change.

Increasing Pollinator Habitat

Pollinator loss is a global concern. According to the University of Cambridge, "The bees, butterflies, wasps, beetles, bats, flies and hummingbirds that distribute pollen, vital for the reproduction of over 75% of food crops and flowering plants… are visibly diminishing the world over, yet little is known of the consequences for human populations." ("Pollinators") This pollinator decline is also occurring in Berkshire County which is the native home to a variety of pollinators that are crucial for the health of local ecosystems and agricultural productivity.

One of the primary drivers of pollinator loss in the Berkshires is habitat loss and fragmentation. As development expands, natural habitats are converted into human-dominated landscapes, resulting in the loss of pollinator-friendly habitats. This loss of native wildflowers, shrubs, and trees that provide nectar, pollen, and nesting sites disrupts the food sources and reproductive cycles of pollinators. Climate change will also impact the geographical distribution of pollinators and their host plants. As temperatures shift, suitable habitats for both pollinators and plants may change. Some species may face local extinctions if they are unable to adapt or migrate to more suitable habitats.

By working toward a more native pollinator-friendly campus that keeps climate-migration patterns in mind, BCC can also create an opportunity for research and education on this important issue. This project will identify how and where climate-resilient and pollinator-friendly habitats can be integrated throughout the landscape of the BCC campus and will incorporate these recommendations into landscape designs for two focus areas on campus.

Serving as a Living Laboratory

A campus that serves as a living laboratory embraces the concept of students actively engaging with real-world issues and conducting research within their own campus environment. These principles, as well as a great appreciation of the importance of environmental sustainability, are embraced in the college's list of values:

- **Student-Centered:** We work to provide access and opportunity for our students, and we support them in exploring and attaining their academic and career goals.
- **Diversity and Inclusion:** We are committed to exploration and development of the BCC community, in which we value diverse perspectives, identities and experiences to ensure individuals are welcomed, acknowledged and celebrated for their authentic selves.
- **Purpose-Driven:** We create and do meaningful work that enhances the well-being of our community.
- **Responsiveness:** We create innovative and accessible ways to adapt to changing needs of our community through inclusive teaching practices, community partnerships and individualized student experiences.
- **Sustainability:** We promote and foster conscientious social, civic, economic, and environmental sustainability.

Many areas of the BCC campus already serve the value of environmental sustainability, which is also applied through the college's Environmental Sciences program. By further integrating sustainability initiatives into the curriculum BCC can offer a place where students can apply theoretical knowledge to practical situations, fostering a deeper understanding of environmental challenges and solutions. Students will be able to study the impact of climate change on local ecosystems, monitor pollinator populations, or install sustainable infrastructure projects. The visiting public will experience firsthand the methods and best practices that they could apply to their own home garden and landscape projects. This hands-on approach might not only enhance learning outcomes for visitors but could also instill a sense of responsibility and stewardship towards the environment. Partnerships can be forged with local schools, community organizations, and businesses to share knowledge and collaborate on sustainability initiatives. Educational workshops, public lectures, and guided tours can be organized to showcase the campus's sustainable features and inspire others to adopt similar practices.

Enhancing the BCC campus landscape with a focus on climate resilience and native pollinator habitat can increase it's use as a living laboratory and will further strengthen the commitment this school holds to ecological responsibility. By prioritizing sustainability and embracing innovative solutions through research, education, and community engagement, the BCC campus will inspire sustainable action far beyond its immediate boundaries.

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88 Village Hill Rd. Northampton, MA 01060
413-369-4044
www.csld.edu

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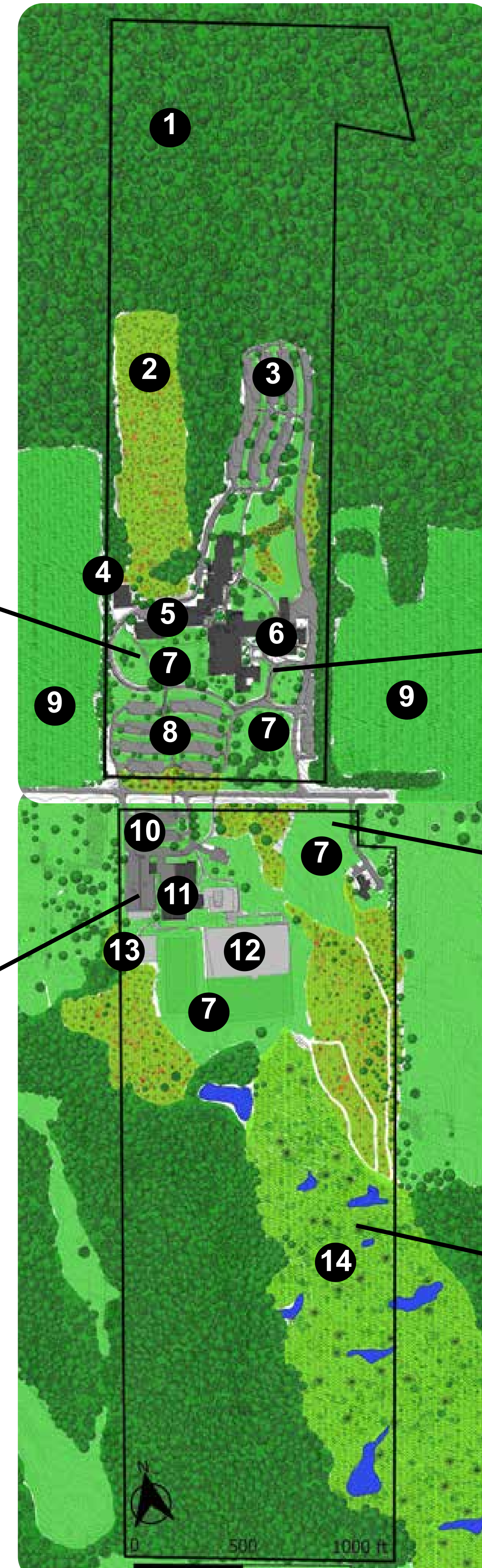
The College

Founded in 1960, BCC was the first community college established in Massachusetts. During its first twelve years, BCC was located in downtown Pittsfield but it continued to grow and in 1972, the college moved to its present location occupying a 180-acre site four miles from the center of Pittsfield. Each year roughly 1,500 students enroll at the main campus, the vast majority of which (97%) are Massachusetts residents with most (94%) coming from Berkshire County. More than half (62%) of the students are women and 22% are people of color. 51% of students are non-traditional by age (23 years or older). BCC's affordable, equitable, and accessible educational opportunities offer options to the Pittsfield and greater Berkshire community to continue learning and expanding their education ("About BCC").

BCC also hosts the Osher Lifelong Learning Institute (OLLI). OLLI at BCC has over 1,450 members and offers non-credit courses and programs for lifelong learners, in-person and online. OLLI at BCC offers opportunities to folks who are older but still desire educational opportunities, engaging an important part of the community that might not be otherwise ("About BCC").

Northern Campus Core
(Drone shot- Christian Tenczar)

Southern Campus Core
(Drone shot- Christian Tenczar)



Current Campus

1. Forest
2. Meadow
3. Student Parking Lot
4. Environmental Science Building
5. Nursing Building
6. Cafeteria and Main Entrance
7. Turf
8. Faculty Parking Lot
9. Hay Fields
10. Athletics Parking
11. Gymnasium
12. Astroturf Field
13. Tennis Court
14. Wetlands

Northern Campus Buildings
(Drone shot- Christian Tenczar)

Southern Wetlands
(Drone shot- Christian Tenczar)

Current Day Campus

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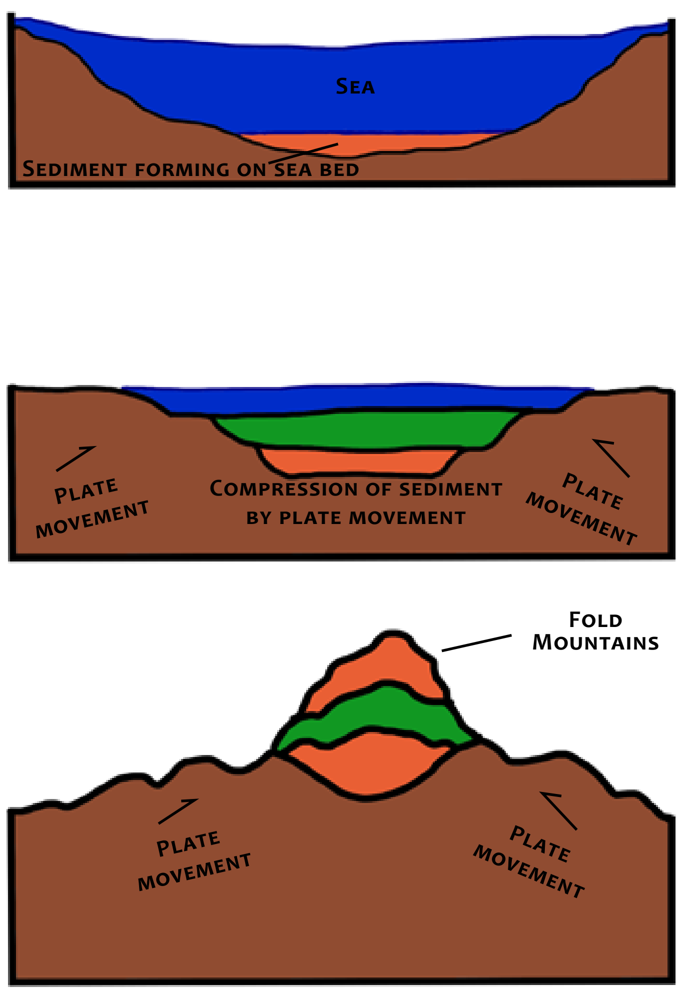
Natural History

The Berkshires are a picturesque mountain range with a rich natural history. From the peaks to the valleys, this region tells a tale of geological processes that have shaped the landscape over millions of years. The Berkshires date back to ancient times when immense tectonic forces shaped the Earth's crust. Around 540-440 million years ago, during the Cambrian and Ordovician periods, a collision between two landmasses occurred, resulting in the formation of the supercontinent called Pangaea. As a result of this collision, vast amounts of ocean sediment were pushed upwards, compressing and creating the bedrock that would form a mountainous region and eventually become the Berkshires.



The bedrock of the Berkshires primarily consists of metamorphic rocks, such as schist and gneiss, formed from the intense heat and pressure that accompanied the tectonic collision. These rocks provide insights into the region's geological history and have significant implications for plant community composition due to the high amounts of calcium.

One of the most striking features of the Berkshires is the presence of marble, particularly in the Marble Valley region where BCC is located. Marble is a metamorphic rock that forms when limestone, a sedimentary rock composed of calcium carbonate formed by the accumulation of shells from sea life, undergoes extensive heat and pressure. In the Berkshires, the compression of limestone beds during the mountain-building process led to the creation of calcite and dolomite marble deposits.

The bedrock composition has a direct impact on the fertility of the Berkshires. As the metamorphic rocks weather over time, they release minerals and nutrients, enriching the soil and supporting diverse plant life. This fertile soil has contributed to the growth of forests, meadows, wetlands, and the region's agricultural practices.

Glaciation

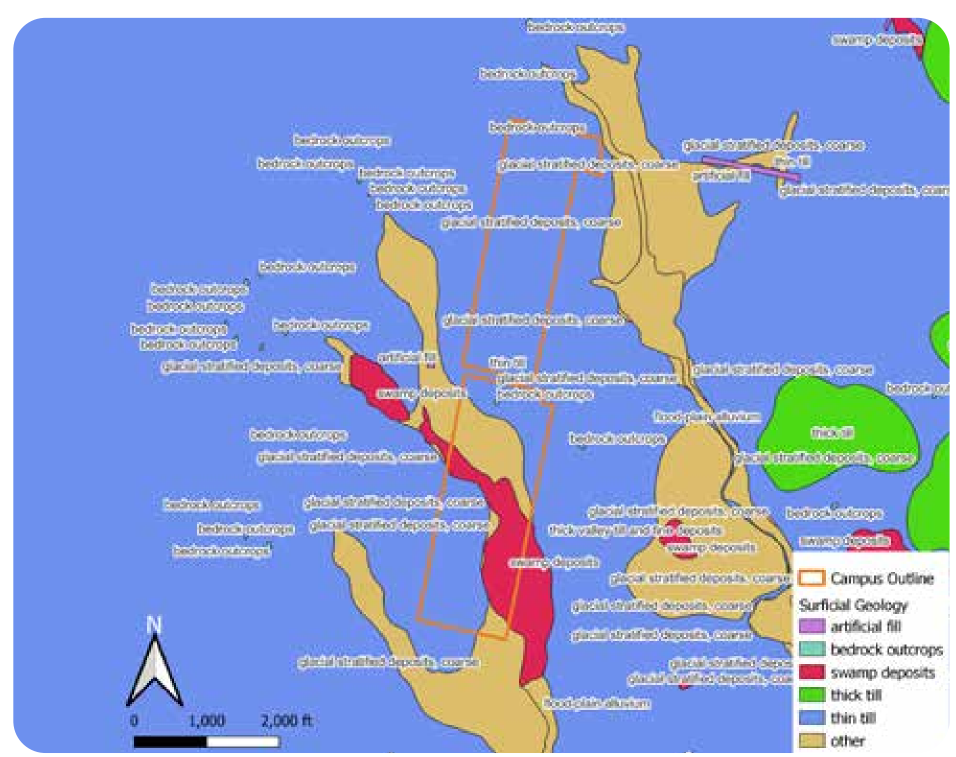
The Berkshires also bear the marks of glaciation. The advance and retreat of massive ice sheets during the last Ice Age sculpted the landscape, eroding the bedrock, and transporting immense amounts of debris. As the ice melted, it deposited this material. The two glacial deposits found on the campus of BCC are thin till and coarse glacial stratified deposits.

Glacial deposits, both thin till and coarse glacial stratified deposits, contributed to the formation of soil in the region. Over time, weathering and decomposition of the parent material mixed with organic matter enriched the soil with a variety of minerals, providing a foundation for plant growth and supporting diverse ecosystems. The composition and characteristics of the soil vary depending on the specific glacial deposit, bedrock, and the surrounding environment.

The glacial deposits also influence the hydrological patterns of the Berkshires. The porous nature of the sediment in coarse glacial stratified deposits allows for water infiltration and contributes to groundwater recharge. Additionally, the varying permeability of the different glacial deposits influences the flow of surface water, shaping the formation of streams, rivers, and wetlands across the region. The coarse deposits in the southern part of campus are at a low enough elevation that they intercept the water table. This allows for groundwater to surface and supply water to the wetlands above swamp deposits. These swamp deposits are thick accumulations of organic material that prevent drainage and help to sustain wetlands and waterbodies in the southern part of campus. There are also nearby low elevation glaciolacustrine deposits from post glacial lakes that exhibit fine sediment accumulations.

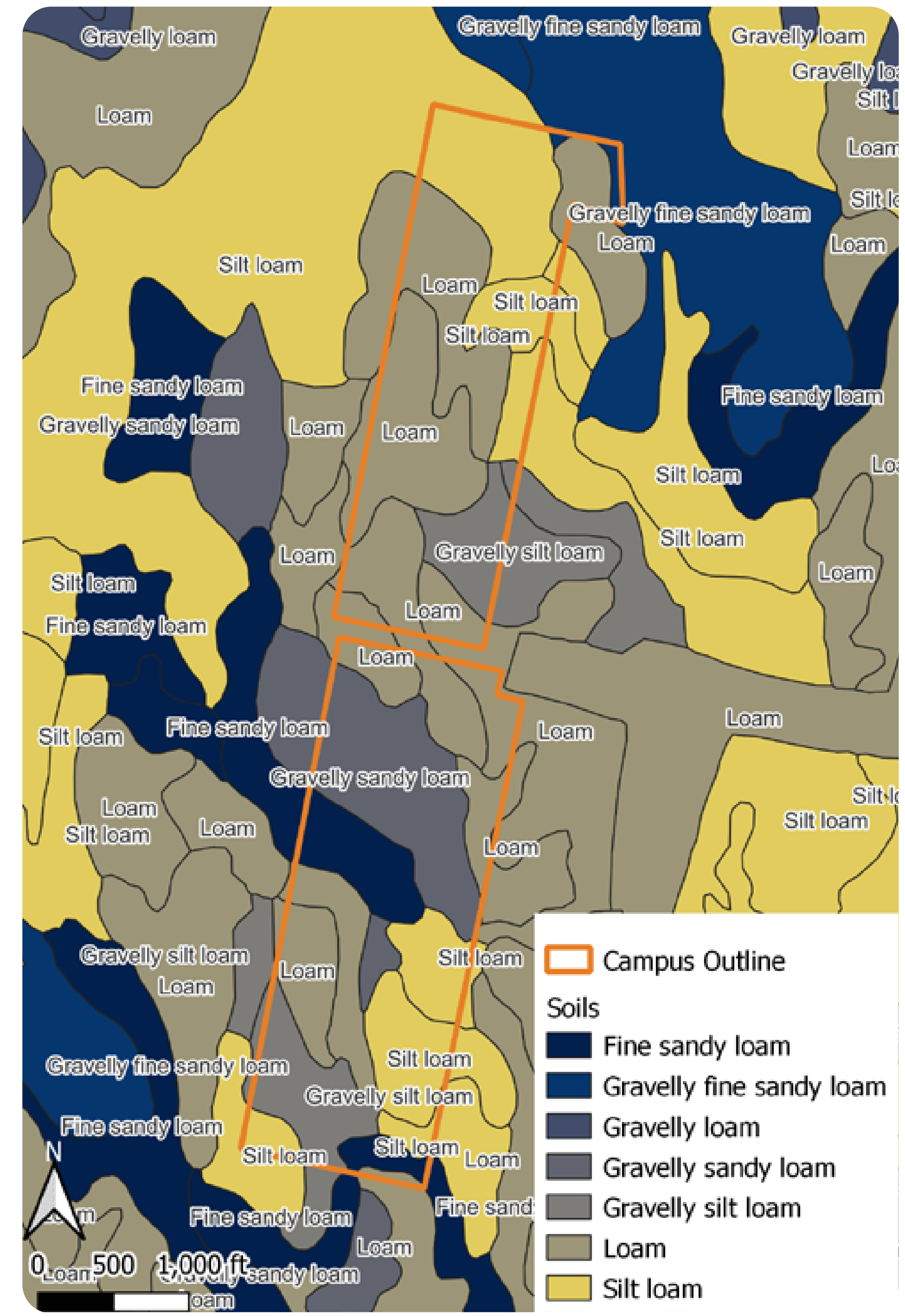
Exploring the natural history of the Berkshires allows us to interpret the intricate interplay between the geology and the diverse ecosystems that thrive in it. The native plant communities found in the forests and meadows on campus give hints to the geology. The well-draining soil in the north and poor draining areas in the south each coincide with different combinations of plant species. The forest plant communities also reflect the minerals found in the bedrock because of the rich calcium soils that support plant communities with high nutrient requirements.

Surficial Geology



Soils

Most of the northern half of the campus is well draining loam and silt loam. These soils host plant communities such as forest and meadow ecosystems that thrive in these fertile soils. These soils also allow for a wide range of plants that can be included into the campus design to increase diversity. The southern half of campus has sandy loam which supports specific wetland species.



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Natural History

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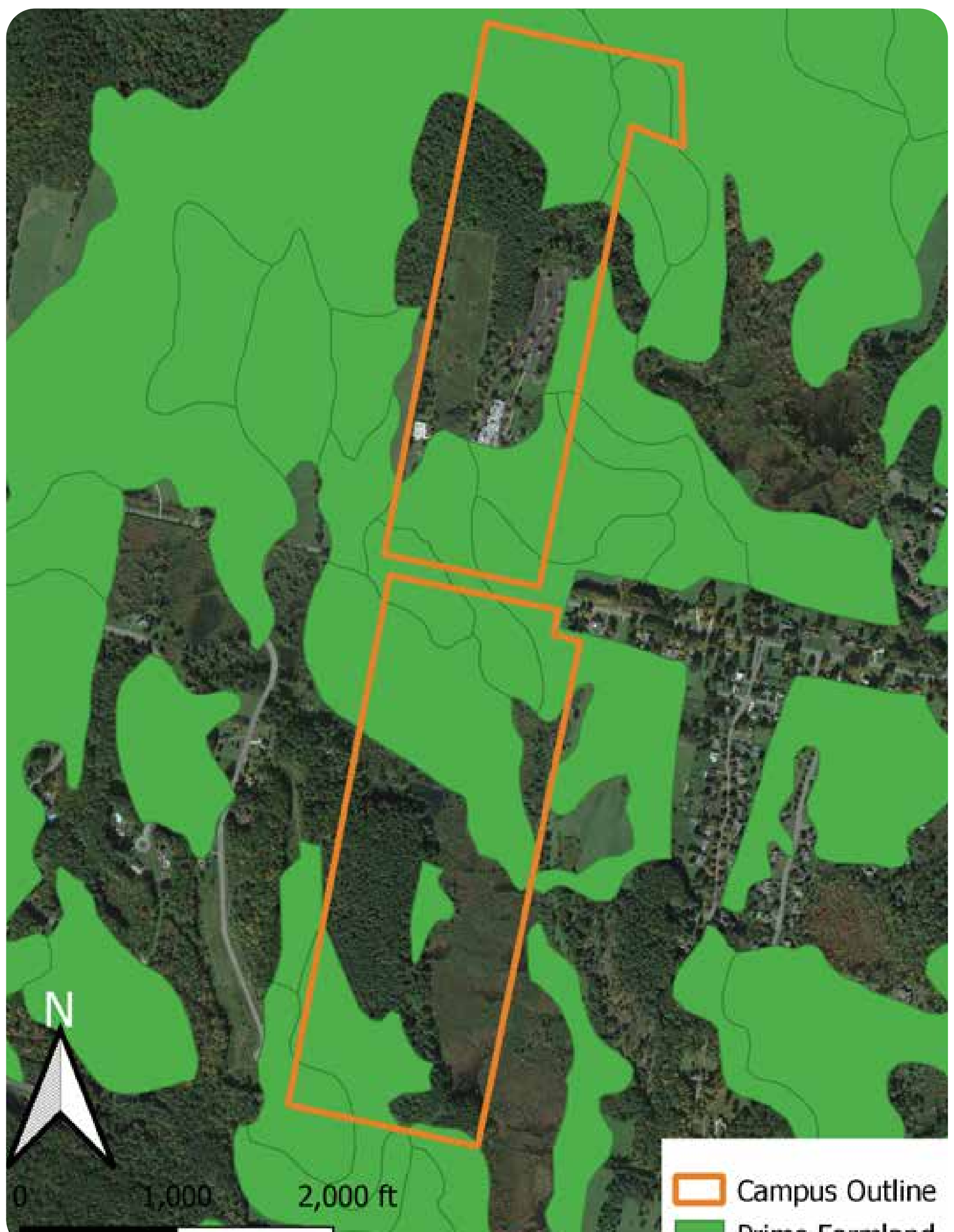
Farmland Soils

The soils around the main campus buildings are classified as prime farmland soil (*MassMapper*). The classification of prime farmland is based on its suitability for agriculture, considering factors such as soil quality, drainage, fertility, and accessibility to water.

The southern half of the campus also has prime farmland soils until the southern edge of the athletic fields. South of the fields the soils switch to poorly drained silt loam where the swamp deposits and wetlands begin.

Historically, post colonization, the BCC campus was used as a poor farm. A poor farm was an institution that provided housing and basic necessities for individuals who were unable to support themselves financially. In Massachusetts, poor farms were established as a form of public assistance for the destitute, elderly, or disabled individuals who lacked resources to care for themselves. These institutions typically had agricultural land attached to them. The farm provided food for the residents and offered a means for the residents to contribute through labor, helping to support the institution and reduce its financial burden.

Over time, as social welfare systems evolved, poor farms became less common, and their functions were absorbed into more comprehensive welfare programs. The poor farm at BCC reflects a historical approach to poverty and care for vulnerable populations, highlighting the importance of providing support and resources to those in need within the community.

