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DEPARTMENT OF LANDSCAPE ARCHITECTURE

NATURE AND UNIVERSITY PARK:
CREATING A FOREST NETWORK WITHIN THE PENNSYLVANIA STATE
UNIVERSITY'S FLAGSHIP CAMPUS

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ABSTRACT

This thesis explores the development of a master plan of forested spaces and pockets on The Pennsylvania State University's University Park campus. Using historical precedents of campus design and Penn State's deep connection to forest landscapes, the thesis argues that a network of forested campus spaces would be an ecological and social asset to Penn State — increasing wildlife patches and corridors, improving ecological functioning and decreasing costs, and providing a cultural amenity which will increase health and serve as a research and educational tool.

All areas of the core University Park campus which are strong candidates for forest spaces are identified, but the thesis focuses primarily on creating a forest network connecting historic woodlots and historic canopy trees on the northern of campus, linking Hort Woods Proper, Hort Woods Remnant, Hartley Woods, Picnic Grove, and the canopy trees of the Nittany Lion Inn, stringing together a forested "emerald necklace" for Penn State's flagship campus. Three other focus areas for forest networks on the campus are also outlined for consideration. Within this thesis, design, implementation, and management strategies for successful forest spaces are discussed.

This thesis attempts to prove that new ecological goals can integrate meaningfully with a campus that has existed for over 160 years, evolving the design of the University Park campus to connect with the native landscape, strengthen the sense of place, and exemplify the values of Penn State.

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Chapter 1

THE ACADEMIC CAMPUS AND ITS LANDSCAPE — A DESIGN HISTORY

When considering the lineage of academic campus design, one thing is clear: the design of the campus is a reflection of institution's values. Often, these values run parallel to the values of the