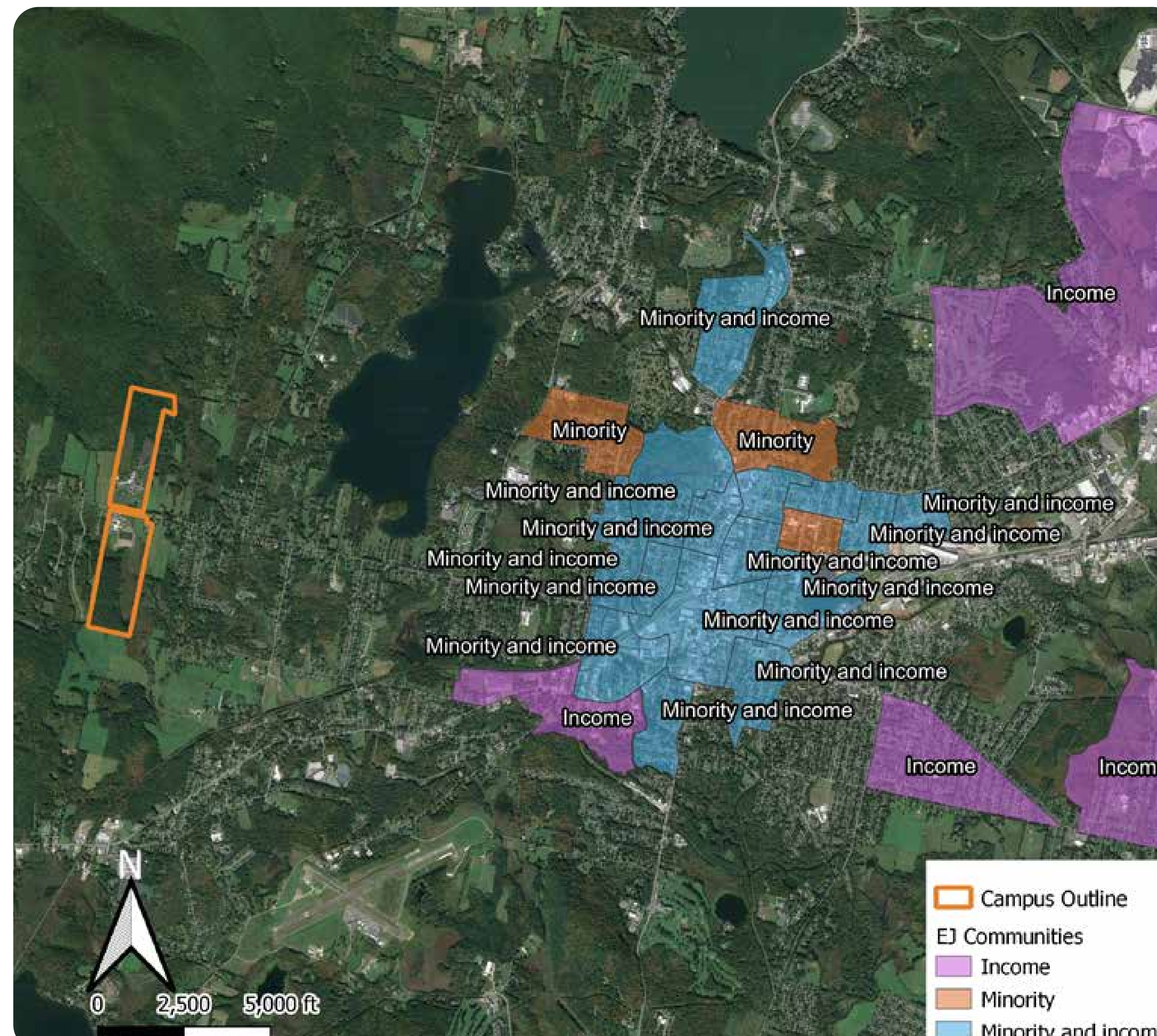


Environmental Justice

Pittsfield, Massachusetts, the city adjacent to BCC, has several environmental justice communities. Environmental justice refers to a neighborhood where the annual median household income is 65% or less of the statewide annual household median income, minorities make up 40% or more of the population, or 25% or more of the households identify as speaking English less than "very well" (*Environmental justice populations in Massachusetts*).

In Pittsfield, there are several communities that face environmental justice challenges, including low-income neighborhoods and communities with predominantly minority populations. These communities may be disproportionately exposed to environmental risks such as pollution, toxins, and other hazards. These hazards can have adverse effects on the health and well-being of residents, leading to increased rates of respiratory problems, cancer, and other health issues.

BCC plays a crucial role in helping to address these environmental justice challenges by providing affordable education to the local and larger community.



Not for construction. Part of a student project and not based on a legal survey.

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History and Community

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Indigenous History

Prior to European colonization, New England was home to many Indigenous tribes, primarily belonging to the Algonkian language family. The original inhabitants of Berkshire County were the Muhheconneok, the People of the Waters That are Never Still. Today they are known as the Stockbridge-Munsee Band of Mohican Indians. The Mohicans were deeply connected to the woodlands and rivers where they lived.

Mohican women typically took charge of the household, children, and gardens, while men ventured further for hunting, fishing, and warrior duties. After hunts and harvests, food like meat, vegetables, berries, and smoked fish were dried and stored in pits lined with grass or bark.

During the winter months, Mohicans engaged in carving utensils and containers, repairing hunting and fishing gear, creating baskets and pottery, and adorning clothing with dyed porcupine quills, shells, and other natural materials. Winter was also a time for teaching, as storytellers imparted knowledge about the origins of life, the creation of the Earth, the changing colors of leaves, and more. Historians recounted the people's stories, including the significance of singing, drums, rattles, and celestial guidance. Children absorbed Mohican traditions, learning how to interact with each family member and respect the Creator's gifts, fostering peace within the community. They also began acquiring skills and embracing their responsibilities.

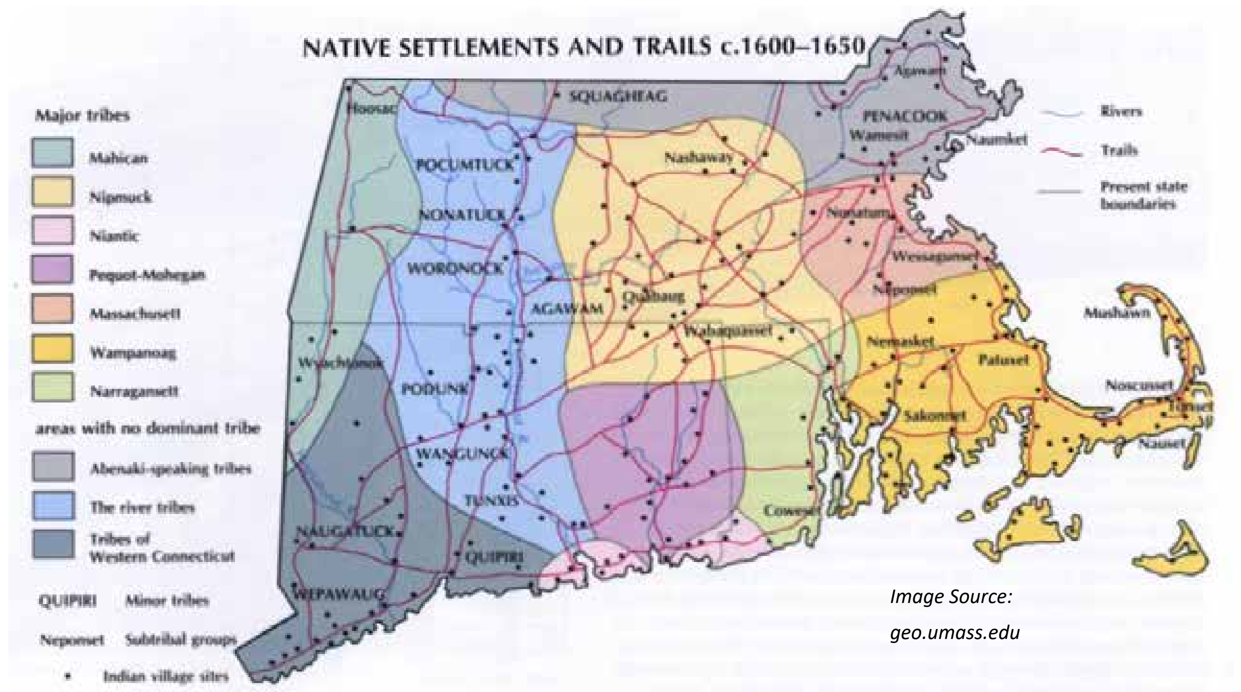


Image Source: geo.umass.edu

In early spring, the Mohicans set up camp in the Sugar Bush, commencing a ceremonial welcome of spring by tapping trees, gathering sap, and boiling it to produce maple syrup and sugar. Throughout the year, various ceremonies took place to honor significant events, such as planting the first seeds (corn, beans, and squash) and the time of harvest.

Then when colonists arrived, the lives of the Mohicans and all Indigenous people changed forever.

The Mohicans underwent profound changes due to the influences of the fur trade, European missionaries, disease, and war. These factors collectively led to a disruption of their traditional cultural practices, with their spiritual ceremonies being replaced by European customs. The decline of the Mohican language among the people further altered their thought patterns concerning the natural world. While certain ancient arts like basket and pottery making persisted, many seasonal occupations were abandoned. To ensure their survival, the Stockbridge Mohicans assimilated the trades and behaviors of their non-Indian neighbors, such as engaging in farming, lumbering, attending church, and sending their children to English schools.

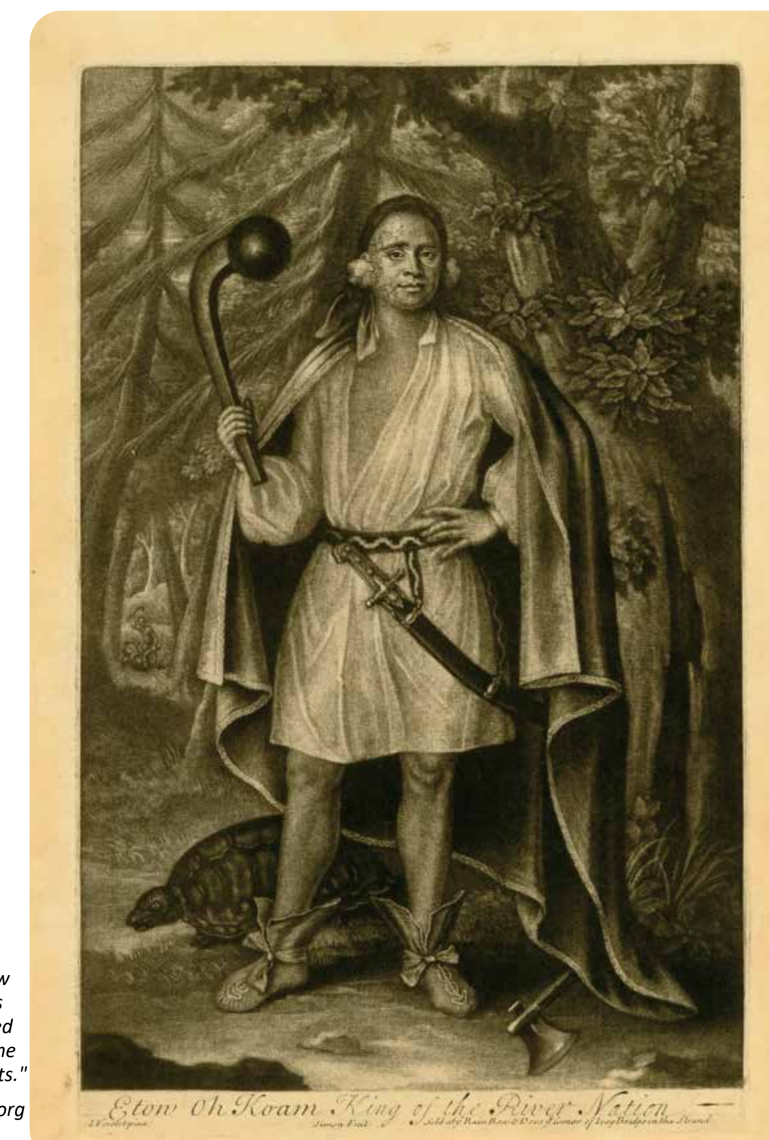
Towards the end of the eighteenth century, the lives of the Mohicans underwent even more significant changes. Following the Revolutionary War, with a reduced population and encroaching settlers employing unscrupulous means to claim their land, the Stockbridge Mohican people found themselves unwelcome on their own land. In response, the Oneida, who had also fought for the colonists during the war, offered them a portion of their fertile farmland and forest. Accepting the invitation, the Stockbridge Mohicans relocated to New Stockbridge near Oneida Lake in the mid-1780s. They cleared forests, established farms, built essential structures such as schools, churches, and a sawmill, and thrived under the leadership of Joseph Quinney and his counselors.

However, land companies sought to profit from the land and pushed for the removal of all Indians from New York State. The pressure for relocation increased, leading a portion of the Stockbridge Mohican people, approximately 70 souls, to embark on a journey to the White River area in present-day Indiana under the leadership of John Metoxen. Unfortunately, upon reaching their destination after a year, they discovered that the Delaware, their relatives, had already been coerced into selling their land. Eventually, the Stockbridge Tribe, Munsee Tribe, and others settled in Wisconsin, where they were finally able to establish a permanent reservation and thrive. Nevertheless, the valleys of the Hudson and Housatonic Rivers, the ancestral homeland, hold sacred significance and preserve their spiritual and cultural heritage. Today, the Stockbridge-Munsee band of the Mohican Tribe maintains a strong connection to this area.

Historical information from articles *Bidwell Lore,* by Rob Hoogs and *Brief History* from the Stockbridge-Munsee Band of Mohican Indians.

On campus

In 2022, the Osher Lifelong Learning Institute (OLLI) at BCC sponsored a year-long program, Indigenous Peoples: “We’re Still Here" with courses, lectures, book groups, art exhibits and guided walks. That program included Indigenous Peoples of the Northeast, a course taught by OLLI instructor Michael Wilcox. Another course, Honoring Our Indigenous Heritage: Native People, Plants, Pollinators, was organized by OLLI/Housatonic Heritage instructor Vivian Orlowski and featured two invited guest speakers with indigenous heritage. One indigenous guest was Misty Cook, author of *Medicine Generations* about medicinal plants and their traditional uses learned from her Mohican elders (Vivian Orlowski). BCC and its affiliates have a great respect for the indigenous history of this area, and desire to have more information and representation on campus about their history and culture.



"Etowaukaum, Sachem of the Mohican Nation, and father-in-law of Lt. Aaron Umpachenee. He was one of the “Four Kings” who visited England in 1710 to see Queen Anne and plead for their sovereign rights."

bidwellhousemuseum.org

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Flora and Fauna: Forests

The BCC campus is a diverse ecosystem that harbors a variety of plant communities. These communities include forests, meadows, wetlands, and lawns. Each of these plant communities has distinct characteristics, vegetation types, and ecological functions.

Forests

Forests are complex ecosystems characterized by a dense canopy of trees and an understory of shrubs, herbaceous plants, and groundcover. BCC has several wooded areas, in the far north of campus and southwest, that serve as vital habitats for numerous flora and fauna species. The forested areas contribute to biodiversity by providing shelter, food, and nesting sites for various wildlife including pollinators. Globally these forest communities also play a role in mitigating climate change by absorbing carbon dioxide through photosynthesis and storing it in live organic material and in soils.

Within this mixed transitional hardwood forest, is a diversity of tree species such as maples, pines, and birches. As the climate continues to change and the region gets warmer, this forest will likely transition to a southern New England mixed hardwood forest of oaks and hickories. Assisted migration is an approach to forest management that involves planting species that are native south of this region to ensure continuous forest cover even as the climate changes. Forest management is not currently practiced at BCC, however proper forestry could improve the health of the forest. Students and nature enthusiasts currently can explore the northern forest by the John Lambert Nature trail.

Northern Campus and Adjacent Forested Hills

Northern Forest property Boundary with Pittsfield State Forest

Northern forest Stand of Old field white pine

Forest Cover on Campus

Forest Connectivity

The northern forest on campus abuts State Forest land, which is also labeled as core forest by Biomap 3. These areas are large tracts of continuous forests that provide habitat for species that require undisturbed forests. This connectivity to core forests shows the importance of this forested area on campus. It not only provides habitat to specialized forest species, but also can act as a buffer against aggressive exotic species that would spread into the core forest. Fragmentation of habitat increases the vulnerability of exotic species invading and negative impacts to native species. Dynamic forest management is recommended for this area to ensure the continual health of the forest and its abutting core forest.

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Forests

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Flora and Fauna: Wetlands

Wetlands

Wetlands are areas where the soil is permanently or seasonally saturated, creating habitats for specialized plant and animal species. BCC is fortunate to have wetlands, both in the northern and southern sections of campus, that contribute to the ecological diversity of the campus. Wetlands play a vital role in purifying water, reducing flooding, supporting biodiversity, and sequestering carbon.

The large wetlands in the southern section are flooded year-round and have several open-water ponds and deep marshes. This year-round presence of water is helped in part by the presence of ecosystem engineers, beavers. Beaver dams regulate water flow, helping to prevent floods during heavy rainfall and maintaining water levels during dry periods. The slowing down and pooling of water also facilitates sediment deposition, which improves water quality by filtering pollutants and excess nutrients. Additionally, wetlands act as natural reservoirs, replenishing groundwater and providing a stable water source for wildlife and nearby vegetation.

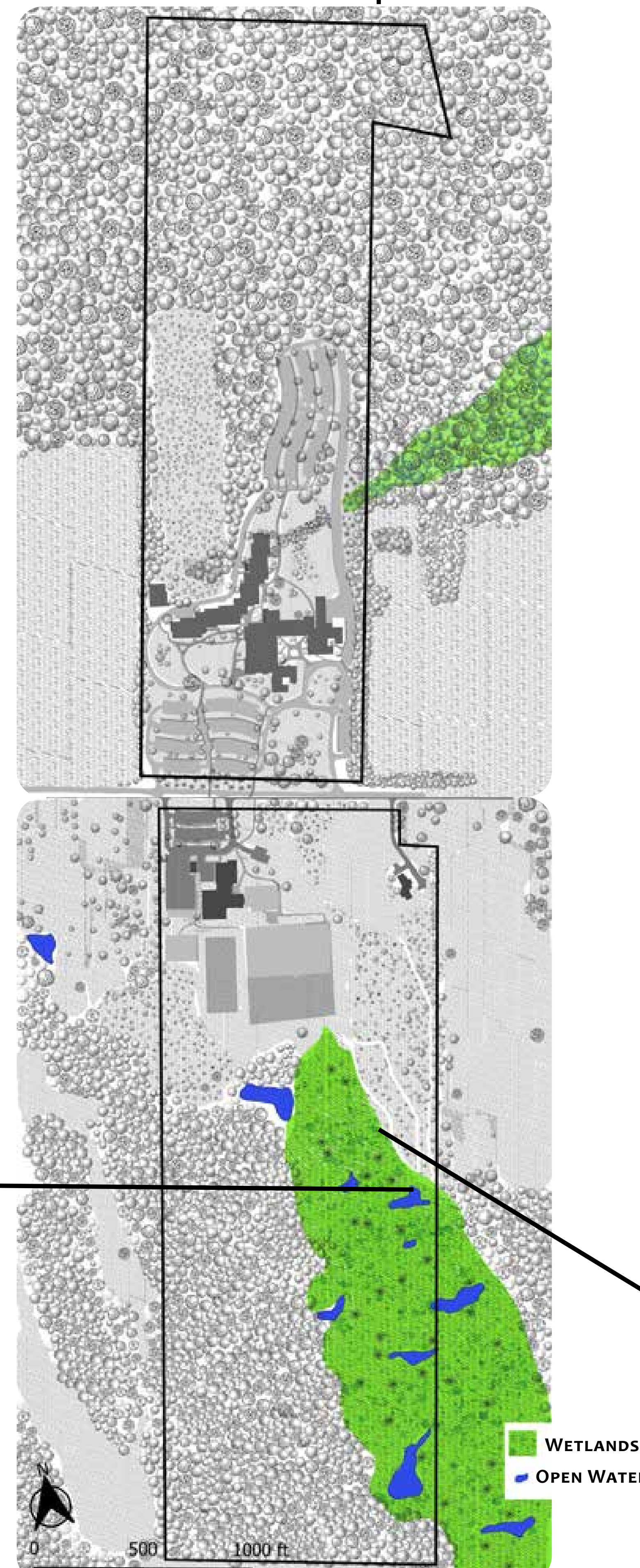
In these wetlands at BCC, there are an array of water-loving plants such as cattails, sedges, rushes, and willows. These plants provide food and shelter for amphibians, birds, fish, and insects. Wetlands also serve as crucial habitat for pollinators. The water-loving plants found in wetlands provide abundant nectar and pollen resources, attracting a variety of bees, butterflies, and other pollinating insects. These wetlands are also mapped by NHESP as priority habitat for rare and endangered species.

These wetlands additionally are valuable educational resources, offering opportunities to study this ecosystem and its hydrology. A trail currently leads to the edge of the wetlands for observation; however, many students and faculty were unaware of this natural feature and trail when the Conway team spoke with them at campus.

Open Water ponds made by beaver dams

Beaver Activity in Southern Wetlands

Wetlands on Campus



Wetlands, Streams, and Priority Habitat around the Campus

Southern Wetlands (Drone shot- Christian Tenczar)

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Wetlands

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Flora and Fauna: Meadows and Lawns

Meadows

Meadows are open areas abundant with wildflowers, grasses, and other herbaceous plants. They are characterized by a high degree of sunlight penetration, allowing for vigorous growth of diverse vegetation. The BCC campus has meadows that provide essential habitat for pollinators such as bees, butterflies, and hummingbirds. A large 10-acre meadow in the northern campus is managed on a 3-year rotational mowing schedule. One-third of the meadow is mown every year to prevent woody encroachment and continue this early successional wildflower habitat.

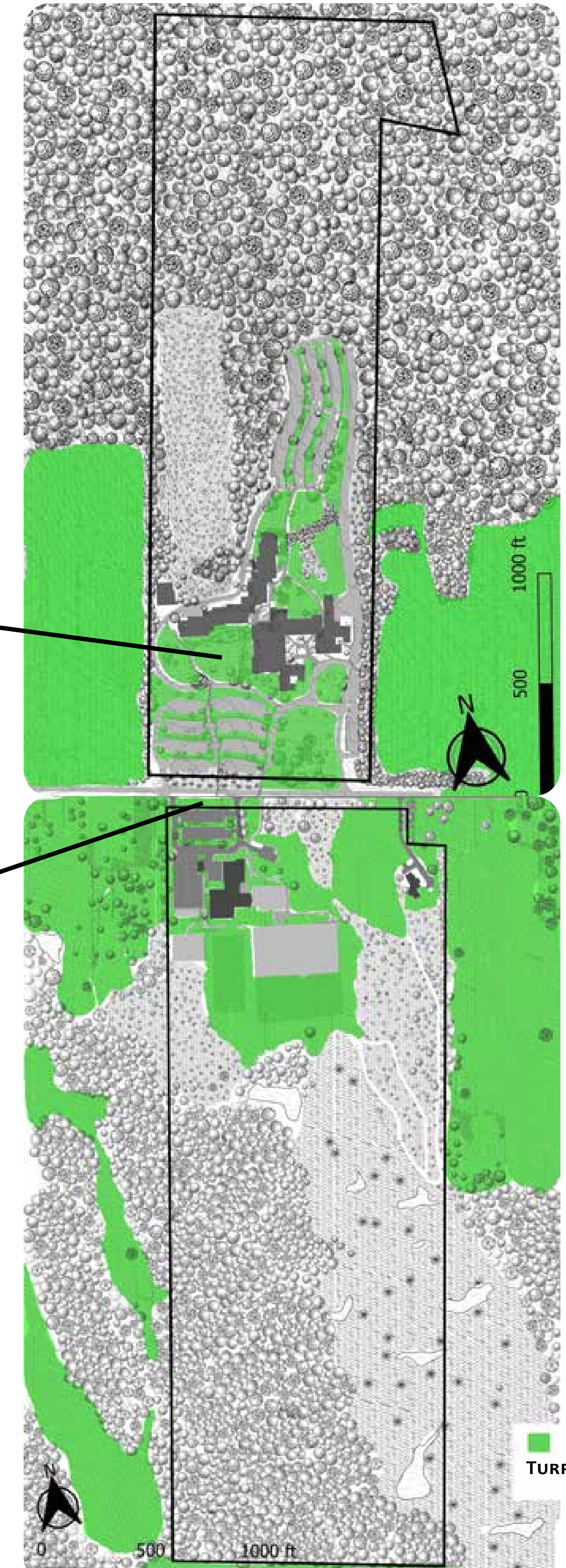
The college's meadows host vibrant wildflowers like goldenrods, milkweeds, and asters which attract pollinators and support the local ecosystem. These areas are used as living laboratories for students studying ecology, entomology, ornithology, and botany. Experimenting in different ways to create more meadows offers opportunities for research and hands-on learning experiences for students and the public.


10 acre northern meadow


Largely Unused Turf


Unused turf between parking and road


Mown path through southern meadow



Lawns

While lawns are less ecologically complex than forests, meadows, or wetlands, lawns serve important functions on the BCC campus. They provide recreational areas for students and staff and contribute to the current open aesthetic of the campus.

BCC is already practicing some ecological lawn management practices, such as mowing at higher heights allowing for some flowering of small plants, and they have eliminated pesticide and fertilizer use. Though predominantly covered with non-native cold season turf grass, lawns can still support a variety of plant species such as clovers, thyme, self heal, and native grasses that can provide pollinator food and host plants. Increasing the species diversity of lawns at BCC would increase their pollinator benefits and reduce maintenance costs and carbon emissions. Lawn areas that are not heavily used can be changed to other plant types such as meadows, shrubs, gardens or forests resulting in budgetary savings and climate resilience benefits.

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Meadows and Lawns

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Berkshire Wildlife Linkage

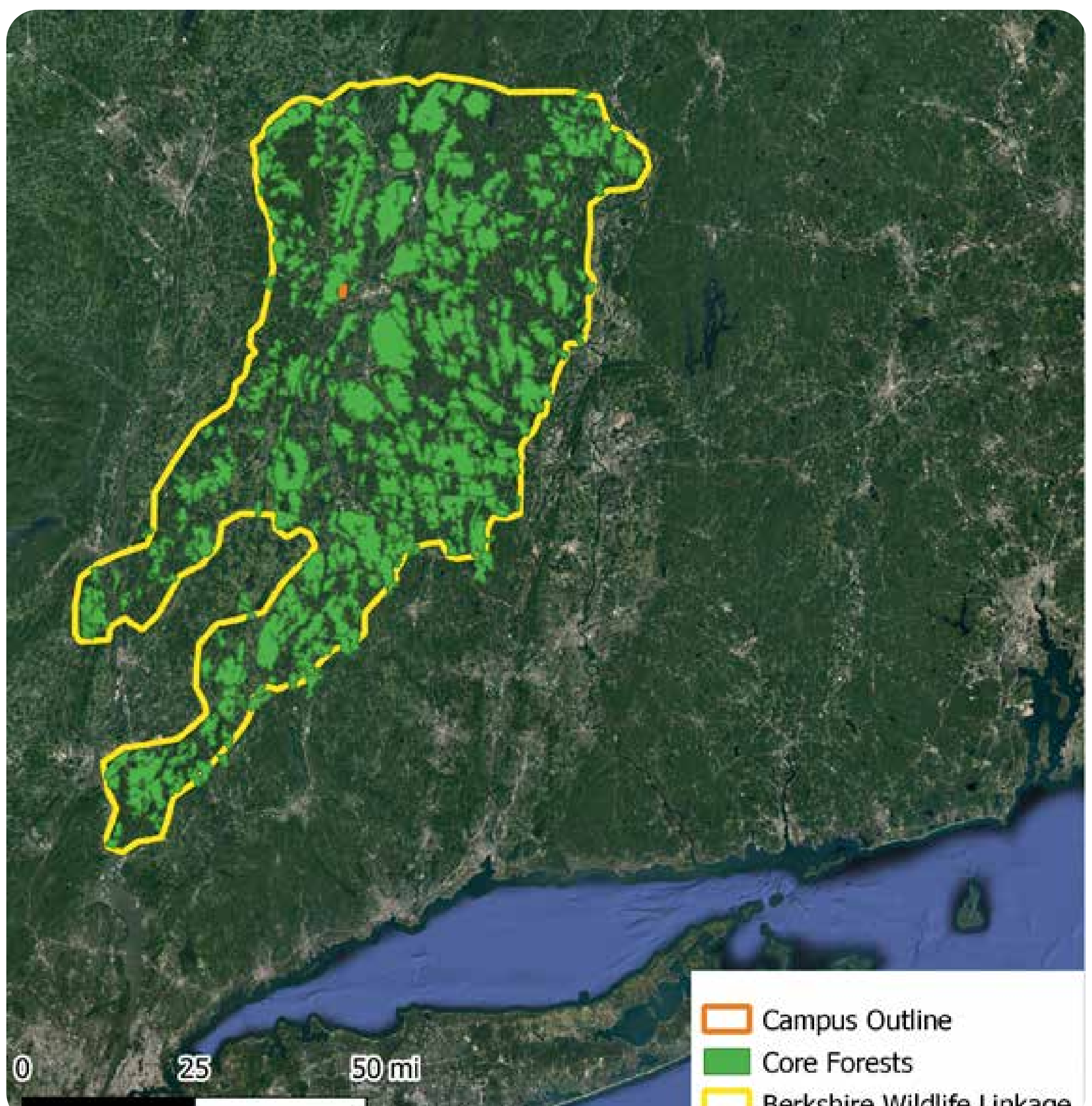
The Berkshire Wildlife Linkage, identified by The Nature Conservancy ("Berkshire Wildlife Linkage"), is a corridor of core forests that facilitates the movement of wildlife species. The BCC campus and its surrounding landscape fall within this habitat area and play an important role in its function because of the natural forest habitat on campus. This linkage serves as a crucial pathway for migratory animals, allowing them to navigate between blocks of forest habitats.

The linkage allows for the movement of numerous bird species, many of which undertake remarkable journeys during their annual migrations. These avian travelers rely on the Berkshire Wildlife Linkage as a corridor connecting their breeding grounds in northern regions with wintering grounds farther south. The forested areas within the linkage offer stopover sites for birds to rest, refuel, and replenish their energy supplies before continuing their long journeys.

The Berkshire Wildlife Linkage serves as a haven for other wildlife species, including mammals like black bears, bobcats, and coyotes. These animals require vast territories to find food, establish territories, and reproduce. The linkage enables these species to disperse, find mates, and maintain genetic diversity within populations.

The preservation of the Berkshire Wildlife Linkage has been prioritized by both local and national conservation organizations because of its importance for the conservation of biodiversity. It allows for the natural movement and dispersal of wildlife, preventing genetic isolation and the negative effects of habitat fragmentation. It also provides opportunities for scientific research and educational activities, creating a deeper understanding and appreciation of this important area.

Many species have been seen and recorded at BCC. Through eBird, iNaturalist, and class studies, abundant species lists have been made showing how active of an area this is.



Pollinators

In the Berkshire region, pollinators contribute to the health and productivity of local ecosystems, as well as the overall well-being of the community. BCC has already taken initiative to improve pollinator habitat on campus and has collected butterfly species inventory research on campus. However, there are still multiple threats to pollinators on the BCC campus.

While BCC has meadows, forests, and wetlands on campus, there are still areas of turf which do not provide substantial habitat or forage for pollinators. The loss of habitat directly impacts pollinator populations and results in pollinator decline. By increasing the number of flowering plants within those lawns and reducing the lawn mowing schedules, BCC can improve habitat for pollinators. Some of these lawns can also be changed to meadows, shrubs, or forests that would increase habitat for pollinators even more than improving lawns.

Native Bumble bee on native partridge pea

Photo from : ag.umass.edu

Another physical factor that could be resulting in pollinator decline on BCC is the lack of diverse native plant species in non-forested areas and non-native species. Non-native species can attract pollinators with flowers that do not provide the necessary pollen or nectar they need. They also may be similar to host plants of pollinator species but may not be edible. An example of this is garlic mustard (*Alliaria petolata),* which is a non-native plant species on campus in the meadows that is similar to native mustard species. The mustard white butterfly (*Pieris oleracea*) is a state listed threatened species that lays eggs on native mustard plants for its caterpillars to eat. Garlic mustard is toxic to the larvae of the butterfly and survivorship of those caterpillars on garlic mustard is low. Garlic mustard outcompetes native mustards and native pollinator species have not evolved alongside this species and thus do not avoid laying their eggs on it, further impacting this already threatened species.

Pollinators rely directly on native plants as their host species for larvae and their flowers for food. When an aggressive non-native species dominates a landscape and shades out native species that pollinators rely on, pollinators then are no longer able to reproduce and feed in that area. There are multiple areas on campus that have non-native plant species outcompeting natives that BCC is currently trying to manage, in the meadows, wetlands, and forests. Continuing to remove those undesired species, paired with planting of other native species that are not in abundance on campus would help to improve pollinator habitat on campus. Increasing the native plant diversity on campus would also increase its resilience to a changing climate as some species may not continue to thrive in this area, while others might. Having a wider range of plants on campus will show a living example of what plants do well in the area and which ones do not.

Maintaining and improving habitat for pollinators at BCC and in the Berkshires is crucial. Steps such as preserving and restoring native plant communities, using pollinator friendly lighting, and providing habitat and nesting sites can help support healthy populations of pollinators and ensure the continued benefits they provide to the region's ecosystems, agriculture, and overall well-being.

One leading supporter of pollinator protection efforts in this region is Housatonic Heritage Operation Pollination. This is a program of the Upper Housatonic Valley National Heritage Area in partnership with the National Park Service. Housatonic Heritage Operation Pollination is collaborating with educational institutions such as Berkshire Community College and encouraging pollinator initiatives with nonprofit organizations, land conservancies, school districts, municipalities, businesses, and local residents. In 2022, Housatonic Heritage signed a Pollinator Resolution with Rotary District 7890 in western Massachusetts, as one of more than 60 such Operation Pollination agreements with Rotary Districts and Clubs nationwide.

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Spring 2023

Wildlife and Pollinators
Learning Landscape and Living Laboratory
Berkshire Community College

Circulation

Vehicle Traffic and Parking

The main campus on the northern half of the property is accessed primarily by vehicles due to the difficulty of walking or biking along West Street and the distance of the campus from any highly developed areas such as the center of Pittsfield. After arriving on the property from the main entrance, a visitor will find parking immediately to the east. This guest parking area gives walking access around a large traffic island to the college buildings' main entrances on the central quad.

Faculty members can access the faculty parking lot by turning west after entering the site. This parking area has a one-way exit to West Street at the southwestern corner.

Student parking is located farther north and allows for walking access to the center of the college building complex. To the far north of this parking area is one of the unmarked entries to the woodland walking trail. From this parking area, a narrow road leads around the western side of the buildings where a small amount of accessible parking is available closer to the building entrances. This road then wraps around the buildings and rejoins the main entry road for an easy exit onto West Street.

A bus line that carries passengers from Pittsfield stops just off the main entry road near the main entrance of the College buildings.

On the southern half of the property, all vehicular traffic is condensed to two smaller parking areas in the northwest corner, accessed immediately off West Street across from the faculty parking area exit in the north. This area also serves as vehicle access to the Facilities Department equipment area.

Pedestrian Circulation

On the northern campus, most of the foot traffic is focused on the point where the two main college buildings meet. This point is directly connected to the student parking area in the north by a wide walkway and gives easy access to most of the classrooms, offices, and other highly used areas. Foot traffic from the faculty parking area can also access this central location. Two walking paths lead from the faculty parking area and across West Street via crosswalks for pedestrians to access the southern half of the site and the athletic facilities there.

In the southern half, foot traffic is mostly contained around the sports fields and buildings that are adjacent to the parking area.

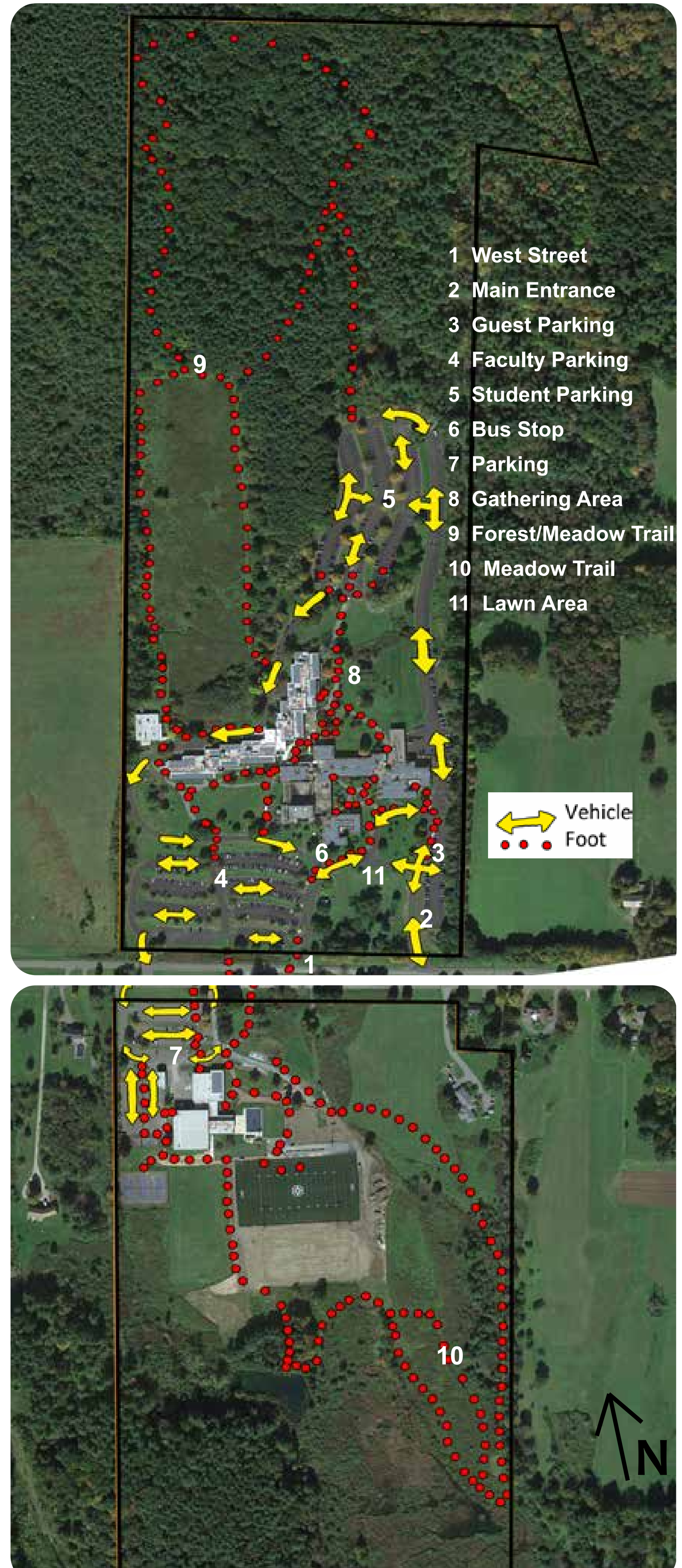
Walking Trails

The campus walking trails are open to both the campus population and the local community. In the northern woodlands, a forested walking trail of approximately 1.5 miles meanders through minimally maintained trails and joins with a mown path that circles around and through a ten-acre meadow. These northern trails can be accessed from three unmarked entry points and are highlighted and mapped on BCC's website. This wooded area is adjacent to State Forest land and offers the potential for a connection between campus and State Forest trails though currently there are no connecting trails.

In the southern half of the property, another mown meadow path leads to the edge of the large wetland where the impact of beaver activity can be viewed. This mown path also offers a somewhat circular section that is sometimes used as a running track.

Gathering Spaces

The main area where students and faculty gather outdoors is an informal space outside the center of the main buildings. This area contains a number of Adirondeck chairs that are moved as needed. Picnic tables are placed at various spots throughout campus, and a large lawn area in the south of the northern half of the site is well-used by students to relax on the turf. There are no formal outdoor classrooms.



Views

There are many spots throughout the campus that offer scenic views of the surrounding mountains, forests, meadows, wetlands, and the campus itself, through windows and exterior vantage points.

A view overlooking the Northern Meadow from the entry to the Forest Trail

The Southern Wetlands and hills beyond as viewed from the Wetland/ Meadow walking trail on the southern half of the campus

Overlooking the Student Gathering area and Orchard from the entry to the "Connector" common room

Not for construction. Part of a student project and not based on a legal survey.

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Campus Use

Learning Landscape and Living Laboratory

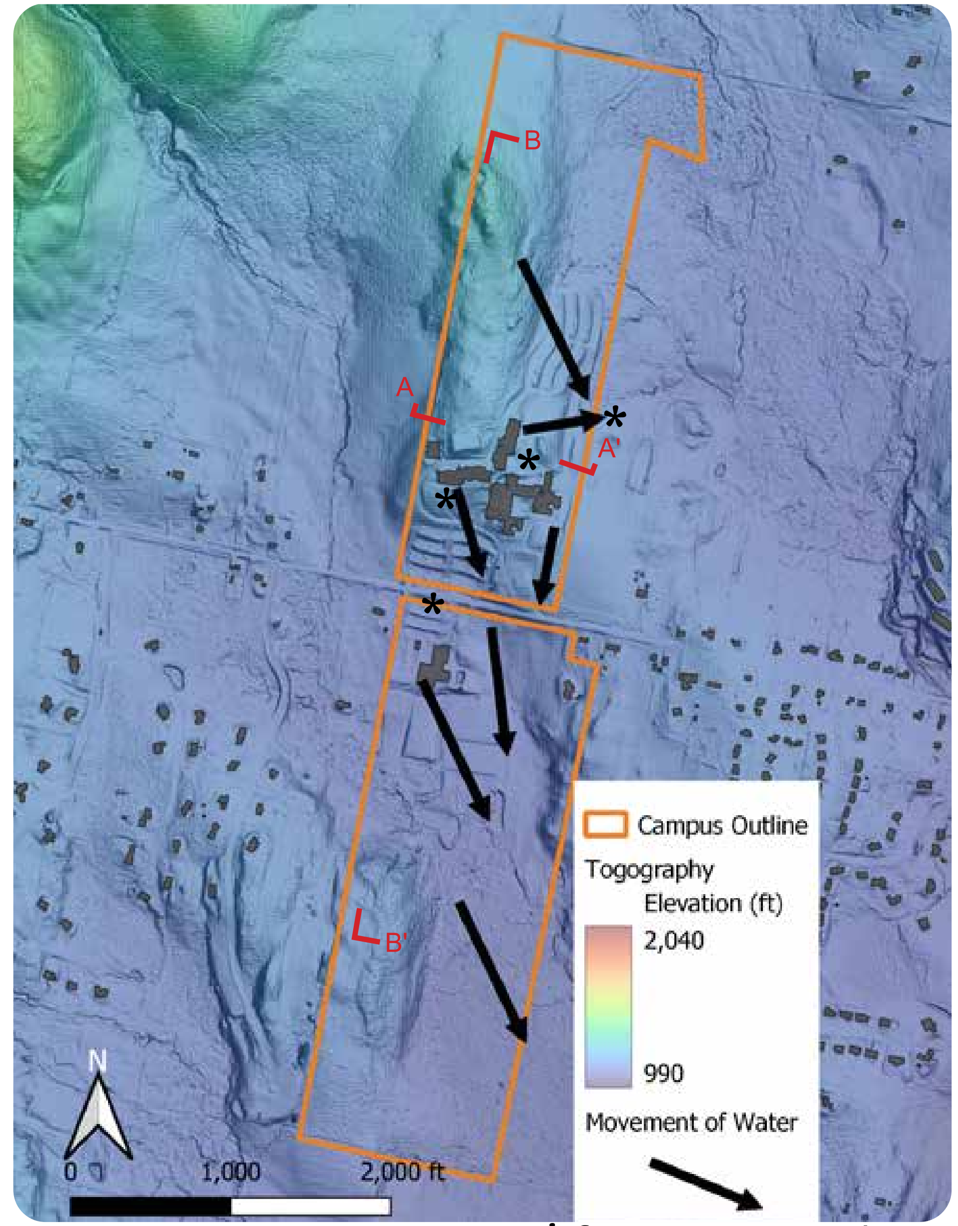
Berkshire Community College

Slope

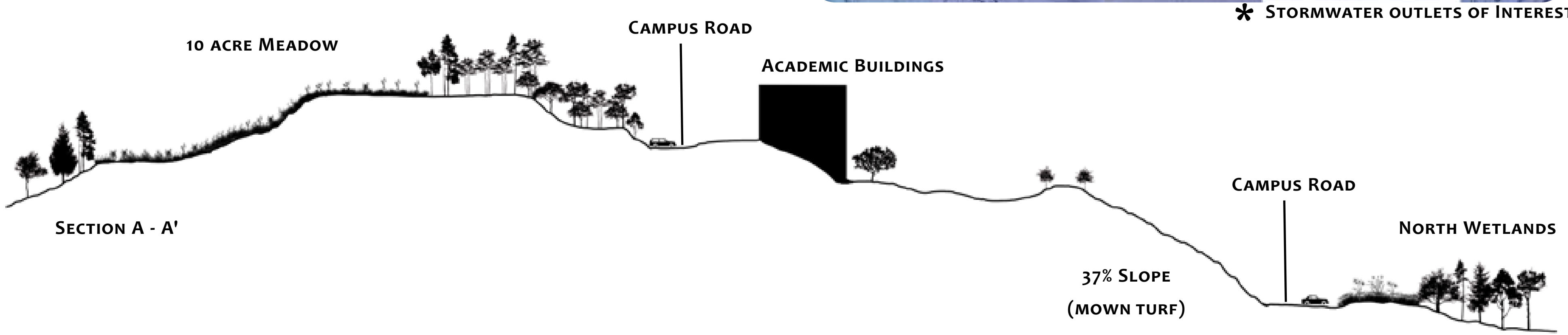
The campus has moderate topographical changes, ranging from the high point in the north at 1,300 feet to its lowest point at 1,080 feet in the southern wetlands. Because of this slope, parking lots in the northern half of campus are terraced. The main campus buildings in the northern section lie upon a slight ridge that runs from the northeast to the southwest. To the east of this ridge there are steep slopes that reach up to 37%, which are currently mowed turf that presents a major challenge to maintain. These steep slopes can be a challenge to people, especially those that may have disabilities, so considering ways to create pathways for them to access these areas would be necessary to make a campus that is accessible to all, or changing these areas to vegetation types that would not be heavily used. The campus buildings in the north are cut into these slopes. Moving between some of these buildings requires going up flights of stairs or switchbacks on accessible paths.

Northern Campus (Drone shot- Christian Tenczar)

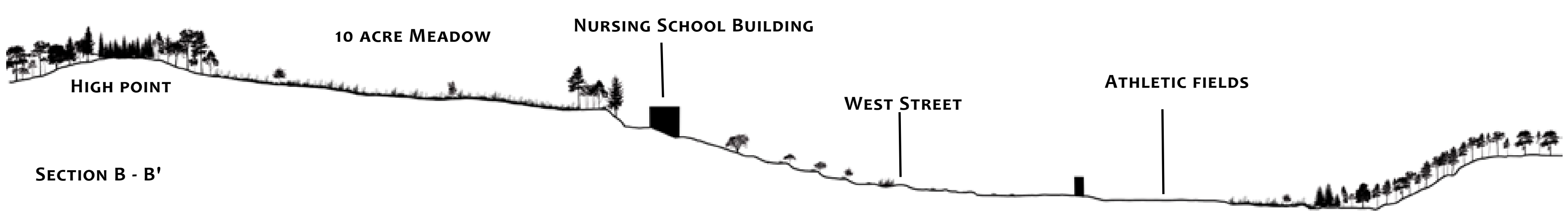
Topography of Campus



* Stormwater outlets of interest



Section A - A'



Section B - B'

Drainage

All of the surface stormwater on campus eventually flows into wetlands, which are sensitive habitats. BCC uses open and closed drainage systems to manage stormwater currently. In two areas in the north there are infiltration systems that appear to be working effectively. There are multiple areas where stormwater from ground drains empty onto lawns making the area unusable and muddy. There are many drains throughout the campus in both turf and along pavement that collect runoff and connect to underground pipes that discharge into wetlands. The stormwater flowing into the northern wetlands is causing erosion due to high uncontrolled flow rates, as evident by the washed-out soil around the outlet. By managing stormwater effectively, the college can minimize the negative impact on wetlands and protect these valuable natural resources.

Stormwater runoff can carry various pollutants such as sediment, nutrients, chemicals, and oil from paved surfaces and buildings. When this contaminated water flows into wetlands, it can degrade water quality and harm aquatic life. Stormwater runoff can also contribute to flooding and erosion, particularly in areas with limited drainage capacity. Stormwater flowing into the northern wetlands is causing erosion, and areas of turf in the north and south remain saturated and muddy. Water testing to see if the wetlands are getting an influx of pollution could give an idea of how impactful this runoff is.

Incorporating more stormwater management areas into the campus infrastructure provides an opportunity for educational engagement. The college can raise awareness among students, staff, and visitors about the importance of sustainable practices, water conservation, and environmental stewardship. By showcasing effective stormwater management techniques, the campus can serve as a model for responsible environmental practices. These areas could also create habitat for wetland species and create ecosystems that can sequester and store carbon. By incorporating stormwater outlets into planting designs the stormwater can also be utilized to irrigate plants.

Vegetated swale leading to North Wetlands

Drainage ditch along road

Drain in turf lawn

Drain in turf lawn

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Slopes and Drainage

Learning Landscape and Living Laboratory
Berkshire Community College

Summary Zones

Summary Analysis

1. This zone has the faculty parking lot that is terraced and facing south. The impervious surfaces drain to storm drains that empty into a vegetated swale along West Street. Islands between parking rows are mostly turf with the occasional small tree.

2. This south-facing sunny sloped area sees moderate foot traffic that passes through on a non-ADA path. There is no wind protection and little shade. The turf is mostly unused and there are no designated gathering areas. A stormwater drain empties directly onto turf and creates a wet muddy area.

3. In this zone is a 10 acre meadow with a mown loop trail. There is no informational signage for the birdhouses, weather station, and path in this area. There is a flat-fenced-off area with an old, buried water tank, the condition of which is unknown. The forest has intact connectivity to core forests. The loop trail going through the forest has no signage, and is minimally maintained with overhead hazards especially in dense stands of old field white pine. There are no designated gathering or specific outdoor classroom areas in this zone.

4. This is the main entrance to campus with adjacent guest parking and bus stop. This also has the main used turf area that has some large shade trees. This zone gives the first impression of campus.

5. This area is the main student hangout and pass-through area. There are some level areas with other extreme slopes that are turf. There is an orchard and a vegetative drainage area that leads to the wetlands. There are some smaller meadow patches. Majority of the turf in this zone is unused.

6. The student parking lot is terraced facing east and stormwater drains to northern wetland. The islands are mainly turf with occasional trees.

7. This zone has gently terraced parking facing south. This area is heavily used by the public, especially on weekends and evenings for community sporting events. The islands are mostly turf with limited infiltration.

8. The athletic buildings are in this zone. There are minimal plantings around buildings, instead mostly turf. A lower percentage of solar on roofs on these buildings. This area also contains the facilities equipment storage buildings and vehicles. The large athletic fields are used by the public as well for events, one of the fields is astroturf.

9. This area has a large meadow and minimally-used circle of turf on moderate slopes. Water moves across the turf and into a wet meadow and crosses a mown loop path, this area becomes muddy in wet weather. There are birdhouses and a variety of wildflowers in meadows. The path is somewhat unknown to the general student population. Path also leads through a small shrubland habitat to the edge of the wetlands.

10. Large possibly calcareous wetland, with high beaver activity creating extensive valuable habitat with deep open water areas. There is a forested steeply sloped hill. No accessible entry in to these habitats.

Opportunities

1. South-facing terraced faculty parking lot is suitable for PV covered parking with EV charging ports. Stormwater runoff can be addressed in islands with rain gardens.

2. This highly visible area would invite in the public with open areas for outdoor gathering and pollinator demonstration gardens showing attractive examples of ecological landscaping. Area would need to be accessible with ADA paths and a new handicap parking lot with two spaces. An arboretum could be planted for wind protection from the west.

3. This area could be used by both the public and school. Improving signage and experimentation with the educational meadow and trail. Improve forest trail with a shorter loop option and removing hazards and clearing the path. Forest offers experimentation for students on management trial studies. Quality informational signage throughout. Regrading to make the entry to this trail more accessible.

4. This would continue to be the main area for a large event gatherings with a bee friendly lawn. Also create an attractive first impression of campus. Use the center circle area as a gathering spot near the bus stop and drop off area with benches and shade tree. Use attractive pollinator plants.

5. This would be the student and faculty area with multiple outdoor classrooms, a community garden, Food Forest, traditional Indigenous garden, and multiple vegetated infiltration basins.

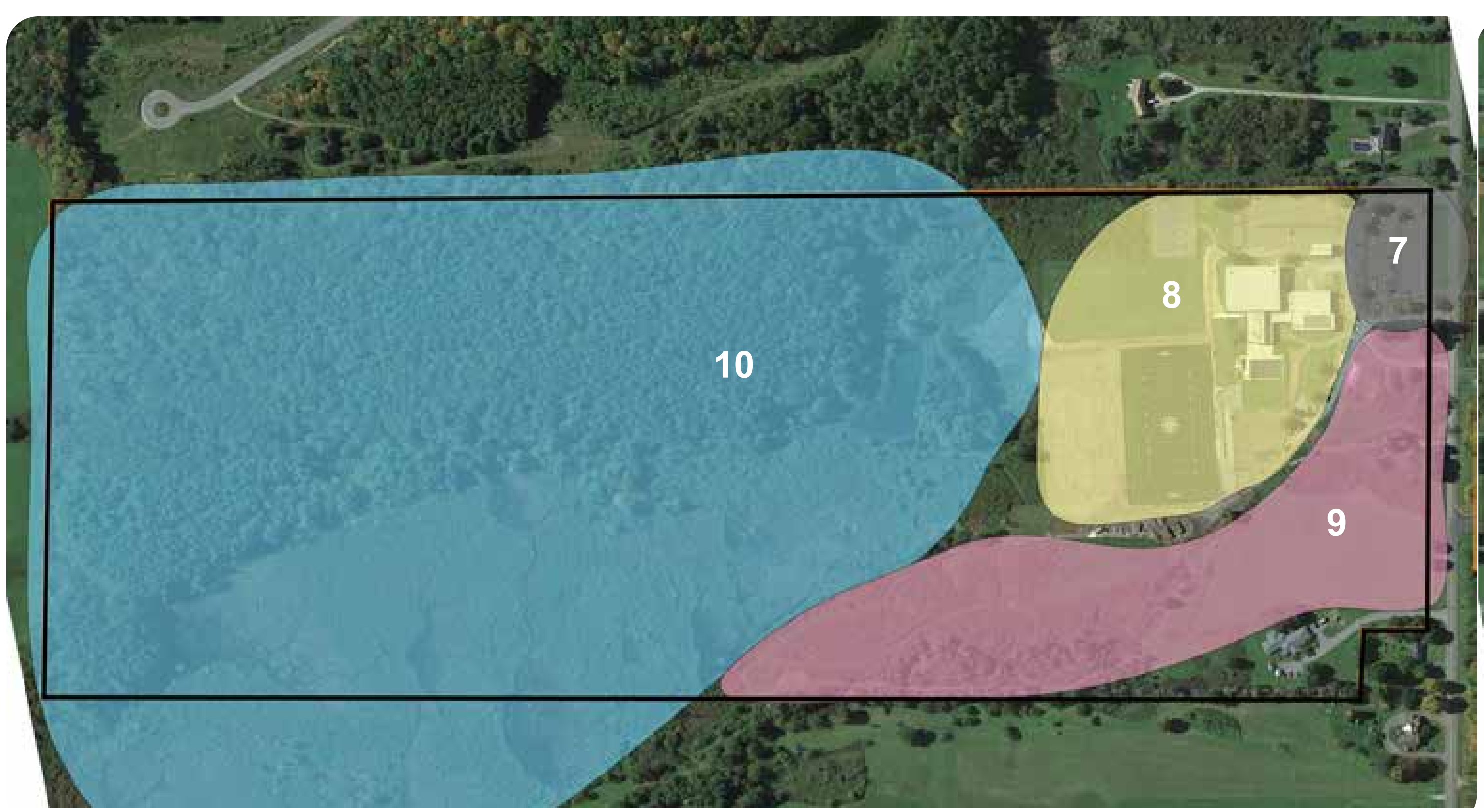
6. This terraced parking is facing east and it would not get as extensive sunlight throughout entire day as other parking lots so it would be less effective PV zone. The islands instead can be planted with native successional trees to create shade for parking and increase stormwater infiltration, carbon sequestration, and create pollinator and wildlife habitat. Also makes for an enclosed forest parking feel.

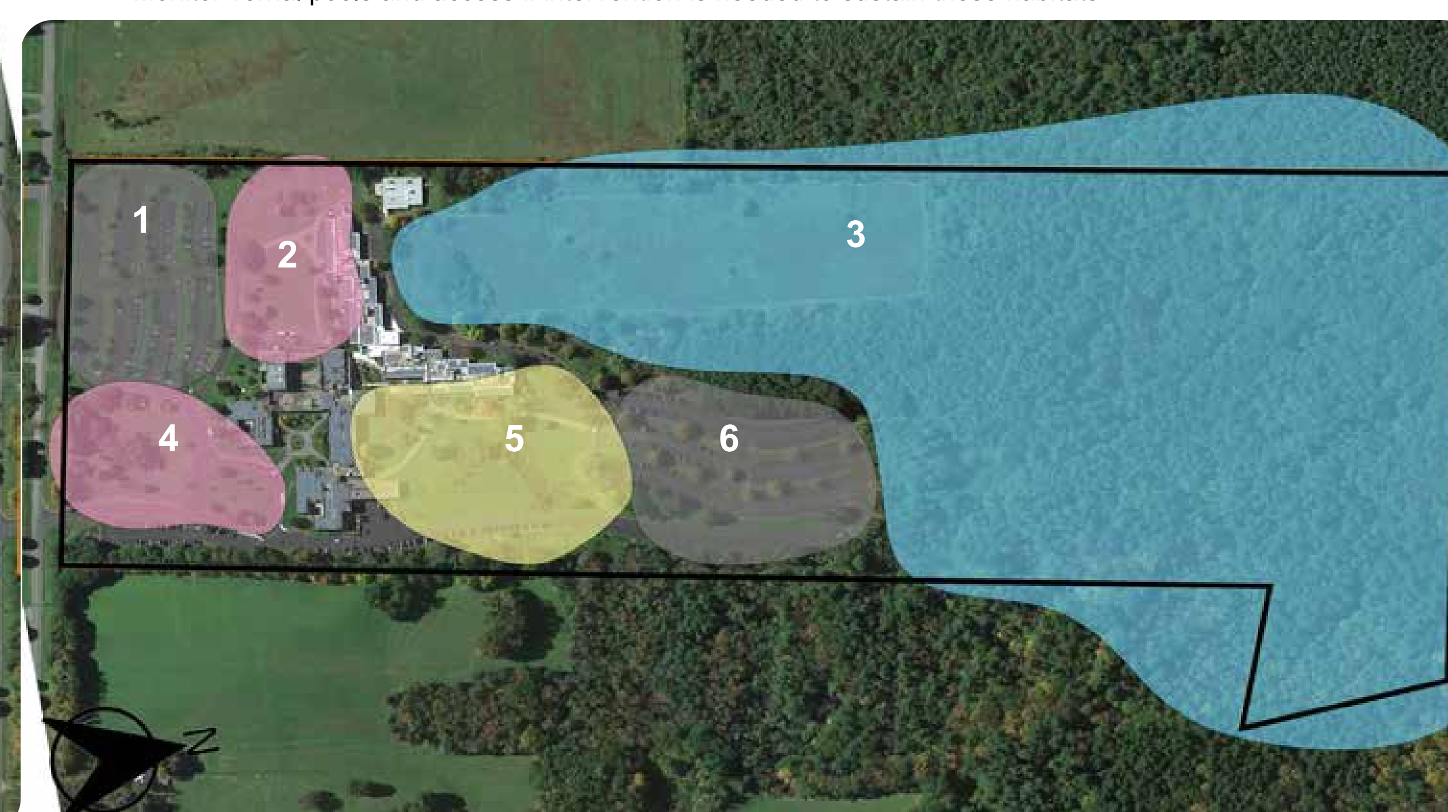
7. The high sun exposure and south facing parking in this zone also offers opportunity for PV covered parking with EV charging ports, especially for facilities vehicles. Like zone 1, stormwater can be addressed in islands with rain gardens.

8. In this zone the addition of low maintenance native shrubs and trees would provide shade and habitat for pollinators and wildlife. Converting all turf that is not sports fields into Bee Lawns also increases pollinator habitat.

9. Convert large circular lawn to meadow with a mowed loop path for running or walking. Continue to increase the diversity of wildflowers and experiment with meadow installation techniques.

10. At the wetland edge add an observation tower for viewing the habitat at a higher vantage with signage and a telescope. Also build infrastructure to prevent unauthorized use, such as ballards to block vehicle. This creates an opportunity for observation and education about wetlands. Add an additional forest trail in this section if possible. Monitor vernal pools and access if intervention is needed to sustain these habitats.





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413-369-4044
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Designed By: Shayne Geiger and Ted Martini

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Summary Zones

Learning Landscape and Living Laboratory

Berkshire Community College

Campus-wide Design Overview

This campus-wide design seeks to enrich existing ecological strengths and increase climate resilience by increasing pollinator and wildlife habitat and addressing existing stormwater infrastructure issues. This design seeks to improve existing usable space and offers the campus population and the larger community a multitude of educational, healthful, and enjoyable experiences that are focused on the importance of sustainable and ecologically friendly land design and management practices and horticulture.

A large portion of mown turf is converted to planting beds which offer foraging and nesting habitat for pollinators. The decreased turf will reduce water runoff and allow infiltration into the soil to hold and cleanse the increased rainfall expected due to climate change. Additional trees will increase the shade canopy in many areas and assist in carbon sequestration and water absorption. This shade will be even more beneficial as temperatures rise due to climate change, allowing for pleasant shady areas to enjoy even in the heat of a summer day. The planting of attractive and useful native perennials, shrubs, and trees will provide examples of the myriad choices of plants that are available and appropriate to the Berkshire region. The addition of photovoltaic panels above parking areas will help to decrease the college's carbon footprint.

This design welcomes visitors to a public demonstration garden area that won't interfere with campus activity and additional walking trails with distinct entrances. It offers a variety of opportunities to pursue community engagement and public programming and invites collaboration and partnerships on the implementation and care of distinct design elements. Ten new gathering spaces of varying sizes and with different advantages are located throughout the campus to encourage a healthier outdoor campus life for all. This design has been developed to allow for the implementation of all its various sections, areas, components, and efforts to be accomplished as programming and other resources become available, in any given order of phases that best fits the college's desires, goals, and abilities.

Design Points of Interest

Ecology

- Increased tree canopy featuring native species.
- Improved stormwater drainage and infiltration, and reduced wetland impact.
- Additional pollinator habitat of many ecotypes.
- Increased meadow areas.
- Areas planted and maintained for successional growth.

Education

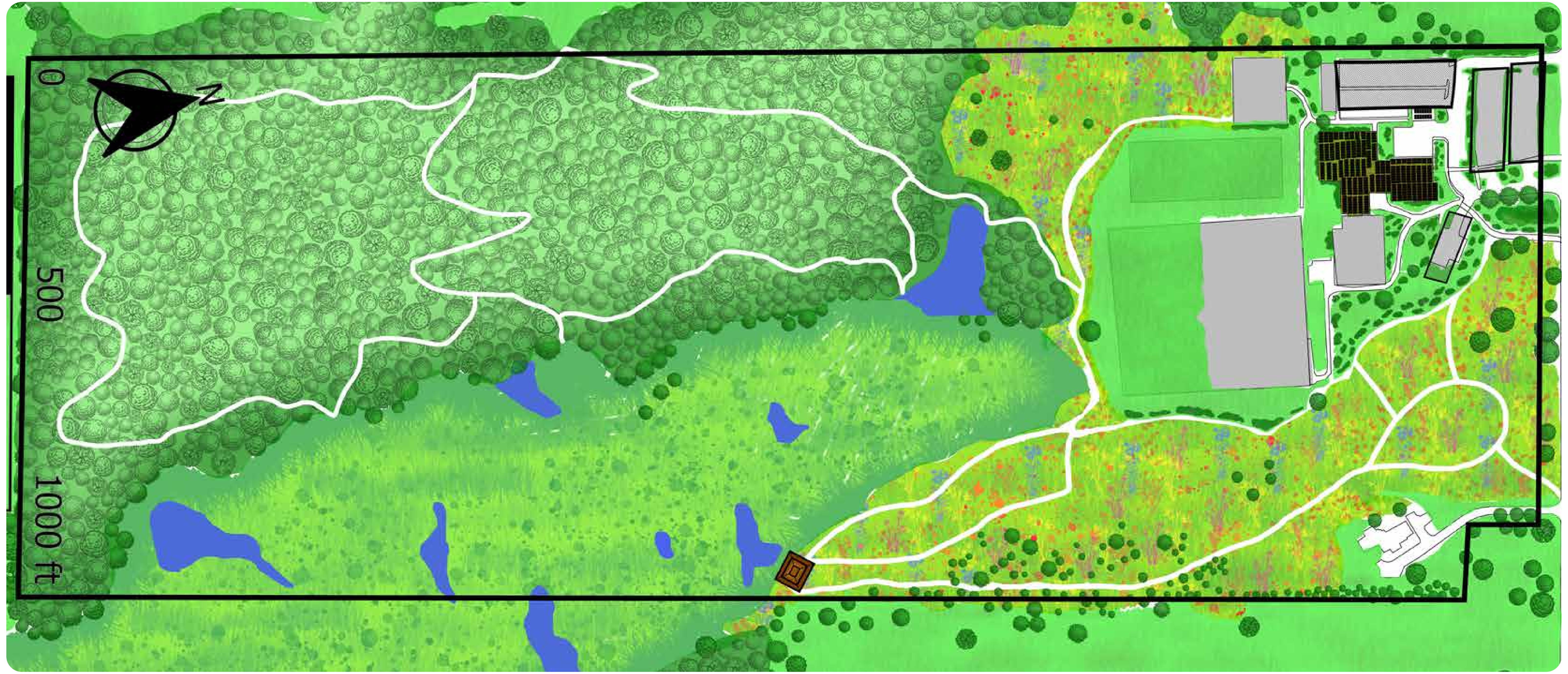
- Well-labeled demonstration gardens, native tree specimens, green infrastructure features, and interpretive signage along all public paths and trails.
- Numerous outdoor classrooms and gathering spaces in a variety of settings.
- Experimental and research areas.
- Native meadow trial areas and food forest demonstration area.

Energy

- Photovoltaic panels cover the faculty parking area and athletics complex parking lots.
- Extensive green roof modules beneath the main building's existing photovoltaics help to filter and retain stormwater, increase the efficiency of photovoltaics by cooling the underside, improve the energy use of buildings, sequester carbon, and provide pollinator habitat.

Experiences

- Well-mapped walking tour throughout the campus and natural trails.
- Enlarged and easily accessible community garden.
- ADA-compliant pathways.
- Pleasant, shady, and numerous gathering and seating spaces of a variety of sizes.
- Welcoming and attractive public-focused areas.
- Large, open, and traffic-resistant lawn spaces for activities and events.
- Accessible meadows and natural areas for birding and wildlife observation.



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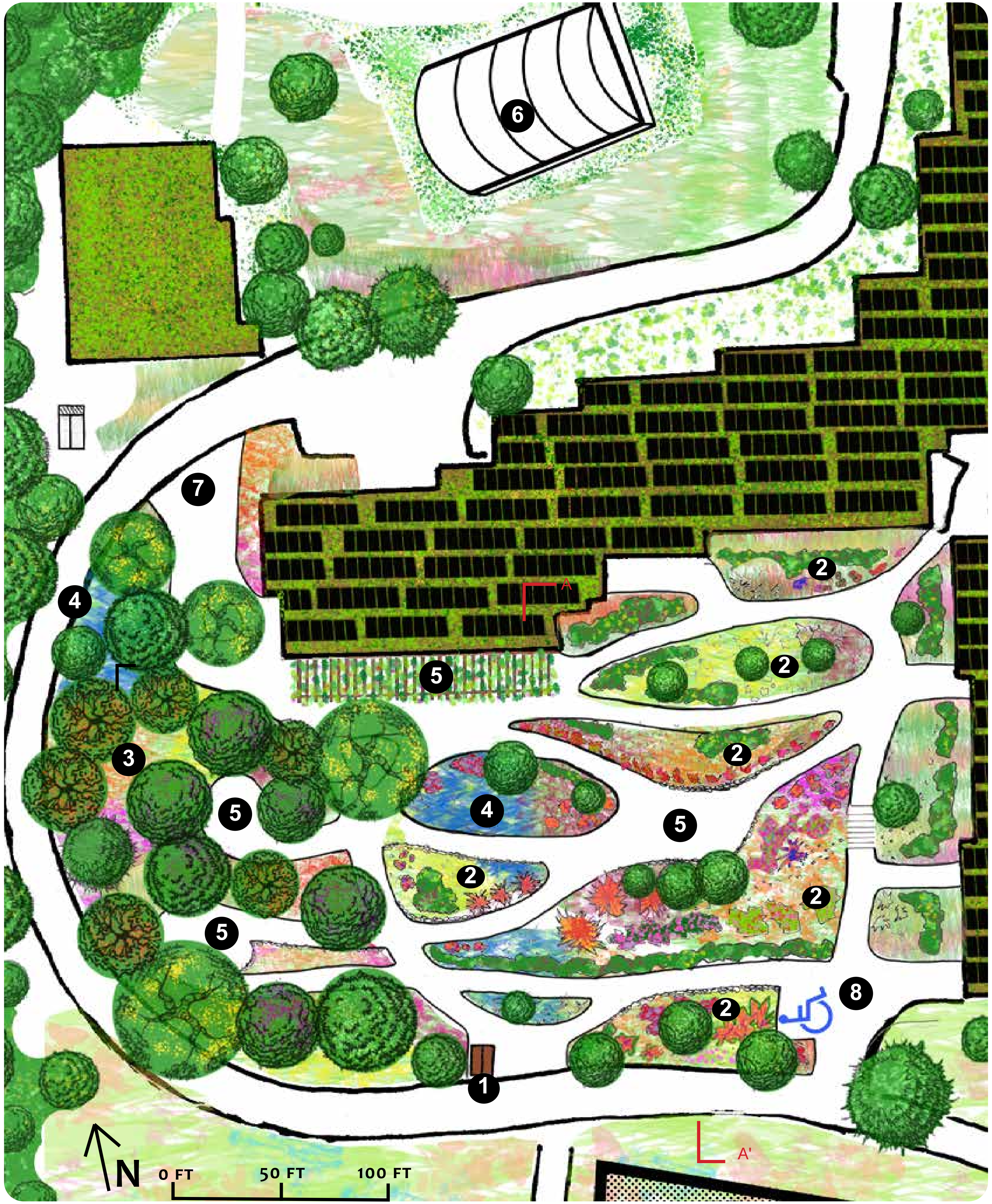
Campus-wide Design

Learning Landscape and Living Laboratory

Berkshire Community College



Public Garden

This design creates an easily accessible and highly curated public native plant garden and native tree arboretum that will demonstrate a wide variety of garden-appropriate native herbaceous, shrub, and tree specimens. The replacement of turf with south-facing garden beds allows for increased stormwater infiltration and provides pollinator foraging and nesting opportunities. Accessible paths and proximity to parking and the bus stop encourage visitors.

1. **Information Kiosk**. A kiosk at the main entrance to the gardens gives visitors information about the importance of native plants and trees to pollinators. The signage within the kiosk shows areas of interest within the garden and arboretum and includes a map of the connections from this site to the meadow and forest trails in both the north and south of campus.

2. **Demonstration Garden Beds**. Multiple beds in shady, sunny, drier, and wetter locations present a curated and neatly displayed collection of native plants suitable for ornamental home gardens, landscaping, and other uses including traditional medicinal plants, drought-tolerant plants, and moisture-loving plants (see Native Specimen Trees, Native Shrubs, Native Groundcovers plant lists in index). All these plants are well-labeled with information pertaining to each plant and their growing conditions and hold the possibility of attaining even more information with the use of QR codes. Trial beds within this garden are reserved for research and experimentation of plant suitability and usability.

3. **Arboretum**. On the western side of this site, a selection of native and migrating ornamental trees is planted among a low-mow lawn (see Native Specimen Trees plant list in index). These trees are also clearly labeled and well-spaced to present the natural growing habit of each tree. Native shrubs are also planted and showcased throughout the garden and arboretum offering visitors a wide variety of choices to consider for their home garden design needs. The placement of the arboretum also blocks winds from the west creating a more comfortable cmlimate throughout the gardens.

4. **Rain Garden**. A rain garden is planted in an area designed to receive and slowly infiltrate stormwater runoff from a discharge pipe in the northern section of the site. This garden will include informative signage about the plants themselves and the design and construction of the green infrastructure involved. A small existing rainwater catchment on the north of the arboretum is also planted with appropriate plants.

5. **Gathering Spaces**. Two large, and two smaller, shaded gathering areas provide outdoor classroom space as well as room for groups of students and visitors to hold activities. Seating, work benches, and demonstration plant containers can be placed in these areas. The northernmost gathering area is covered with a trellis attached to the adjacent building for shade and for the support of climbing plants and vines.

6. **Greenhouse**. To encourage student engagement with the horticultural aspects of implementing and maintaining this site, an additional, larger greenhouse is placed within a fenced area that contains an unused underground water tank. This expanded greenhouse and nursery space is deer resistant due to the existing chain link fence and is easily accessible from the Hoffman Environmental Sciences building. Testing and assessment of the existing water tank will need to be done to determine its usability for irrigation purposes and/or temperature control of the greenhouse.

7. **Trail Connection**. The northern end of the garden path serves as a connection to the Environmental Sciences building and the adjacent access to the meadow and woodland trails in the north. This entrance to the meadow trail is currently difficult to access and difficult to find and so adjustments to that area will need to be considered.

8. **Parking**. Parking accommodations for the accessible paths are achieved with the addition of a one-car and one-van ADA-accessible parking area in the southeastern corner of the site.

Section A'-A

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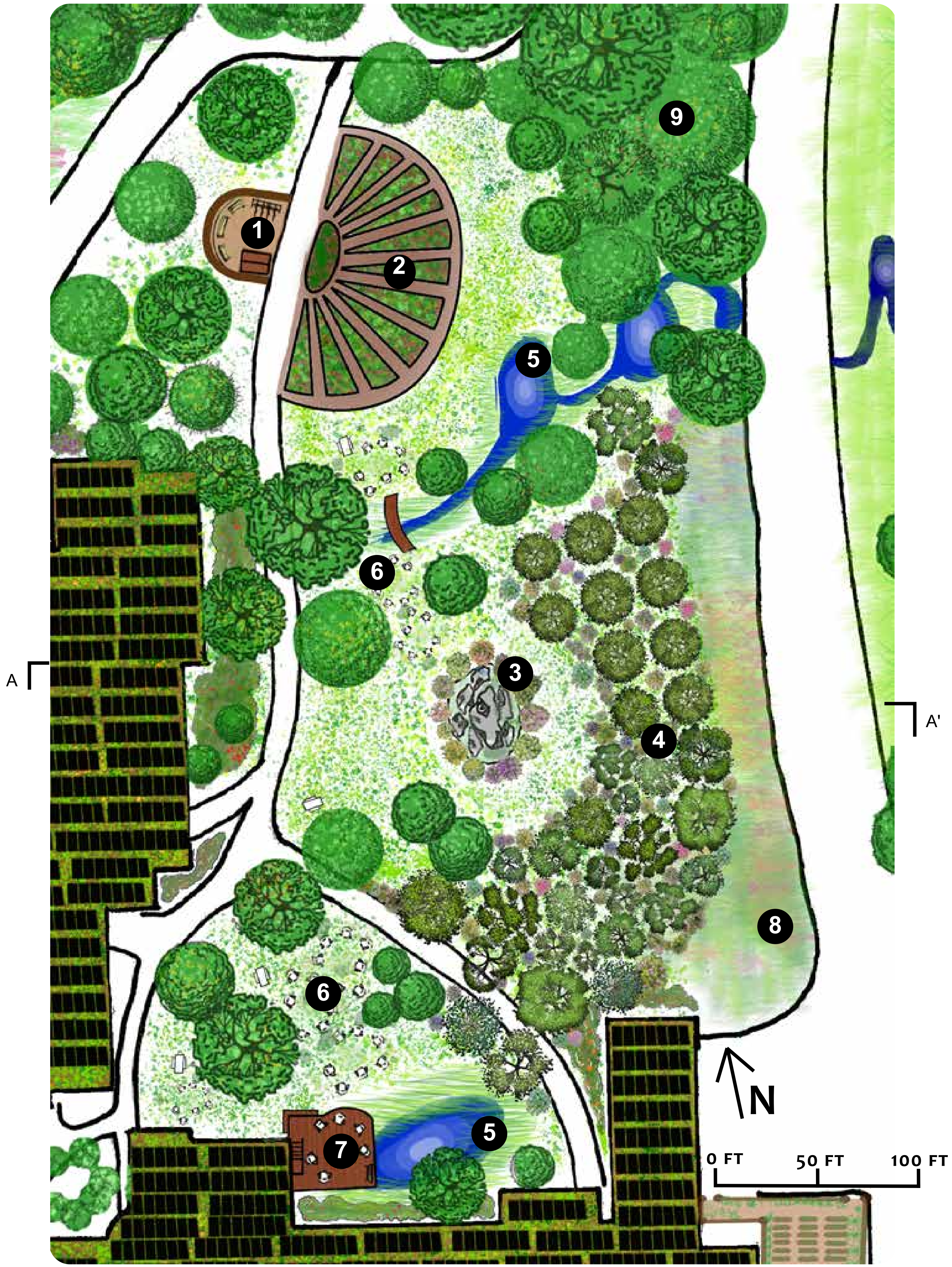
Detail- Public Garden

Learning Landscape and Living Laboratory

Berkshire Community College



Student and Faculty Space

This design retains the current use of this area as a student and faculty outdoor space and expands on the food production opportunities of the current community garden located outside of the campus kitchens. The existing orchard is expanded to include edible perennial shrubs and trees and a Food Forest demonstration area. Existing turf is decreased to improve water infiltration and green infrastructure is constructed to slow and absorb stormwater runoff that is currently causing erosion and impacts to a wetland to the east of the property.

1. **Entry Kiosk.** Echoing the walking tour experience of the Public Garden site, a gathering area at the entry from the student parking area contains an informational kiosk that highlights and maps the various areas of this space. This gathering area provides seating and a bike rack and offers a space for groups to meet upon arriving at the school.

2. **Community Garden.** Directly across from the entry kiosk, a community garden offers raised beds to students and faculty to engage in the cultivation of whatever plants they wish. This space pays tribute to the property's historical use as a "Poor Farm" which offered food-growing opportunities to area residents who did not have agricultural space of their own.

3. **Indigenous Garden.** Designed around the existing contours and bedrock outcrop, a circular garden is created using plants historically used by Indigenous communities prior to colonization. This area has signage paying homage to the native peoples of these lands and their interconnected culture with the natural world, highlighting various plants that were important to their livelihoods. Consultation with local Indigenous representatives on which plants to use is recommended.

4. **Orchard and Food Forest.** The existing fruit tree orchard is expanded with the planting of fruit-bearing woody plants such as berries, nut and fruit trees, and edible understory plants. This Food Forest demonstrates the benefits of a regenerative approach to food production. Based on the principles of ecology and permaculture to create productive and resilient ecosystems, Food Forests provide sustenance while mimicking the natural beauty and functions of forests, supplying similar ecosystem services. Bioswales are made on a contour in the middle of the food forest to slow and retain water in this system to give more available moisture to the forest, and the ridges are used as paths.

5. **Green Infrastructure and Stormwater Management.** Bisecting much of this area from the west to the east is a substantial stormwater runoff trench that leads under the adjacent roadway and finally into a wetland off-site. To mitigate erosion occurring at the eastern end of this channel and reduce the possibility of pollution impacting the wetland, a series of step pools and infiltration basins are created to slow runoff. These temporarily pooling areas are planted with deeply rooted species to filter pollutants. This not only improves water quality downstream but also creates additional habitat. A rain garden is created by elevating the current storm drain near the southern buildings and planting with appropriate species.

6. **Hangout Space.** To continue the use of this area as an outdoor eating, relaxing, gathering, and studying area, the turf will be converted to a bee friendly lawn (see Bee Lawns in Index) and have movable seating and the addition of movable picnic-type tables and benches.

7. **Outdoor Classrooms.** To facilitate academic activities outdoors, a large deck is built at the base of a stairway leading out of a classroom building and above the newly constructed rain garden. This classroom space would be complete with electrical and audio/visual equipment ports and will be furnished with movable seats and tables, as well as an informational sign about the rain garden and the services it provides.

8. **Meadow Trials and Demonstrations.** The slope at the easternmost edge of this area will be planted with patches of various types of meadow plants and native wildflowers to demonstrate and evaluate options available for meadow installation. This decreases the maintenance of this difficult slope and creates diverse pollinator habitats. The replacement of the turf in this area with meadow species will also increase stormwater infiltration.

9. **Increased Canopy and Forest.** North of the trial meadow and into the parking lot islands, native trees and understory species are planted and allowed to succeed into forest. This provides shade to cars, creates habitat for wildlife and pollinators, and sequesters and stores carbon, as well as decreasing the maintenance of these areas.

Section A-A'

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Detail- Student and Faculty

Learning Landscape and Living Laboratory

Berkshire Community College

Pollinators

Pollinators, such as bees, butterflies, moths, beetles, flies, wasps, hummingbirds, bats, and other mammals are essential for the reproduction of flowering plants. These organisms transfer pollen from the male reproductive parts to the female reproductive parts of flowers, enabling fertilization and the production of seeds and fruits.

Pollinators are also important contributors to the Berkshire region's biodiversity. They are responsible for pollinating a wide variety of plant species, including native wildflowers, shrubs, and trees. By facilitating plant reproduction, pollinators support the growth and maintenance of diverse plant communities, which in turn provide food and shelter for other wildlife, including birds, mammals, and insects.

Many crops in the Berkshires, including fruits, vegetables, and nuts, rely on pollinators for successful pollination and subsequent fruit or seed production.

Pollinators play a role in climate resilience by assisting with the adaptation and migration of plant species. As the climate changes, some plant species may need to shift their ranges to more suitable locations. Pollinators move pollen and seeds, allowing plants to establish and thrive in new locations.

Pollinators are also an important part of the food chain. They are able to harness and extract energy directly from plants, and then transfer that energy to other organisms when they are consumed. They are part of diverse and complex food webs, which need pollinators to stay intact.

Pollinator Loss

Globally and locally, pollinators are facing a wide range of environmental factors that are causing massive population declines. These stressors are mainly due to human actions that we are aware of and can change. These stressors include habitat loss, pesticides, air pollution, water pollution, light pollution, infectious agents, non-native species, and a changing climate.

Pollution

Air, water, and light pollution all impact pollinators. Insects are some of the most sensitive organisms to pollution, affecting their ability to breathe, reproduce and feed, thus causing immediate loss of pollinators. Air pollution, primarily driven by industrial emissions and vehicle exhaust, creates nitrogen oxides and sulfur dioxide that contribute to smog and acid rain, which harm plants and reduce the availability of nectar and pollen sources. Light pollution in the evenings directly affects nocturnal pollinators such as moths. Excess light confuses and limits visitation to flowers. Water pollution from agricultural runoff, industrial waste, and urban development poses risks to both pollinators and their habitats. Chemical contaminants in water bodies harm pollinator larvae, disrupt aquatic plant communities, and reduce the availability of clean water sources for pollinators, affecting their survival and reproduction.

nationalgeographic.org

Pesticides

Pesticide use also impacts pollinators significantly. While pesticides are used to target one organism, they usually impact the broader environment and result in many unforeseen consequences. Direct exposure to these chemicals can cause mortality or harm pollinators' reproductive capabilities, navigation, and immune systems. Indirectly, pesticides can also contaminate nectar and pollen sources, leading to long-term effects on pollinator health and population dynamics. Pesticides such as DDT, glyphosate, and imidacloprid are examples of products that initially were thought to be harmless to other non-target species but have been found to have serious impacts, one of which is pollinator die off ("Understanding Pesticides").

cloudfront.net

Non-Native Species

The introduction of non-native species, including plants, insects, and diseases, disrupts the delicate balance of native ecosystems. Invasive species outcompete native plants for resources, alter plant-pollinator interactions, and introduce novel diseases that native pollinators may not have evolved defenses against. These disruptions threaten native pollinator populations and ecosystem stability. Many times, exotic flower plants cannot be used by native pollinators.

NON-NATIVE GARLIC MUSTARD *nps.gov*

Habitat Loss

Habitat loss, destruction, degradation, conversion, and fragmentation are examples of habitat change that impacts pollinators. A host of reasons can cause these examples such as development, land use change, land management, or non-native species. Loss of foraging, nesting and breeding habitat directly limits the population size of pollinators.

npr.brightspotcdn.com

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Infectious Agents and Disease

There are several exotic infectious agents that have been known to impact native pollinators in North America. These agents can cause significant harm to pollinator populations and have negative consequences for ecosystems and agricultural systems that rely on their pollination services. Exotic infectious agents, such as Varroa mites, Nosema ceranae, and Crithidia bombi, weaken the immune systems of native pollinators. These agents increase mortality rates, reduce foraging efficiency, and contribute to colony collapse disorder in honeybees and population declines in bumblebees.

VARROA MITE ON BEE LARVAE *cloudfront.net*

Changing Climate

Climate change impacts native pollinators through shifts in temperature, precipitation patterns, and phenological mismatches. Altered flowering timings and mismatches between pollinators and their host plants reduce foraging opportunities and reproductive success. Climate change also exacerbates habitat loss through sea-level rise, droughts, and intensified wildfires, further threatening pollinator populations.

the Conway School
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413-369-4044
www.csld.edu

Designed By: Shayne Geiger and Ted Martini
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POLLINATOR THREATS

LEARNING LANDSCAPE AND LIVING LABORATORY

BERKSHIRE COMMUNITY COLLEGE

Bee Lawns

Lawns can still provide pollinator benefit, if cared for with intention. First, a mix of native grasses and flowers specifically chosen to increase food and host plant availability compared to traditional turf lawns with 1-2 species. Installation of the pollinator friendly lawns “Bee Lawns” is easiest by seeding. Dormant seeding in November to mid December is best, when germination will not occur until the spring and turf grasses have died back. These seeds will germinate and grow the following spring. Cutting the lawn very short prior to seeding will help expose soil. Using proper seed spreading equipment apply 4-5 pounds of seed per 1,000 square feet. Seed can be mixed with sand to distribute small seeds more easily. After seeding in the late fall or early winter rake the seed into the soil to mix and cover the seeds. This should be done when no snow is present on the ground.

Once the newly seeded lawn is 5 to 6 inches tall the following spring, the lawn can be mowed by removing the top one-third of the lawn height. Bee lawns should be mown less frequently, at most every 2-3 weeks, and should be left at a height of 3 inches or more. Avoid mowing when bee lawn flowers are in full bloom. Avoid bagging clippings and allow them to decompose and compost back into the lawn, improving the nutrients and organic matter in the soil. Established bee lawns should not require fertilizers or irrigation.

Plants for Bee Lawns

Flowers

Trifolium repens - Dutch White Clover

Fragaria viginiana - Virginia Strawberry

Thymus praecox ssp. arcticus - Creeping Thyme

Prunella vulgaris - Self heal

Viola sagittate - Arrowhead violet

Viola sororia - Common Blue Violet

Oxalis dilleniid - Slender Yellow Wood Sorrel

Oxalis stricta - Common Yellow Oxalis

Sibbaldiopsis tridentata - Three-toothed-cinquefoil

Muhlenbergia schreberi — Nimblewill Muhly

Taraxacum officinale — Common Dandelion

Plantago maritima — Seaside Plantain

Plantago pusilla — Dwarf Plantain

Plantago rugelii — Rugel's plantain

Plantago virginica — Pale-seeded Plantain

Astragalus crassicarpus - Ground Plum

Coreopsis lanceolata - Lanceleaf Tickweed

Symphyotrichum lateriflorum - Calico American Aster

Warm Season fescues

This list does not contain all the flowering plants to be valued in lawns at BCC. Continuing research for effective species in Bee Lawns for the Berkshires should continue and take place at BCC. Grasses are also valuable additions and research on warm season grasses for this area would also improve pollinator benefits.

Case Study: University of Minnesota

University of Minnesota has created a Bee Lawn program with many resources and information for both individuals and organizations on how to plant and maintain a bee lawn. They also provide many other pollinator friendly tips and tactics to improve habitat for pollinators. *Photos from University of Minnesota*

Case Study: Smithsonian

To improve pollinator habitat at the Smithsonian in Washington DC, a partially shaded area that has high foot traffic and which had been maintained as turf lawn at the National Museum of Natural History has been over-seeded each fall with a pre-mixed blend of low growing flowering plants since 2020. The higher mowing height allows for the flowers to fully bloom. *Photo by the Smithsonian*

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the **Conway**School
88 Village Hill Rd.Northampton, MA 01060
413-369-4044
www.csld.edu

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Bee Lawns

Learning Landscape and Living Laboratory

Berkshire Community College

Meadows

Early successional wildflower meadows have immense pollinator benefits in the form of food, nesting, and hibernating habitat. BCC already has several meadow areas that are maintained on a three year rotational mowing basis. This mowing should be done in late fall after plants have gone dormant or early spring before plants have reemerged. This will have the least negative plant and wildlife impact. Experimentation of different gaps in mowing frequency could explore the response of plant and pollinator species, for example mowing every year, two years, or five years.

This design calls for additional meadows on campus. There are several way to “install” or allow for meadows to grow. Given that all areas recommended to be turned into meadows are currently lawns the following installation tactics are for meadow installation on lawns. All seeding should be done in late fall once plants have gone dormant. Planting of starts can be on a case by case basis, however spring may be the best time. Mulching around planted starts can improve survival rate by retaining more moisture, suppressing existing unwanted competitive vegetation, and breaking down to provide nutrients and organic matter. Mulch can consist of compost, leaves, woodchips, grass clippings, straw, and salt marsh hay. Mulch created from on site vegetation should be prioritized as it will usually be the cheapest and most environmentally friendly option instead of purchasing and delivering from outside sources. Wood chips can often be provided at low cost by tree management companies. The following alternatives can be experimentally used to establish meadows at BCC.

Let it grow

The first alternative is the easiest and cheapest way to transition a lawn into a meadow. This involves shifting the mowing frequency from weekly to annually or every three years. This tactic however likely will not result in as many desired native wildflower species in the short term. The first few years may look more like an overgrown lawn and less like a wildflower meadow. As time goes on overseeding with a wildflower seed mix after mowing in the fall can help to establish desired species in these meadows. Individual plants of established perennial wildflowers can be installed to diversify the meadows as well. Competition from current turf grasses and exotic weeds will limit wildflower growth, at least in the short term of the first few years.

Possible short term outcome, of let it grow lawn *wordpress.com*

Tilling

The next option that can help to decrease turf and weed pressure is tilling. Tilling breaks up the existing vegetation, exposing fresh soil that can be planted with seeds or starts. This option is best suited for areas with lower weed pressure and on areas without steep slopes as tilled soils can easily erode with rain. Tilling does not kill the existing vegetation completely and brings weed seeds to the surface, so it is best combined with other tactics such as solarization, smothering, sheet mulching, and cover crops or repeated tilling. Once the previous vegetation is suppressed to a satisfied amount, planting can begin. Seeds can be sowed in late fall and starts should be mulched. Typically this will take several seasons of tilling and other methods to reach a point of planting.

Tilling of lawn *toptillers.com*

Cover Crops

Cover crops can be used to suppress current vegetation and reduce growth of plants within the seed bank. Planting a dense summer cover crop of buckwheat will provide floral resources for bees. Mowing at the end of the bloom period before seeds are set will prevent it from reproducing. The remaining living tissue will be killed by freeze in the fall. Oats can also be used as they will die from freezing temperatures. Seeding the same fall as growing a cover crop will potentially not be as effective, so the following fall may be a better choice. Cover cropping is likely not the best singular option, however when paired with other options can be a helpful intermediate step to outcompete the existing vegetation and seed bank.

Cover crop of rye and fetch *wordpress.com*

Herbicides

Herbicides are often used to kill off existing vegetation before planting or seeding. While this option can be less labor intensive, long term effects to the surrounding habitats and ecosystems may outweigh the benefits, and there are substantial risks to applicators, users of the landscape, and wildlife and pollinators. BCC already does not use herbicides on campus and continuing that practice will help to keep the campus pollinator and ecologically friendly.

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Meadow Installation Tactics

Learning Landscape and Living Laboratory
Berkshire Community College

Solarization

Solarization uses sheets of clear plastic to cover existing vegetation over the summer from June through September or longer. The clear plastic traps solar radiation as heat, effectively cooking the plants underneath. This tactic is only effective in sunny exposed locations, not partially or shaded spots. Lawns should be cut very short before covering with plastic. Edges of the plastic sheet should then be buried to trap in the heat. The weather also plays a factor in how effective solarization will be. During cool cloudy seasons it will not be as effective as sunny hot years. Solarization can have negative impacts on the soil health by cooking soil microbes along with the plants. However, after one summer of effective solarization seeding or planting into the soil can occur that fall.

SOLARIZATION WITH CLEAR PLASTIC *omn.edu*

Sheet mulching

Sheet mulching uses decomposable cardboard or similar thick paper product to cover existing vegetation, and then mulch is applied on top. Prior to sheet mulching, lawns should be cut as short as possible. Cardboard can then be placed on top of vegetation and then wetted or pinned to prevent blowing away. Two layers of cardboard may be needed if cardboard is thin or if existing vegetation is persistent. Then a thick layer of mulch should be applied on top of cardboard. Wait at least 5 months before planting into the decomposing cardboard with starts. Seeding is not effective with sheet mulching because seeds will not be able to reach the soil underneath mulch. This tactic is also better suited to smaller patches because of the large amount of cardboard and mulch required.

PROCESS OF SHEET MULCHING *sublimegardendesign.com*

Fire

The last installation technique is using fire. This technique poses significant risk and should be done by trained individuals. A burn permit needs to be acquired and a certified fire chief may need to be present and oversee. Burning can be an educational option because it is the most natural method of meadow creation. There are many regulations to burning and it should not be attempted lightly. Future programming of wildfire or natural resource management could involve students learning how to safely burn meadows, but many steps need to be taken first to ensure safety. Please consult professional guidance before attempting. The greatest danger in a fire is overconfidence. Intense hot fire will be the most effective at killing off vegetation but also be more dangerous. Vegetation needs to grow out to give enough fuel to sustain a fire. After burning the existing vegetation, seeding or planting can take place (Pauly).

Fire is also an effective method to maintain meadows, and was used traditionally by Indigenous groups. Fire discourages Eurasian cool season grasses which are the main grasses used in turf.

BURNING TO MAINTAIN MEADOW *inquirer.com*

Smothering

Smothering is similar to solarization because it uses plastic sheets to kill existing vegetation. However, this tactic uses black plastic that does not allow light to penetrate and reach the plants underneath. This kills the plants by depriving them of sunlight. This tactic does not impact soil microbial activity as much as solarization; however, it also does not kill seeds that solarization may be able to. Because of this smothering will likely have best results when used for at least two years. The first summer cut the lawn as short as possible, then cover and leave for the entire summer. In the fall remove plastic and store to use again. The following spring, once plants have begun to sprout and grow, but before they set seed, cover again with the black plastic to kill them. After several months, once plant matter is killed, uncover again. Let weeds and grasses sprout once more and grow before covering to kill. This process will decrease the available seed bank, allowing for less competition when wildflowers are planted. Experimentation should be done to see how many times uncovering and covering should take place before planting. This tactic can also be used with sheet mulching.

SMOTHERING LAWN WITH BLACK PLASTIC *epic48.com*

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88 Village Hill Rd. Northampton, MA 01060
413-369-4044
www.csld.edu

DESIGNED BY: SHAYNE GEIGER AND TED MARTINI
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MEADOW INSTALLATION TACTICS
LEARNING LANDSCAPE AND LIVING LABORATORY
BERKSHIRE COMMUNITY COLLEGE

Plants for Meadows

In addition to the non-exhausted supplied plant list, seed mixes to establish and diversify meadows can be purchased from nurseries such as New England Wetland Plants that sell bulk native seed mixes organized into different ecotypes such as wetland mixes, warm season grass mixes, showy wildflower mixes, conservation wildlife mixes, and many more.

Monarch on Butterfly Weed (*Asclepias tuberosa*)

Joe Pye Weed (*Eupatorium maculatum*)

Big Bluestem (*Andropogon gerardii*)

Latin Name	Common Name	Plant Type	Light	Height	Soil Moisture	Bloom Time	Notes
Carex vulpinoidea	Fox Sedge	Sedge	FS	1'-3'	W	May-June	Good for rain gardens
Carex sprengelllii	Long Beaked Sedge	Sedge	FS, PS	2'-3'	D, M, W	May-June	Non-rhizomatous
Carex stricta	Tufted Sedge	Sedge	FS, PS	1'-3'	M, W	May-June	Rhizomatous, prefers wet areas like swales,
Carex bickellii	Copper Shouldered Oval Sedge	Sedge	FS, PS	1'-3'	M, W	June-July	Fibrous, good for wet areas and rain gardens
Andropogon gerardii	Big Bluestem	Grass	FS	5'-8'	D,M	Aug-Oct	Fibrous, drought tolerant, reseeds abundantly, host plant for butterflies, food and shelter for songbirds
Elymus hystix	Bottlebrush Grass	Grass	PS, S	2'-5'	D,M	June-Aug	Fibrous, shade tolerate, attractive texture
Elymus canadensis	Canada Wild Rye	Grass	FS	4'-5'	D,M	July-Aug	Fibrous, fast growing, good nurse crop and for intial meadow establishment
Sorghastrum nuntans	Indiangrass	Grass	FS	5'-7'	D, M, W	Aug-Sep	Fibrous, drough resistant, self seeds, beneficial for songbirds and gamebirds
Schizachyrium scoparium	Little Bluestem	Grass	FS	2'-3'	D, M	Aug-Oct	Fibrous, not ideal in wet areas
Chasmanthium latifolium	Northern Sea Oats	Grass	FS, PS	3'-4'	D, M	Aug-Oct	Fibrous, native in states south of Mass, host plant of several Lepitoptera species, grows well under Black Walnut
Spartina pectinata	Prarie Cordgrass	Grass	FS	6'-8'	M, W	Aug-Sep	Rhizome, wetland grass, provides food and nesting habitat
Sporobolus heterolepis	Prarie Dropseed	Grass	FS	2'-4'	D, M	Aug-Sep	Fibrous, host plant for butterflies and moths, previously present, now locally extinct
Eragrostis spectabilis	Purple Lovegrass	Grass	FS	1'-2'	D	July-Sep	Fibrous, host plant for Zabulon Skipper butterfly, likes dry soild, good for center of roundabout
Bouteloua curtipendula	Sideoats Grama	Grass	FS	2'-3'	D, M	Aug-Sep	Fibrous, host plant for several butterly and moths, locally rare
Panicum virgatum	Switchgrass	Grass	FS	3'-6'	D, M, W	Aug-Sep	Fibrous, provides food and shelter for birds
Deschampsia cespitosa	Tufted Hairgrass	Grass	PS	1'-3'	M, W	June	Fibrous, host plant for butterflies
Hierochloe odorata	Vanilla Sweet Grass	Grass	FS	1'-2'	M, W	July-Aug	Rhizome, wetland grass, somewhat aggressive
Elymus virginicus	Virginia Wild Rye	Grass	FS, PS, S	4'-5'	M, W	July-Aug	Fibrous, fast growing, moisture tolerant, provides food for birds and host plant
Calystegia spithamaea	Upright False Bindweed	Herbaceous	FS, PS	3"-20"	D	May-Aug	A species of Greatest Conservation Need in Mass
Tripsacum dactyloides	Eastern Gamagrass	Grass	PS	2'-3'	M,W	Apr-Sep	Important food for Deer, host plant for butterflies, aggressive
Eriophorum virginicum	Cotton Grass	Grass	FS, PS	1'-2'	W	June-Sep	Rhizome, benefits pollinators and songbirds
Monarda fistulosa	Bergamot	Wildflower	FS, PS	2'-5'	D, M	July-Sep	Host plant, pollinated by hummingbirds, butterflies, pollinators, and feeds birds, grows under Black Walnut
Aster macrophyllus	Big Leaf Aster	Wildflower	PS	1'-2'	D, M	Aug-Sep	Drought tolerant, late blooming, extends pollinator food into fall, grows well under Black Walnut
Actaea racemosa	Black Cohosh	Wildflower	PS, S	4'-6'	M	June-Sep	Host plant, long lasting flowers provide ample food for pollinators, good in shade, rare locally
Rudbeckia hirta	Black Eyed Susan	Wildflower	FS, PS	1'-3'	D, M	June-Sep	Biennial, lone bloom time attracts butterflies and other pollinators, seedheads provide food for birds, grows well under Black Walnut
Caulophyllum thalictroides	Blue Cohosh	Wildflower	PS, S	2'-4'	M	Apr-June	Fruits are edible for birds, grows well under Black Walnut
Verbena hastata	Blue Vervain	Wildflower	FS	3'-6'	M, W	July-Sep	Host plant, loves moisture, long lasting flowers benefit hummingbirds, butterflies, and other pollinators
Eupatorium perfoliatum	Boneset	Wildflower	FS	3'-5'	M, W	Aug-Sep	Host plant, likes moisture, attracts butterflies and other pollinators
Liatris spicata	Dense Blazing Star	Wildflower	FS	3'-5'	M, W	Aug-Sep	Host plant, attracts butterflies, bees, and hummingbirds, birds feed on seeds
Gentiana andrewsii	Bottle Gentian	Wildflower	FS, PS	1'-2'	W	Aug-Oct	Only pollinated by bumble bees, keeps blooms late into the fall past frosts, locally rare, grows well under Black Walnut
Rudbeckia triloba	Brown Eyed Susan	Wildflower	FS, PS	2'-5'	M, W	July-Sep	Host plant, attracts many pollinators
Asclepias syriaca	Common Mlikweed	Wildflower	FS, PS	2'-4'	D, M	June-Aug	Host plant for Monarch, and visited by many pollinators
Asclepias tuberosa	Butterfly Weed	Wildflower	FS	2'-4'	D, M	June-Aug	Host plant for Monarch and Queen butterflies, and visited by many pollinators
Lobelia cardinalis	Cardinal Flower	Wildflower	FS, PS	2'-4'	W	July-Sep	Host plant, attracts hummingbirds with vibrant red flowers, natural wetland plant
Aquilegia canadensis	Columbine	Wildflower	FS, PS	1'-3'	D, M	May-June	Host plant, prefers well draining sandy soil, does well in rock gardens
Amsonia tabernaemontana	Common Bluestar	Wildflower	FS, PS	2'-3'	M, W	May-June	Attracts hummingbird moths
Aster prenanthoides	Crooked Stem Aster	Wildflower	FS, PS	2'-3'	M, W	Aug-Oct	Prefers forest edges, host plant, and beneficial for fall pollinators, locally rare, grows well under Black Walnut
Veronicastrum virginicum	Culver's Root	Wildflower	FS, PS	3'-6'	M, W	July-Aug	Beneficial for butterflies and various solitary bees
Viola labradorica	Labrador Violet	Wildflower	FS, PS	6"	D, M	June-Aug	Low growing ground cover, grows well under Black Walnut
Aster novae-angliae	New England Aster	Wildflower	FS, PS	3'-6'	M	Aug-Oct	Host plant, pollinator powerhouse, important late season plant for Monarchs, grows well under Black Walnut
Eupatorium maculatum	Joe Pye Weed	Wildflower	FS	4'-6'	M, W	Aug-Sep	Host plant, good for pollinators especially butterflies
Zizia aurea	Golden Alexanders	Wildflower	FS, PS, S	1'-2'	M, W	May-June	Host plant for Black Swallowtail butterfly
Pycnanthemum virginianum	Mountain Mint	Wildflower	FS, PS	2'-3'	W	July-Sep	Attracts wide variety of pollinators
Pycnanthemum muticum	Short Toothed Mountain Mint	Wildflower	FS, PS	2'-3'	D, M	July-Sep	Pollinator powerhouse, spreads via rhizomes
Asclepias incarnata	Red Milkweed	Wildflower	FS	3'-5'	W	June-July	Host plant for Monarchs, pollinator powerhouse, needs wet areas
Chelone glabra	White Turtlehead	Wildflower	FS, PS	2'-4'	W	Aug-Sep	Host plant, wetland plant, pollinated by bumblebees
Osmunda cinnamomea	Cinnamon Fern	Fern	FS, PS, S	3'-4'	M, W	June-Aug	Spreads slowly via rhizome, grows well under Black Walnut
Dennstaedtia punctilobula	Hayscented Fern	Fern	FS, PS	1'-2'	D, M	May-Aug	Spreads via rhizome, prefers well draining soil, grows well under Black Walnut
Onoclea sensibilis	Sensitive Fern	Fern	FS, PS, S	2'	M, W	June-Aug	Needs consistent moisture, spreads via rhizomes, grows well under Black Walnut

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Meadow Plants
Learning Landscape and Living Laboratory
Berkshire Community College

Forest Management

The forests on campus are intact core forests that provide habitat and other ecosystem services. Some parts of these forests have regrown from recent abandonment of farm fields. In these areas dense stands of early successional eastern white pine (*Pinus strobus*) are experiencing die off as they reach the end of their life span and shade each other out. The forest trail goes through these areas and the dead and dying trees above present a hazard to hikers. In these areas it could be appropriate to practice forest management to clear the unsafe trees, and thin the stands of pines so that selected healthy individuals survive. Alongside this management, active planting within the forest could also take place, to increase the biodiversity of the forest, which would also increase its resiliency. Using later successional tree species that are not currently present in the forest would have the greatest benefit. As the climate changes, tree species that are native farther south or downslope of the Marble Valley will be better suited to a climate that is warmer. Oaks, tulip poplar, hickories, chestnuts, catalpa, and black walnut are examples of trees that could provide additional resilience as they are adapted to warmer temperatures.

Pollinator Important Trees: Oaks

There are over 90 species of oaks in North America, at least 10 of which are native to Massachusetts. Oak trees support 897 caterpillar species in North American, and research has recorded 511 caterpillar species on small plots in the Northeast (*Tallamy*). Birds and many mammals also rely on oaks for the acorns they produce. Oaks are the largest and longest lived trees in this area as well, and are good candidates for urban trees as their roots are strong and resistant to damage and they seal and heal damage well.

Oaks are a genus to consider for assisted migration as well. With these numerous benefits and their importance for pollinators, the campus-wide design calls for increasing oak abundance substantially. Planting oaks in meadows is also an excellent companion planting to increase the pollinator habitat of a meadow.

White oak (*Quercus alba*) *wikimedia.org*

Green Stormwater Infrastructure

The campus-wide design proposes adjusting storm drain heights and regrading turf areas to establish infiltration areas that will create both habitat and take pressure off of stormwater systems. Wetlands and infiltration basins can be created by raising the height of drains in existing basins and low points. The water level will at most reach the height of the drain, so ensuring the drain height is at an appropriate level is necessary to avoid unwanted flooding. Basins can be planted with various sedges and flowering plants from seed mixes. The maintenance of these areas will be less than continual turf mowing. Less stormwater will also be exported from campus via drains and instead infiltrate into the ground, helping to filter pollutants and recharge groundwater. These habitats also store and sequester carbon and provide habitat for pollinators.

Native Plants to Consider for Infiltration areas

Latin Name	Common Name	Plant Type	Light	Height	Soil Moisture	Bloom Time	Notes
Carex grayi	Bur Sedge	Sedge	FS, PS	2’-3’	M, W	May-June	Slowly spreads rhizominously, wet loving, good for rain gardens
Carex vulpinoidea	Fox Sedge	Sedge	FS	1’-3’	W	May-June	Good for rain gardens
Carex bromoides	Brome Sedge	Sedge	PS, S	1’-2’	W	Apr-June	Good for rain gardens
Carex stricta	Tufted Sedge	Sedge	FS, PS	1’-3’	M, W	May-June	Rhizomatous, prefers wet areas like swales,
Carex bickellii	Copper Shouldered Oval Sedge	Sedge	FS, PS	1’-3’	M, W	June-July	Fibrous, good for wet areas and rain gardens
Carex amphibola	Creek Sedge	Sedge	PS, S	1’-2’	M, W	May	Fibrous, good for wet areas and rain gardens, shade tolerant, ideal for vegetative swales
Carex crinita	Fringed Sedge	Sedge	FS, PS	3’-4’	W	June	Does well in wet spots and standing water
Hierochloe odorata	Vanilla Sweet Grass	Grass	FS	1’-2’	M, W	July-Aug	Rhizome, wetland grass, somewhat aggressive
Elymus virginicus	Virginia Wild Rye	Grass	FS, PS, S	4’-5’	M, W	July-Aug	Fibrous, fast growing, moisture tolerant, provides food for birds and host plant
Juncus tenuis	Path Rush	Grass	FS, PS	6”-2’	M, W	July	Good for rain gardens and swales
Iris versicolor	Blue Flag Iris	Herbaceous	FS, PS	2’-3’	Wet	June-July	Thrives in wet areas, attracts pollinators, grows well under Black Walnut
Verbena hastata	Blue Vervain	Wildflower	FS	3’-6’	M, W	July-Sep	Host plant, loves moisture, long lasting flowers benefit hummingbirds, butterflies, and other pollinators
Eupatorium perfoliatum	Boneset	Wildflower	FS	3’-5’	M, W	Aug-Sep	Host plant, likes moisture, attracts butterflies and other pollinators
Gentiana andrewsii	Bottle Gentian	Wildflower	FS, PS	1’-2’	W	Aug-Oct	Only pollinated by bumble bees, keeps blooms late into the fall past frosts, locally rare, grows well under Black Walnut
Lobelia cardinalis	Cardinal Flower	Wildflower	FS, PS	2’-4’	W	July-Sep	Host plant, attracts hummingbirds with vibrant red flowers, natural wetland plant
Asclepias incarnata	Red Milkweed	Wildflower	FS	3’-5’	W	June-July	Host plant for Monarchs, pollinator powerhouse, needs wet areas
Chelone glabra	White Turtlehead	Wildflower	FS, PS	2’-4’	W	Aug-Sep	Host plant, wetland plant, pollinated by bumblebees
Matteuccia struthiopteris	Ostrich Fern	Fern	PS, S	3’-5’	W	July-Aug	Adaptable to many soil types, can spread rhizominously, fiddlehead shoots can be harvested and eaten, grows well under Black Walnut
Osmunda cinnamomea	Cinnamon Fern	Fern	FS, PS, S	3’-4’	M, W	June-Aug	Spreads slowly via rhizome, grows well under Black Walnut
Woodwardia areolata	Netted Chain fern	Fern	PS, S	1’-2’	W	July-Oct	Colony forming, creates ground cover
Woodwardia virginica	Virginia Chain Fern	Fern	PS	2’-3’	W	June-Sep	Spreads quickly via rhizomes
Spiraea tomentosa	Steeplebush	Shrub	FS, PS	2’-3’	W	Aug-Sep	Does well in wet conditions, host plant, attracts many pollinators
Vaccinium corymbosum	Highbush Blueberry	Shrub	FS, PS	3’-8’	D, M, W	May-June	Host plant, pollinator attractor, edible berries for humans and wildlife
Viburnum recognitum	Northern Arrowwood	Shrub	PS	5’-15’	W	May-June	Provides food cover and nesting sites for birds, host plant, prefers wet areas
Ilex verticillata	Common Winterberry	Shrub	FS, PS, S	6’-10’	M, W	Apr-July	Tolerates poor drainage, need male and female plant for pollination, edible to birds, not humans
Cephalanthus occidentalis	Buttonbush	Shrub	PS, S	6’-12’	W	June-Sep	Pollinator powerhouse, fruits eaten by birds
Rhododendron viscosum	Swamp Azalea	Shrub	PS	5’-15’	W	May-Aug	One of the last azaleas to bloom, evergreen, handles flooding well
Nyssa sylvatica	Black Gum	Tree	FS, PS	30’-60’	M, W	Apr-June	Edible fruits, salt and compaction tolerant, part of NHESP plant community
Quercus palustris	Pin Oak	Tree	FS, PS	50’-60’	M, W	March-May	Host plant to many species, acorns are an important food source for wildlife
Quercus bicolor	Swamp White Oak	Tree	FS	50’-60’	M, W	March-May	Host plant to many species, acorns are an important food source for wildlife
Thuja occidentalis	Eastern White Cedar	Tree	FS, PS	20’-40’	W	March-May	Browsed on by deer in winter, good evergreen boarder tree

Not for construction. Part of a student project and not based on a legal survey.

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Forests and Stormwater

Learning Landscape and Living Laboratory

Berkshire Community College

Native Specimen Trees

Name	Common Name	Height	Spread	Sun Exposure	Moisture	Resistance/Tolerance	Notes
Abies balsamea	balsam fir	35-60 ft	12-18 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Host Plant, Pollinator Powerhouse Plant, Attracts Songbirds
Acer pensylvanicum	striped maple	15-25 ft	7-10 ft	Sun/Part Shade	Average		Pollinator Powerhouse Plant, Other Pollinators/Wildlife, Host Plant
Acer rubrum	red maple	35-50 ft	20-40 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Attracts Songbirds, Pollinator Powerhouse Plant, Host Plant, Attracts Bees
Acer saccharinum	silver maple	50-65 ft	30-50 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Acer saccharum	sugar maple	60-80 ft	20-50 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Aesculus pavia	red buckeye	12-15 ft	2-15 ft	Sun/Part Shade	Average	Deer/Rabbit	Attracts Hummingbirds, Attracts Bees, Attracts Butterflies
Amelanchier arborea	downy/common serviceberry	15-25 ft	12-20 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Attracts Bees
Amelanchier canadensis	Canada serviceberry, shadbush	10-18 ft	5-10 ft	Sun/Part Shade	Dry/Wet/Average	Deer/Rabbit/Salt	Host Plant, Attracts Bees, Attracts Songbirds, Pollinator Powerhouse Plant
Amelanchier laevis	Allegheny serviceberry, shadbush	15-30 ft	8-18 ft	Sun/Part Shade	Dry/Wet/Average	Deer/Rabbit/Salt	Host Plant, Attracts Bees, Attracts Songbirds, Pollinator Powerhouse Plant
Benthamidia florida	flowering big-bracted dogwood	12-20 ft	8-15 ft	Sun/Part Shade	Average	Deer/Rabbit	Host Plant, Attracts Songbirds, Attracts Butterflies, Other Pollinators/Wildlife
Benthamidia florida 'Rubra'	pink-bracted dogwood	12-20 ft	8-15 ft	Sun/Part Shade	Average	Deer/Rabbit	Attracts Bees, Other Pollinators/Wildlife, Host Plant
Betula alleghaniensis	yellow birch	40-60 ft	15-30 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Attracts Songbirds, Host Plant, Pollinator Powerhouse Plant
Betula lenta	black birch, cherry birch	40-60 ft	10-25 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Attracts Songbirds, Host Plant, Pollinator Powerhouse Plant
Betula nigra	river birch	25-45 ft	15-25 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit/Salt	Attracts Songbirds, Host Plant, Pollinator Powerhouse Plant
Betula papyrifera	paper birch	25-45 ft	15-25 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Salt	Attracts Songbirds, Host Plant, Pollinator Powerhouse Plant
Betula populifolia	gray birch	20-40 ft	8-15 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Salt	Attracts Songbirds, Host Plant, Pollinator Powerhouse Plant
Carpinus caroliniana	American hornbeam, musclewood	20-30 ft	20-35 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Other Pollinators/Wildlife, Host Plant
Carya ovata	shagbark hickory	50-100 ft	20-40 ft	Sun/Part Shade	Average/Dry	Drought	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Castanea dentata	American chestnut	50-100 ft	30-50 ft	All	Average/Dry	Drought	Host Plant, Attracts Bees, Attracts Songbirds, Pollinator Powerhouse Plant
Catalpa speciosa	northern catalpa	40-70 ft	20-50 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	
Celtis occidentalis	hackberry	30-50 ft	20-50 ft	Sun/Part Shade	Average/Dry	Drought/Salt	Attracts Songbirds, Host Plant
Cercis canadensis	redbud	12-25 ft	10-20 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Attracts Butterflies, Host Plant, Attracts Hummingbirds, Other Pollinators/Wildlife
Chamaecyparis thyoides	Atlantic white cedar	20-40 ft	6-15 ft	Sun	Wet	Deer/Rabbit	Attracts Songbirds, Host Plant
Chionanthus virginicus	fringe tree, old man's beard	10-20 ft	8-18 ft	All	Average/Wet	Salt	Host Plant, Attracts Bees, Attracts Songbirds, Pollinator Powerhouse Plant
Crataegus crus-galli	cockspur hawthorn	15-30 ft	20-35 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Host Plant, Attracts Bees, Attracts Songbirds, Pollinator Powerhouse Plant
Gleditsia triacanthos	honey locust	25-35 ft	25-35 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Salt	Attracts Butterflies, Host Plant, Other Pollinators/Wildlife
Ilex opaca	American holly	12-30 ft	8-14 ft	Sun/Part Shade	Average	Deer/Rabbit/Salt	Attracts Bees, Attracts Songbirds, Other Pollinators/Wildlife, Host Plant
Juglans cinerea	butternut, white walnut	40-70 ft	20-40 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Pollinator Powerhouse Plant, Other Pollinators/Wildlife, Host Plant
Juglans nigra	black walnut	50-80 ft	30-60 ft	Sun/Part Shade	Average	Salt	Pollinator Powerhouse Plant, Other Pollinators/Wildlife, Host Plant
Juniperus virginiana	red cedar	15-30 ft	3-10 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Salt	Attracts Songbirds, Host Plant, Pollinator Powerhouse Plant
Larix laricina	tamarack, larch	30-60 ft	10-18 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit/Salt	Attracts Songbirds, Host Plant, Pollinator Powerhouse Plant
Liriodendron tulipifera	tuliptree, tulip poplar	70-120 ft	30-60 ft	Sun/Part Shade	Average	Deer/Rabbit	Attracts Bees, Attracts Songbirds, Other Pollinators/Wildlife, Host Plant
Magnolia tripelata	umbrella tree	25-40 ft	15-35 ft	Sun/Part Shade	Average	Deer/Rabbit	Other Pollinators/Wildlife, Host Plant
Morus rubra	red mulberry	15-35 ft	15-35 ft	Sun/Part Shade	Dry/Wet/Average	Drought	Attracts Songbirds, Other Pollinators/Wildlife, Host Plant
Nyssa sylvatica	black gum, tupelo, tupelo	30-60 ft	20-35 ft	Sun/Part Shade	Average/Wet	Salt	Attracts Songbirds, Other Pollinators/Wildlife, Host Plant
Ostrya virginiana	ironwood, hop hornbeam	20-30 ft	10-18 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Picea glauca	white spruce	30-60 ft	8-16 ft	Sun	Average/Dry	Deer/Rabbit/Drought	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Picea mariana	black spruce	20-50 ft	8-16 ft	Sun	Average/Wet	Deer/Rabbit	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Picea rubens	red spruce	30-60 ft	10-18 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Pinus rigida	pitch pine	30-60 ft	15-25 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Pinus strobus	white pine	60-90 ft	25-40 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Pinus strobus 'Nana'	Nana dwarf white pine	4-6 ft	4-6 ft	Sun	Average/Dry	Deer/Rabbit/Drought	Host Plant
Platanus occidentalis	American sycamore	70-100 ft	40-60 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit/Salt	Attracts Songbirds, Host Plant
Populus tremuloides	quaking aspen	25-55 ft	15-25 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Attracts Songbirds, Host Plant, Pollinator Powerhouse Plant
Prunus americana	American plum, wild plum	4-10 ft	4-12 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Host Plant, Attracts Bees, Attracts Songbirds, Pollinator Powerhouse Plant
Prunus serotina	black cherry	30-60 ft	20-30 ft	Sun/Part Shade	Average	Deer/Rabbit/Salt	Host Plant, Attracts Bees, Attracts Songbirds, Pollinator Powerhouse Plant
Quercus alba	white oak	60-80 ft	30-40 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Quercus bicolor	swamp white oak	60-80 ft	30-40 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Quercus coccinea	scarlet oak	50-70 ft	25-40 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Quercus rubra	red oak	60-80 ft	30-45 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit/Salt	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Quercus velutina	black oak	50-60 ft	50-60 ft	Sun	Average/Dry	Deer/Rabbit/Drought	Other Pollinators/Wildlife, Host Plant
Salix nigra	black willow	10-60 ft	15-50 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Host Plant, Attracts Bees, Attracts Songbirds, Pollinator Powerhouse Plant
Sassafras albidum	sassafras	20-40 ft	8-18 ft	Sun/Part Shade	Dry/Wet/Average	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees, Attracts Songbirds
Sorbus americana	American mountain ash	15-30 ft	10-25 ft	Sun/Part Shade	Average/Wet		Host Plant, Attracts Bees, Songbirds, Butterflies, Pollinator Powerhouse Plant
Swida (Cornus) alternifolia	pagoda dogwood, alternate dogwood	10-20 ft	6-15 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit	Host Plant, Attracts Bees, Songbirds, Butterflies, Pollinator Powerhouse Plant
Tilia americana	basswood, linden	50-70 ft	30-45 ft	Sun/Part Shade	Average		Host Plant, Attracts Bees, Attracts Songbirds, Pollinator Powerhouse Plant

Native Plant Lists

The choice to plant more native trees and other plants on the BCC campus will result in an educational environment that promotes biodiversity by providing habitat and food sources for native species, including birds, insects, mammals, and other plants. Natives will also support ecosystem services by preventing soil erosion, filtering water, and improving air quality by absorbing carbon dioxide and releasing oxygen through photosynthesis. Since they have evolved over time to adapt to the local conditions, natives are well-suited to the specific environment of the Berkshire region, requiring less maintenance, watering, and fertilizers compared to many non-native species. This makes them more resilient to pests, diseases, and extreme weather events, reducing the need for chemical interventions. (*why-plant-natives?*)

Native plants and pollinators have coevolved over thousands of years, developing intricate relationships. Native plants provide the essential resources that local pollinators require for survival, including nectar, pollen, and shelter. Pollinators, in turn, have evolved specific traits to effectively pollinate native plants, creating a mutually beneficial relationship. Native plant communities can provide nesting sites, such as hollow stems or leaf litter, for solitary bees and other insects. Native shrubs and trees can also serve as nesting and roosting places for birds and bats, which are important pollinators as well. (*Who Are Pollinators?*) Many native pollinators face threats due to habitat loss. By recommending the planting of native trees and other plants in areas that are currently maintained as turf lawns, this plan seeks to create corridors and patches of suitable habitat that support the survival and reproduction of these pollinators.

The following plant lists (Native Trees, Native Grasses, Native Groundcovers, and Native Low-Maintenance Shrubs) are provided as guides to choosing the individual plants that would be planted in any of the designed planting areas. These lists were compiled from the collection of the Native Plant Trust (nativeplanttrust.org) and are not meant to be complete list of all plants native to the Berkshire region. In addition, the choice of individual plants for specific locations is dependent on a variety of micro-environment conditions that are best assessed on site when the plant choices are being made. More Native plants suitable for the Northeast Region can be found at nativeplanttrust.org.

Native Specimen Trees

This plan has included designs for a food forest, a public arboretum, and other areas such as parking lot islands where the addition of native trees would serve to increase pollinator habitat, intercept rainfall, provide shade and cooling, improve canopy connectivity, and create educational opportunities. The native trees listed here offer options of varying sizes, growing requirements, and benefits they may provide, to be considered for the variety of locations on campus.

Red buckeye *Prunus serotina*

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Tree List for BCC
Learning Landscape and Living Laboratory
Berkshire Community College

Native Grasses

Name	Common Name	Height	Spread	Sun Exposure	Moisture	Resistance/Tolerance	Notes
Andropogon gerardii	big bluestem	24-60 in	24-48 in	Sun	Average/Dry	Deer/Rabbit/Salt/Drought	Host Plant/Attracts Songbirds
Carex appalachica	Appalachian sedge	8-10 in	10-14 in	Sun/Part Shade	Average/Dry	Deer/Rabbit	Other Pollinators/Wildlife, Pollinator Powerhouse Plant, Host Plant
Carex crinita	fringed sedge	1-3 ft	1-2 ft	Sun/Part Shade	Wet	Deer/Rabbit	Other Pollinators/Wildlife, Pollinator Powerhouse Plant, Host Plant
Carex eburnea	Bristle-leaf sedge	6-10 in	8-12 in	Sun/Part Shade	Average/Wet	Drought	Other Pollinators/Wildlife, Pollinator Powerhouse Plant, Host Plant
Carex pensylvanica	Pensylvania sedge	6-10 in	12-18 in	All	Average/Dry	Deer/Rabbit/Drought	Other Pollinators/Wildlife, Pollinator Powerhouse Plant, Host Plant
Carex plantaginea	plantain sedge	6-10 in	8-12 in	Sun/Part Shade	Average/Wet	Deer/Rabbit	Other Pollinators/Wildlife, Pollinator Powerhouse Plant, Host Plant
Carex platyphylla	silver sedge	8-12 in	8-12 in	Part Shade/Shade	Average/Dry	Drought	Host Plant/Other Pollinators/Wildlife
Chasmanthium latifolium	sea oats	2-3 ft	2-3 ft	All	Average/Wet	Drought	Host Plant/Other Pollinators/Wildlife
Deschampsia flexuosa	wavy hair grass	2-3 ft	1-2 ft	Part Shade/Shade	Average	Deer/Rabbit/Salt	Host Plant/Other Pollinators/Wildlife
Eragrostis spectabilis	purple lovegrass	8-14 in	10-16 in	Sun/Part Shade	Average/Dry	Deer/Rabbit/Salt/Drought	Host Plant/Other Pollinators/Wildlife/Attracts Songbirds
Eriophorum virginicum	cotton grass, tussock sedge	12-24 in	12-18 in	Sun/Part Shade	Wet	Deer/Rabbit	Host Plant/Other Pollinators/Wildlife/Attracts Songbirds
Juncus tenuis	path rush	8-20 in	18-24 in	Sun/Part Shade	Average/Wet/Dry	Deer/Rabbit/Drought	Host Plant/Other Pollinators/Wildlife
Panicum virgatum	switchgrass	3-6 ft	2-3 ft	Sun	Average/Dry	Drought/Salt	Host Plant/Other Pollinators/Wildlife/Attracts Songbirds
Schizachyrium scoparium	little bluestem	12-48 in	8-24 in	Sun/Part Shade	Average/Dry	Deer/Rabbit/Salt/Drought	Host Plant/Other Pollinators/Wildlife
Sorghastrum nutans	Indian grass	3-5 ft	2-3 ft	Sun	Average/Dry	Deer/Rabbit/Drought	Host Plant/Other Pollinators/Wildlife/Attracts Songbirds
Sporobolus heterolepis	prarie dropseed	12-36 in	12-18 in	Sun/Part Shade	Average/Dry	Deer/Rabbit/Salt/Drought	Host Plant/Other Pollinators/Wildlife/Attracts Songbirds
Tripsacum dactyloides	gama grass	3-7 ft	3-4 ft	Sun	Average/Wet	Deer/Rabbit/Drought	Host Plant/Other Pollinators/Songbirds
Typha latifolia	broad leaf cattail	3-8 ft	3-4 ft	Sun/Part Shade	Wet	Salt	Host Plant/Other Pollinators/Songbirds

Native Grasses

Native grasses offer numerous benefits and can be utilized in the designs presented in a variety of ways including in foundation plant beds, meadow plantings, and small turf areas throughout the campus. Native grasses have deep root systems that help stabilize soil, making them excellent for erosion control. The campus at BCC has many steeply sloped areas and soil stabilization in these areas is essential in reducing erosion and soil and nutrient runoff. The extensive root systems of grasses help improve soil structure, increase organic matter content, and enhance soil fertility. Native grasses are important for supporting biodiversity by creating habitat for wildlife. They provide cover for nesting, foraging, and shelter. These grasses can also offer ornamental value.

A mixed grouping of native grasses

Native Groundcovers

Name	Common Name	Height	Spread	Sun Exposure	Moisture	Resistance/Tolerance	Notes
Anemone canadensis	Canada anemone	12-24 in	3-5 ft	Sun/Part Shade	Average/Dry/Wet	Deer/Rabbit	Attracts Bees/Other Pollinators/Wildlife
Antennaria neglecta	field pussytoes	1-3 in	6-12 in	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant/Attracts Butterflies
Antennaria plantaginifolia	plantain pussytoes	1-3 in	12-24 in	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant/Attracts Bees/Butterflies/Other pollinators/Wildlife
Arctostaphylos uva-ursi	red bearberry	3-6 in	2-3 ft	Sun	Average/Dry	Deer/Rabbit/Drought/Salt	Attracts Bees/Attracts Songbirds/Other Pollinators/Wildlife
Asarum canadense	Canada wild ginger	3-6 in	12-16 in	Part Shade/Shade	Average/Wet	Deer/Rabbit	Other Pollinators/Wildlife
Carex pensylvanica	Pennsylvania sedge	6-10 in	12-18 in	All	Average/Dry	Deer/Rabbit/Drought	Host Plant,Pollinator Powerhouse Plant
Chamaepericlymenum canadense	bunchberry	2-5 in	8-16 in	Part Shade/Shade	Average/Wet		Host Plant, Attracts Bees/Songbirds/Pollinator Powerhouse Plant
Eragrostis spectabilis	purple lovegrass	8-14 in	10-16 in	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant/Attracts Songbirds/Other Pollinators/Wildlife
Eurybia macrophylla	big leaf aster	6-18 in	16-24 in	Part Shade/Shade	Average	Deer/Rabbit	Host Plant, Attracts Bees/Songbirds/Pollinator Powerhouse Plant
Fragaria vesca	woodland strawberry	2-5 in	6-12 in	Sun/Part Shade	Average	Deer/Rabbit/Drought	Host, Attracts Bees/Songbirds/Butterflies/Pollinator Powerhouse Plant
Fragaria virginiana	wild strawberry	2-5 in	12-24 in	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Host Plant, Attracts Bees/Songbirds/Pollinator Powerhouse Plant
Gaultheria procumbens	wintergreen	1-4 in	6-12 in	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Attracts Bees/Other Pollinators/Wildlife
Geum fragarioides	Appalachian barren strawberry	3-6 in	8-12 in	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Host Plant/Attracts Bees/Other Pollinators/Wildlife
Juniperus communis 'Repanda'	repanda' juniper	12-16 in	3-4 ft	Sun	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant/Attracts Songbirds/Other Pollinators/Wildlife
Juniperus horizontalis	creeping juniper	2-6 in	3-6 ft	Sun	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant/Attracts Songbirds/Other Pollinators/Wildlife
Maianthemum canadense	Canada mayflower	2-4 in	10-14 in	Part Shade/Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Attracts Bees/Attracts Songbirds/Other Pollinators/Wildlife
Maianthemum stellatum	starry false Solomons seal	1-2 ft	1-2 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Attracts Bees/Attracts Songbirds/Other Pollinators/Wildlife
Mentha canadensis	American wild mint	12-18 in	18-24 in	Sun/Part Shade	Average/Wet	Deer/Rabbit/Drought	Attracts Bees/Attracts Burreflies/Other Pollinators/Wildlife
Mitchella repens	partridgeberry	1-2 in	10-14 in	Part Shade/Shade	Average/Dry/Wet	Deer/Rabbit/Drought	Attracts Bees/Other Pollinators/Wildlife
Mitella diphylla	bishop's cap	8-16 in	4-8 in	Part Shade/Shade	Average/Wet	Deer/Rabbit	Attracts Bees/Other Pollinators/Wildlife
Packera obovata	running groundsel	3-6 in	12-24 in	Sun/Part Shade	Average/Wet	Deer/Rabbit	Host Plant/Attracts Bees
Phegopteris connectilis	long beech fern	4-12 in	24-36 in	Part Shade/Shade	Average	Deer/Rabbit	Other Pollinators/Wildlife
Phlox divaricata	woodland phlox, wild blue phlox	10-14 in	12-16 in	Part Shade/Shade	Average		Attracts Bees/Attracts Butterflies/Other Pollinators/Wildlife
Phlox subulata	moss phlox	1-5 in	12-18 in	Sun	Average/Dry	Drought	Host Plant/Attracts Bees/Attracts Butterflies
Podophyllum peltatum	mayapple	6-12 in	3-5 ft	Part Shade/Shade	Average	Deer/Rabbit	Attracts Bees/Other Pollinators/Wildlife
Prunus pumila var. depressa	sand cherry, dwarf sand plum	12-30 in	2-4 ft	Sun	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees/Songbirds/Pollinator Powerhouse Plant
Rhus aromatica	fragrant sumac	3-7 ft	4-6 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees/Songbirds/Other Pollinators/Wildlife
Rhus aromatica 'Gro-Low'	Gro-Low fragrant sumac	1-2 ft	6-8 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Attracts Bees/Other Pollinators/Wildlife
Rubus allegheniensis	blackberry	3-5 ft	4-6 ft	All	Average/Dry	Deer/Rabbit/Drought	Host Plant/Attracts Bees/Butterflies/Songbirds/Other pollinators/Wildlife
Rubus hispidus	creeping dewberry	1-3 in	1-3 ft	All	Average/Dry/Wet	Deer/Rabbit/Drought	Host Plant/Attracts Bees/Attracts Songbirds
Rubus occidentalis	black raspberry	3-5 ft	3-6 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Host, Attracts Bees/Songbirds/Butterflies/Pollinator Powerhouse Plant
Tiarella cordifolia var. cordifolia	running foam flower	3-12 in	12-24 in	Part Shade/Shade	Average	Deer/Rabbit	Host Plant/Attracts Bees/Other Pollinators/Wildlife

Native Groundcovers

This list of native Groundcovers is included to provide options that can be used to avoid bare ground, or to minimize the maintenance efforts and costs involved in seasonal mulching of planted beds. Groundcovers in general help to reduce the evaporation of moisture from the soil.

These native plants are well adapted to the Northeast region's site conditions. Once established, they often have lower water demands and are more tolerant of drought conditions. Groundcovers with dense foliage and extensive root systems help prevent soil erosion. They stabilize the soil by binding it together, reducing the impact of rainwater runoff and minimizing the loss of topsoil.

Native groundcovers can outcompete invasive plants and weeds, reducing the need for chemical herbicides or manual weeding. Their ability to form a dense cover shades the soil, making it difficult for weed seeds to germinate and establish themselves, preventing the dominance of non-native invasive species. When weeds do establish within beds where groundcovers are planted, they are easy to identify for removal.

Wild Sweet William *Phlox divaricata*

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Grasses and Groundcovers

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Low Maintenance Native Shrubs

Name	Common Name	Height	Spread	Sun Exposure	Moisture	Resistance/Tolerance	Notes
Amelanchier canadensis	Canada serviceberry, shadbush	10-18 ft	5-10 ft	Sun/Part Shade	Average/Wet/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees,Songbirds, Pollinator Powerhouse Plant, Other Pollinators/Wildlife
Amelanchier spicata	running serviceberry	4-6 ft	4-10 ft	Sun/Part Shade	Average/Wet/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees,Songbirds, Pollinator Powerhouse Plant, Other Pollinators/Wildlife
Aralia spinosa	devil's walking stick	8-15 ft	6-10 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees,Songbirds, Other Pollinators/Wildlife
Aronia floribunda	purple chokeberry	6-8 ft	3-4 ft	Sun/Part Shade	Average/Wet		Attracts Bees,Songbirds, Other Pollinators/Wildlife
Cephalanthus occidentalis	buttonbush	3-8 ft	3-6 ft	Sun	Wet	Deer/Rabbit/Salt	Host Plant, Attracts Bees, Butterflies, Other Pollinators/Wildlife
Clethra alnifolia	summersweet	4-8 ft	4-6 ft	Sun/Part Shade	Average/Wet	Drought/Salt	Host Plant, Attracts Bees, Butterflies
Corylus americana	American hazelnut	5-9 ft	4-6 ft	Sun/Part Shade	Average/Dry	Drought	Host Plant, Other Pollinators/Wildlife, Attracts Songbirds, Pollinator Powerhouse Plant
Corylus cornuta	beaked hazelnut	4-12 ft	4-6 ft	Sun/Part Shade	Average/Dry	Drought	Pollinator Powerhouse Plant, Host Plant, Other Pollinators/Wildlife
Crataegus crus-galli	cockspur hawthorn	15-30 ft	20-35 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Host Plant, Attracts Bees, Songbirds, Pollinator Powerhouse Plant, Other Pollinators/Wildlife
Dasiphora floribunda	shrubby cinquefoil	1-3 ft	1-3 ft	Sun/Part Shade	Average/Wet/Dry	Deer/Rabbit/Drought/Salt	Attracts Bees, Butterflies, Other Pollinators/Wildlife
Diervilla lonicera	bush honeysuckle	2-4 ft	2-5 ft	Sun/Part Shade	Average/Dry	Drought	Host Plant, Attracts Butterflies, Hummingbirds
Dirca palustris	leatherwood	3-6 ft	3-5 ft	Part Shade	Average	Deer/Rabbit	Host Plant, Attracts Bees
Gaylussacia baccata	black huckleberry	1-3 ft	2-3 ft	Part Shade/Shade	Average/Dry	Deer/Rabbit/Drought	Host Plant, Attracts Bees,Songbirds, Other Pollinators/Wildlife
Hamamelis virginiana	American witch hazel	6-15 ft	6-15 ft	Part Shade/Shade	Average/Wet	Deer/Rabbit	Host Plant, Attracts Bees
Hydrangea arborescens	American hydrangea	2-4 ft	3-5 ft	Part Shade/Shade	Average	Drought	Host Plant, Attracts Bees,Butterflies
Hypericum prolificum	shrubby St John's wort	2-4 ft	2-4 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees,Butterflies
Ilex verticillata	common winterberry	4-10 ft	4-10 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit/Salt	Host Plant, Attracts Bees,Songbirds, Other Pollinators/Wildlife
Kalmia angustifolia	sheep laurel	1-3 ft	1-3 ft	Sun/Part Shade	Average/Wet/Dry	Deer/Rabbit	Host Plant, Attracts Bees,Songbirds, Other Pollinators/Wildlife
Kalmia latifolia	mountain laurel	4-10 ft	4-8 ft	All	Average/Wet	Deer/Rabbit/Drought	Host Plant, Attracts Bees
Lindera benzoin	spicebush	6-12 ft	6-12 ft	All	Average/Wet	Deer/Rabbit/Salt	Host Plant, Attracts Bees, Songbirds
Morella caroliniensis	bayberry	2-6 ft	3-6 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant,Pollinator Powerhouse Plant, Attracts Songbirds
Myrica gale	sweetgale	2-4 ft	3-5 ft	Sun/Part Shade	Wet	Deer/Rabbit	Host Plant,Pollinator Powerhouse Plant, Attracts Songbirds
Physocarpus opulifolius	ninebark	4-9 ft	6-10 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Host Plant, Attracts Bees
Prunus americana	American plum, wild plum	4-10 ft	4-12 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Host Plant, Attracts Bees, Songbirds, Pollinator Powerhouse Plant, Other Pollinators/Wildlife
Prunus pumila var. depressa	sand cherry, dwarf sand plum	12-30 in	2-4 ft	Sun	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees, Songbirds, Pollinator Powerhouse Plant, Other Pollinators/Wildlife
Rhododendron groenlandicum	Labrador tea	12-30 in	12-24 in	Sun/Part Shad	Average/Wet		Host Plant, Attracts Bees,Butterflies
Rhododendron maximum	great rosebay, great laurel	6-15 ft	6-15 ft	Part Shade/Shade	Average/Wet	Drought	Host Plant, Attracts Bees,Butterflie
Rhus aromatica	fragrant sumac	3-7 ft	4-6 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees, Songbirds, Pollinator Powerhouse Plant, Other Pollinators/Wildlife
Rhus copallinum	winged sumac	5-8 ft	6-10 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees, Songbirds, Other Pollinators/Wildlife
Rhus glabra	smooth sumac	8-15 ft	10-18 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees, Songbirds, Other Pollinators/Wildlife
Rhus typhina	staghorn sumac	8-15 ft	8-18 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Host Plant, Attracts Bees, Songbirds, Other Pollinators/Wildlife
Rosa carolina	Carolina rose, pasture rose	2-4 ft	3-4 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit/Drought/Salt	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Rosa virginiana	Virginia rose	2-4 ft	3-6 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought/Salt	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Rubus allegheniensis	blackberry	3-5 ft	4-6 ft	All	Average/Dry	Deer/Rabbit/Drought	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Rubus hispidus	creeping dewberry	1-3 in	1-3 ft	All	Average/Wet/Dry	Deer/Rabbit/Drought	Host Plant, Attracts Bees, Songbirds
Rubus idaeus	red raspberry	2-5 ft	3-5 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Rubus occidentalis	black raspberry	3-5 ft	3-6 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Rubus odoratus	flowering raspberry	3-5 ft	4-6 ft	Sun/Part Shade	Average	Deer/Rabbit	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Salix discolor	pussy willow	5-15 ft	4-8 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit/Salt	Host Plant,Pollinator Powerhouse Plant, Attracts Bees
Sambucus nigra ssp. canadensis	black elderberry	5-8 ft	3-8 ft	Part Shade	Wet	Salt	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds
Sambucus racemosa	red elderberry	4-8 ft	3-6 ft	Sun/Part Shade	Average/Wet		Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds,
Spiraea alba var. latifolia	white meadowsweet, white spirea	2-5 ft	2-4 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Spiraea tomentosa	steeplebush, rosy meadowsweet	2-5 ft	2-4 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Swida alternifolia	pagoda dogwood	10-20 ft	6-15 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Swida amomum	silky dogwood	3-8 ft	3-6 ft	Sun/Part Shade	Average/Wet		Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Swida racemosa	gray dogwood	3-8 ft	3-8 ft	Sun/Part Shade	Average/Wet	Salt	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Swida sericea	red twig dogwood	3-8 ft	4-7 ft	Sun/Part Shade	Average/Wet	Salt	Attracts Songbirds, Bees, Other Pollinators/Wildlife
Taxus canadensis	American yew	24-36 in	3-6 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit/Drought	Attracts Songbirds, Other Pollinators/Wildlife
Vaccinium angustifolium	lowbush blueberry	1-2 ft	1-3 ft	Sun/Part Shade	Average/Dry	Drought	Host Plant, Attracts Bees, Songbirds, Pollinator Powerhouse Plant, Other Pollinators/Wildlife
Vaccinium corymbosum	highbush blueberry	3-8 ft	3-7 ft	Sun/Part Shade	Average/Wet/Dry	Deer/Rabbit/Drought	Host Plant, Attracts Bees, Songbirds, Pollinator Powerhouse Plant, Other Pollinators/Wildlife
Vaccinium macrocarpon	large cranberry	1-3 in	18-24 in	Sun	Wet	Deer/Rabbit	Host Plant, Attracts Bees, Songbirds, Pollinator Powerhouse Plant, Other Pollinators/Wildlife
Viburnum acerifolium	maple leaf viburnum	3-6 ft	3-5 ft	All	Average/Dry	Deer/Rabbit/Drought	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Viburnum dentatum	smooth arrowwood	6-10 ft	4-8 ft	Sun/Part Shade	Average	Deer/Rabbit/Salt	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Viburnum lentago	nanyberry	8-18 ft	6-12 ft	Sun/Part Shade	Average/Dry	Deer/Rabbit/Drought	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Viburnum nudum var. cassinoides	withe-rod, possum haw	6-12 ft	4-8 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Viburnum nudum var. nudum	witherod	6-12 ft	4-8 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Viburnum opulus var. americanum	American cranberry bush	5-12 ft	4-7 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit/Salt	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant
Viburnum opulus var. americanum	American cranberry bush	5-12 ft	4-7 ft	Sun/Part Shade	Average/Wet	Deer/Rabbit/Salt	Attracts Butterflies, Attracts Bees, Host Plant, Attracts Songbirds, Pollinator Powerhouse Plant

Low Maintenance Native Shrubs

The existing landscape of the BCC campus includes a large amount of 'edge-to-edge' turf lawns that cover the area from the edge of walkways and roads and continue to the walls of the buildings and structures. There are also smaller pocket areas where turf is present such as the islands between parking areas and small patches of ground between walkways and other features that could be planted with appropriately sized shrubs. The turf in these areas slows water absorption creating runoff, adds to the maintenance and associated costs of the entire site, and provides limited opportunities for pollinators and wildlife to forage and nest.

Conversion of some of these turf areas into low-maintenance native shrub-planted beds would increase habitat, carbon sequestration, and climate resilience on campus. Wide beds of low-growing native shrubs expanding outward from the foundations of the buildings on campus would preserve views from the windows of the buildings. A variety of shrubs listed here could be chosen to replace the turf in many individual sites throughout the campus.

Native shrubs could also be considered in the design of garden areas and landscaping including the Public Garden and Student and Faculty Space and others areas in this design. They can serve to create natural boundaries and provide privacy where desired.

Listed here are native shrubs considered "Low-Maintenance" and native to the Northeast Region by the Native Plant Trust, and are a partial selection of a more complete list found at nativeplanttrust.org

A massing of *Rhododendron maximum* planted in a small pocket area at Smith College

the ConwaySchool
Graduate Program in Sustainable Landscape Planning + Design
88 Village Hill Rd. Northampton, MA 01060
413-369-4044
www.csld.edu

Designed By: Shayne Geiger and Ted Martini
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Shrubs for BCC

Learning Landscape and Living Laboratory

Berkshire Community College

Food Forests

A Food Forest, also known as an edible forest garden or a permaculture forest garden, is a designed agricultural system that imitates the structure and function of a natural forest ecosystem. Multiple layers of plants are carefully selected to grow symbiotically and provide food for people and wildlife.

Plants are arranged in distinct layers, such as canopy trees, understory trees, shrubs, herbaceous plants, climbers, and groundcovers, each serving different ecological functions. A wide variety of edible plants, including fruit and nut trees, perennial vegetables, herbs, and medicinal plants, are interplanted to create a resilient and productive ecosystem. Perennial plants are chosen that live for multiple years and provide a long-term source of food. This reduces the need for annual replanting. Food forests seek to emulate the ecological interactions found in natural forests, such as nutrient cycling, beneficial insect habitats, and symbiotic relationships between plants. Food forests aim to be low-input systems, requiring minimal synthetic fertilizers, pesticides, or herbicides. Edible forest gardens use organic cultivation methods and focus on soil health and water conservation. Food Forests are gaining popularity as sustainable alternatives to conventional agriculture, promoting regenerative practices and a closer connection to nature.

Food Forests at BCC can provide educational opportunities in addition to the bounty of food it would produce. Showcasing to students and the public how to create a Food Forest and the benefits of them. Not only do these systems benefit humans but they also provide habitat and food for wildlife and pollinators.

Special Opportunity: American Chestnut Restoration

BCC could consider joining an American chestnut restoration project. Recently, the State University of New York College of Environmental Science and Forestry developed a transgenic American chestnut tree that has blight resistance, referred to as D 58. As part of the restoration plan by the American Chestnut Foundation, they want individuals and institutions to grow pure American chestnuts to fruiting size that can then be bred with the new D 58 pollen to produce blight resistant seeds that can then be used to replant chestnuts into New England forests. As part of this plan they send pure American chestnut seeds or seedlings to individuals to grow them. BCC could participate to help restore a functionally extinct tree back into New England forests, an provide an educational opportunity for students and the public.

THE AMERICAN CHESTNUT FOUNDATION™

Native Plants to consider in Food Forests

Latin Name	Common Name	Plant Type	Light	Height	Soil Moisture	Bloom Time	Notes
Corylus americana	American Hazelnut	Shrub	FS, PS	6’-15’	D, M, W	Apr-May	Host plant, wide range of wildlife eat nuts, grows well under Black Walnuts
Hamamelis virginiana	American Witch Hazel	Shrub	FS, PS, S	10’-20’	D, M, W	Sep-Nov	Host plant, birds eat the fruit, important late season pollinator plant, grows well under Black Walnuts
Rubus odoratus	Purple Flowering Raspberry	Shrub	FS, PS, S	5’-8’	M	June-Aug	Wildlife enjoy berries, creates large patches, grows well under Black Walnut
Diervilla lonicera	Bush Honeysuckle	Shrub	FS, PS, S	1’-3’	D, M	June-Aug	Host plant, attracts many pollinators including butterflies, birds enjoy the fruits, drought tolerant, creates good hedgerows
Actaea pachypoda	White Doll’s Eyes	Shrub	PS, S	1’-2’	M	May-June	Berries are eaten by birds, thrives under Black Walnuts
Amelanchier arborea	Common Serviceberry	Shrub	FS, PS	15’-25’	D, M	March-Apr	Attractive fall foliage, benefits early pollinators, wildlife enjoy berries, edible to humans
Amelanchier canadensis	Canada Serviceberry	Shrub	FS, PS	10’-18’	D, M, W	March-Apr	Attractive fall foliage, benefits early pollinators, wildlife enjoy berries, edible to humans, drought tolerant
Aronia floribunda	Purple Chokeberry	Shrub	FS, PS	6’-8’	M, W	Feb-May	Early pollinator provider, berries are tart but can be eaten
Prunus maritima	Beach Plum	Shrub	FS	5’-6’	M	May	Needs two to cross pollinate, spreads, pollinator powerhouse
Prunus americana	American Plum	Shrub	FS, PS	4’-10’	D, M	March-Apr	Host plant, good for hedge rows, edible fruit to humans and wildlife
Rubus allegheniensis	Blackberry	Shrub	FS, PS, S	3’-5’	D, M	May-July	Host plant, pollinator powerhouse, wildlife and humans enjoy berries, need two individuals to cross pollinate
Rubus idaeus	Red Raspberry	Shrub	FS, PS	2’-5’	D, M	May-July	Host plant, pollinator powerhouse, wildlife and humans enjoy berries, drought tolerant
Rubus occidentalis	Black Raspberry	Shrub	FS, PS	3’-5’	D, M	May-July	Host plant, pollinator powerhouse, wildlife and humans enjoy berries, forms sizeable cluster
Sambucus nigra ssp. Canadensis	Black Elderberry	Shrub	PS	5’-8’	W	May-July	Host plant, attracts many pollinators and wildlife, fruits edible if cooked
Vaccinium corymbosum	Highbush Blueberry	Shrub	FS, PS	3’-8’	D, M, W	May-June	Host plant, pollinator attractor, edible berries for humans and wildlife
Vaccinium angustifolium	Lowbush Blueberry	Shrub	FS, PS	1’-2’	D, M	May-June	Host plant, pollinator attractor, edible berries for humans and wildlife
Vitis labrusca	Fox Grape	Vine	FS, PS	4’-40’	M	Apr-May	Host plant, pollinator attractor, edible berries for humans and wildlife
Ilex verticillata	Common Winterberry	Shrub	FS, PS, S	6’-10’	M, W	Apr-July	Tolerates poor drainage, need male and female plant for pollination, edible to birds, not humans
Cephalanthus occidentalis	Buttonbush	Shrub	PS, S	6’-12’	W	June-Sep	Pollinator powerhouse, fruits eaten by birds
Gaylussacia frondosa	Blue Huckleberry	Shrub	FS, PS	3’-4’	M, W	March-May	Host plant, pollinator attractor, edible berries for humans and wildlife
Prunus pensylvanica	Pin Cherry	Tree	FS, PS	15’-35’	D, M	Apr-May	Pollinator powerhouse, host plant, fruits eaten by many birds
Prunus serotina	Black Cherry	Tree	FS, PS	30’-60’	M	Apr-May	Pollinator powerhouse, host plant, fruits eaten by many birds
Asimina triloba	Paw Paw	Tree	FS, PS	12’-25’	M, W	Apr-May	Provides large tropical fruits, needs fair draining soil that stays moist, needs shade first 2 years of growing, then needs full sun after for optimal fruit production
Pyrus pyrifolia	Asian Pear	Tree	FS	15’-25’	M	March-May	Provides large fruits, needs two varieties for cross pollination
Castanea Dentata	American Chestnut	Tree	FS, PS	40’-60’ +	M	Apr-June	Hybrid of American and Chinese chestnut to create blight resistance, pollinator power house, wildlife food producer
Morus rubra	Red Mullberry	Tree	FS, PS, S	20’-30’	D, M	Mar-Aug	Needs a male and female tree, wildlife eat fruit and pollinated by many, host plant
Prunus persica	Peach	Tree	FS	12’-18’	D, M	March-May	Self fertile, grows large fruits, relatively pest resistant, needs well draining soil
Juglans nigra	Black walnut	Tree	FS, PS	75’+	M, W	May-June	Self fertile, grows large nuts, spreads
Juglans cinerea	Butternut	Tree	FS, PS	40’-75’	M, W	May-June	Pollinator powerhouse, host plant, produces sweet buttery nuts
Carya ovata	Shagbark hickory	Tree	FS, PS	50’-100’	D, M	April-May	Pollinator powerhouse, host plant, tasty edible nut

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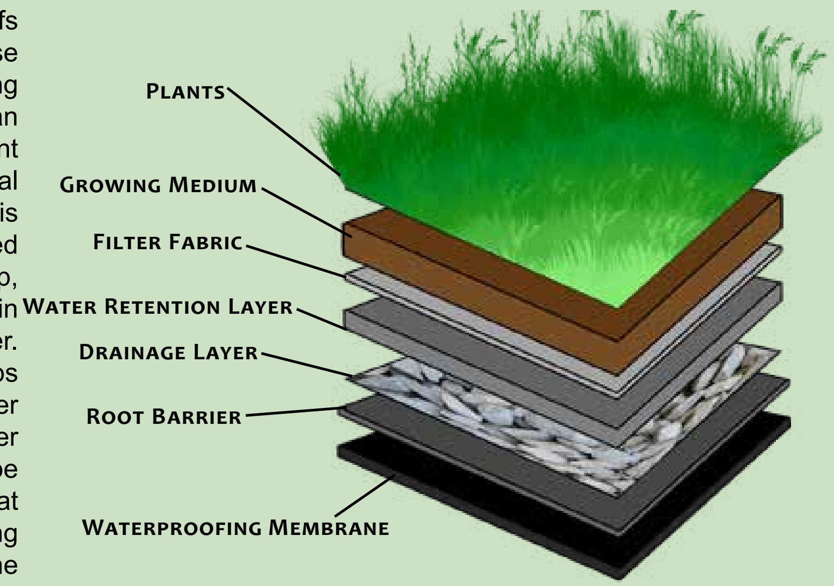
Food Forests
Learning Landscape and Living Laboratory
Berkshire Community College

Green Roofs

The campus-wide design proposes retrofitting the flat roofs of campus buildings with extensive green roofs. While these have a larger upfront cost, they pay for themselves in the long run, if major structural upgrades are not necessary, and can be installed in stages as the existing roofs reach the point when they need to be replaced. On existing roofs several layers are added to make them suitable for plants. First is a waterproofing membrane that would already be needed in a normal roof. Then a root barrier layer is added on top, which is usually a flexible polyethylene that does not contain chemicals or compounds that would leach out into water. Next is a drainage layer, usually a crushed stone, that helps to move excess water towards the drain. Above that is a water retention layer, sometimes made of mineral wool or other fabrics, that helps to slow and hold water on the roof to be available to plants for longer. Above that is a filter fabric that keeps soil out of the drainage layers, keeping them working effectively. Then the growing medium soil is placed above the filter, and finally the plants above that.



PV Covered Parking

Two large parking lots at BCC offer promising opportunities for incorporating Photovoltaic covered parking. This provides multiple benefits such as shade and weather protection for parked cars and substantial electrical outputs. The two parking lots shown with PV covered parking in the final design cover an approximate area of 150,000 square feet. If this total area was covered by solar panels, it could produce 1.76 million kilowatts of electricity per year. According to the U.S. Department of Transportation, Americans drive an average of 13,476 miles per year. An electric vehicle consumes 0.32 kilowatts per mile. PV covered parking at BCC could produce enough electricity throughout the year for 408 fully electric vehicles. Not only could BCC transition their entire facilities and educational departments fleet vehicles to electric and power them with the electricity produced on site, students and faculty with electric cars could also charge their vehicles on campus as well. The 1.76 million kilowatts of electricity produced would save almost 4 million pounds of CO2 from being released into the atmosphere each year if that electricity had been produced in a coal burning power plant.

In the existing islands between rows of parking, native shade loving plants such as shrubs and ferns can be planted in swales and infiltration areas for capturing the rain runoff from the PV panels. Managing this stormwater on site will not only help keep waterbodies downstream cleaner but also help increase water infiltration on site and improve the campus' climate resiliency. By recharging groundwater and rehydrating the landscape on campus, BCC will increase it's resiliency as droughts are expected to increase with climate change and utilizing stormwater on site will help reduce negative effects in those extreme weather patterns.

renewableenergymagazine.com

BioSolar Roofs

Green roofs help improve the energy efficiency of buildings by increasing the insulation of the roofs, keeping buildings cooler in the heat and warmer in the cold. This will decrease the amount of energy used to control the temperature within the buildings. Green roofs help to slow down, filter, and evaporate stormwater. Instead of rainwater being quicky funneled into combined sewer and stormwater pipes, green roofs allow rainwater to be absorbed by plants and soil on the roofs where the rain falls. This puts less water in sanitary sewer systems that can overflow when large amounts of stormwater enter them and helps keep waterbodies clean, which is an issue in Pittsfield (*Britton-Mehlisch*). This water gets absorbed and used by plants and through photosynthesis and evapotranspiration is returned to the atmosphere. The excess water that does exit the roofs also has fewer pollutants than water that would exit a traditional roof after it filters through the soil and plants. These plants sequester carbon from the atmosphere, reducing greenhouse gases. They also provide habitat and flowers that can be utilized by pollinators. Using this space increases the effectiveness of a pollinator campus by utilizing a space that currently has no pollinator value.

icbprojects.co.uk

When green roofs are used under solar panels, they increase their efficiency. On hot days panels lose efficiency because they get above their optimal operating temperature (*Green roofs and solar power*). Green roofs under solar panels, also known as Biosolar roofs, help to cool the roof and underside of the solar panels because of evapotranspiration and reduce the heat island effect, making the panels more efficient on hot and cold days, as much as 20% at peak times (Velazquez).

Lastly green roofs last generally twice as long as conventional roofs (*Green Roofs*). Because of the many environmental benefits, their long-term cost savings (224% ROI), and improvement of solar panel efficiency, the campus-wide design includes retrofitting the BCC roofs to be Biosolar roofs when possible. These Biosolar roofs could be another educational example for students and visitors and a chance for BCC to be a leader in the region.

the Conway School
Graduate Program in Sustainable Landscape Planning + Design
88 Village Hill Rd. Northampton, MA 01060
413-369-4044
www.csld.edu

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Green Roofs and Solar

Learning Landscape and Living Laboratory

Berkshire Community College

An example of a pathway signage at Greenfield Community College

An example of interpretive signage identifying a garden plant

Interpretive Signage

Plant interpretive signage refers to the use of informational signs or panels placed near plants to provide educational and interpretive content to visitors. These individual plant signs can include any combination of plant information including the common and scientific names of the plant, the plant's physical features, such as its size, shape, color, and unique characteristics, information about the natural habitat and geographic range of the plant, the plant's role within the ecosystem, including its interactions with other plants, animals, and insects. It can describe how the plant contributes to pollination, habitat creation, or food sources for wildlife, showcasing the intricate web of ecological relationships. Plant signage can be an excellent opportunity to inform on conservation efforts related to the plant or highlight any threats or challenges the plant faces in its natural habitat. This can inspire visitors to take action to protect plant biodiversity and habitats. This signage may even provide practical advice on the care and maintenance of specific plants. Plant interpretive signage can also go beyond factual information and incorporate interpretive elements including anecdotes, stories, or interesting facts about the plant, engaging visitors and creating a more immersive experience.

Self-Guided Tours and Campus Way-Finding

Campus 'way-finding' refers to the process of helping individuals navigate and find their way around campus, providing clear and concise directions, signs, maps, and other tools to assist people in locating specific buildings, facilities, departments, or points of interest within the campus environment. The campus at BCC currently has two campus maps placed at the beginning of the path leading from the student parking area and along the path leading from the faculty parking lot. This plan incorporates the use of informative maps and information kiosks, one placed where the student parking area map is now located, and another at the main entrance of the public garden. Within these kiosks, maps would include clear graphics of the walkways through campus, the paths throughout the various gardens, and the walking trails through the meadows and forested areas. Space in the kiosks could also serve as school or community posting boards for students, faculty and staff to share information about upcoming events, post important notices, or relate other information to the public.

In addition to the trailhead kiosks, the strategic placement of numerous signs along the walkways, paths, and trails would highlight various information of the section of the path that might be of interest to students and visitors alike. These kiosk maps and pathway signs could work together to offer a self-guided walking tour through the campus and could share information about the specific areas where they are positioned.

The design of these kiosks and accompanying path signs could take an aesthetic form that relates well to the existing architecture of the campus structures and other elements and could compliment the collection of public art currently placed around the campus.

Information kiosks could take many aesthetic forms

QR Coded Plant Labels

The purpose of QR code plant signage is to enhance the visitor's experience by offering convenient smartphone access to detailed information about the plants and their environment. Users can access a wealth of knowledge in a digital format, often with multimedia elements like images, videos, or audio recordings. Signs or labels with QR codes are strategically placed near individual plants or in designated areas of a public garden. Each sign contains a unique QR code that corresponds to a specific plant or plant category. When a visitor scans the QR code using their smartphone camera, the smartphone is instantly redirected to a designated webpage or digital content associated with the plant. Visitors can then access a range of information about the plant, such as its common and scientific names, description, habitat, care tips, and related facts. This information is compiled by the person who set up the QR code generator and can include any digital information.

Benefits of using QR code signage as a self-guided walking tour for visitors include detailed information sharing, minimal visual disruption of larger plant signs, and real-time updates. Information about plants can change over time, and new insights or research may become available. QR code plant signage allows for the information to be updated as needed, ensuring accuracy.

QR codes can also be used to gather data on visitor engagement and interests. By analyzing the usage patterns and the content accessed through the QR codes, public gardens can gain insights into visitor preferences, popular plants, and areas of interest, enabling them to adapt and improve their exhibits and educational programs.

Finally, the use of QR codes as informational tools in public or educational gardens is an eco-friendly approach with less environmental impact for plant and garden signage. Rather than printing and updating physical signage for every plant, QR code plant signage reduces the waste of paper and other standard sign materials due to the ability to update digitally or even reuse QR signage for different purposes. It promotes a more sustainable approach to providing information to visitors.

The campus of Smith College in Northampton, MA offers QR code plant labels for visitors and students to identify and gain information on certain plants.

Using a smartphone QR code reader on the image above will lead you to a database of information on a particular tree at Smith College.

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Partnerships and Programming

This plan began as a collaborative effort between the Upper Housatonic Valley National Heritage Area organization and Berkshire Community College with the intention of planning for a more climate-resilient campus that offers educational opportunities to the Berkshire region. This model of collaboration between organizations and institutions that share a mission of strengthening ecological health and offering educational opportunities within the region can serve as a starting point for the process of enhancing and implementing this plan in the future. The Berkshires are home to a wide variety of organizations, groups, and businesses that could benefit from partnerships with BCC and could offer skills, knowledge, and volunteer services that would help to achieve this plan's goals.

Working with organizations outside of the college's structure will increase community involvement with the campus and result in additional public exposure to the ecological principles this plan presents. Local businesses such as native plant nurseries could increase public awareness of the availability of more ecologically sound plants in the region, Youth-focused groups could offer healthful and educational experiences to those they serve, and other educational institutions could share in the use of the campus for their specific horticultural or environmental programming.

This plan explores a wide range of topics within the overall goal of expanding the ecological health of the site. Special interest groups that are interested in any one of the many aspects involved in this plan, acting as partners in the implementation, growth, and use of the campus, will help to achieve the goal of community education and involvement.

Master Gardeners Demonstration Gardens

The Master Gardeners program of El Dorado County, California has developed and continues to maintain a public demonstration garden on the campus of Folsom Lake Community College in Placerville, CA. The garden aims to educate the general public on sustainable horticulture and pest management practices based on traditional, current, and evolving research by providing hands-on, interactive experiences on research-based, sustainable gardening practices specific to the west slope of El Dorado County, appropriate for all ages, and cultures, and gardening experience. There are 16 individual demonstration gardens ranging from a Shade Garden to the Rock Garden. This garden is open to the public and offers group tours and public education classes presented by the local county Master Gardeners group in association with the county agricultural extension office.

Allegheny College Partners with the Foundation for Sustainable Forests

Many collaborative projects between Allegheny College PA and the Foundation for Sustainable Forests (FSF) illustrate the institutional and educational benefits to the college and the practical advantages for the organization partnering with the school. The Foundation for Sustainable Forests, located in northwestern PA, has engaged in numerous collaborative projects with Allegheny College including a 2016 logging operation near the Robertson Athletic Complex at the college. Focused on controlling invasive plants in the forest and removing diseased, damaged, and weak trees, the project involved students and employees working together to prepare the land for a timber harvest that was carried out with the use of horse-drawn logging teams. The project succeeded in promoting the growth of ecologically and economically valuable trees while also teaching students lessons in sustainability.

With this project, Allegheny has taken the important next step of ensuring that Robertson Forest is managed and used well. Academically, this collaboration allowed students to play a large role in the project, from the hands-on work of cutting invasive plants to the more academic aspect of preparing a plan for future forestry projects. Other collaborative projects like this have provided enthusiastic and purpose-driven students who further FSF's goals, while simultaneously engaging students in real-life applications that showcase classroom theory and knowledge. ('timber!')

Programming Case Studies

The Public Garden design of this plan is intended to create educational opportunities for students and the community of the Berkshires region. One example of the potential of an on-site public garden offering programming possibilities for higher education is found on the site of the Niagara College, Canada. The 125-acre Daniel J. Patterson Campus in Niagara-on-the-Lake serves as a living lab that offers hands-on experiential learning. Niagara College is Ontario's only college where students are responsible for maintaining the campus landscape while earning either a Landscape Technician or Horticultural Technician certification. The Niagara-on-the-Lake campus is the first postsecondary institution in Canada to be recognized as a Certified Audubon Cooperative Sanctuary (*Niagara College Canada*).Another model for educationally focused management and care of a college campus is the Sandhills Horticultural Garden.

Sandhills Garden is a renowned botanical garden located on the campus of Sandhills Community College in Pinehurst, North Carolina. It is a 32-acre public garden in the heart of the Sandhills region, known for its distinctive flora and fauna. The gardens feature a diverse collection of plants, including both native and exotic species, carefully curated to showcase the beauty and diversity of plant life. The primary mission of the Sandhills Horticultural Gardens is to serve as the basis of Sandhills Community College's landscape gardening associate degree program and is designed and maintained to provide hands-on training and practical experience within the context of the gardens. This approach provides opportunities for students to participate in the planning, design, installation, and maintenance of specific garden areas or projects. The Sandhills Horticultural Gardens are open to the public and serve to educate visitors about horticulture, conservation, and sustainable gardening practices (*Horticultural Gardens*)

Sandhills Horticultural Gardens

Students Ruthie Schwab, Diana Bonaccorsi and Ben Elga tend "The Garden Project"

Photo: Denise Applewhite

Student Initiatives Case Study

"The Garden Project" is a student initiative on the campus of Princeton University at Forbes College and is overseen by the school's Office of Sustainability. This student-led project aims to educate the campus about the American food system and its implications for the environment, health and nutrition, culture, and the future. The Princeton Environmental Institute has provided a student internship for a project coordinator and a garden apprentice. Part-time student summer work at the garden is funded through the Office of Sustainability.

Shana Weber, the University's sustainability manager, said the Garden Project reflects the kind of holistic approach she is working toward at the university level.

"Although it is still in a pilot stage, I see the garden becoming a great way to begin conversations on campus about the environment and sustainability," Weber said.

"… students aren't just interested in planting vegetables and flowers. They're interested in using the garden as an educational tool to help people learn about sustainable food systems, and they're inviting in a very diverse group of partners to help them accomplish that."

Patrick Caddeau, director of studies at Forbes College, said Forbes has been glad to provide space and some startup funding for the garden. He said administrators are looking forward to incorporating the garden into the college's efforts to promote environmental awareness, including a cook-off planned for freshman orientation where student chefs will prepare meals featuring items from the garden.

The student gardeners are also seeking interdisciplinary opportunities to connect academic departments with the garden. The student Project Coordinator said she hopes to enlist creative arts students to paint a mural on the wall facing the plot and has had preliminary discussions with students from the School of Architecture about holding a design contest to build a low-impact greenhouse (*Garden project aims to educate campus about food choices and Sustainability*).

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Housatonic Heritage

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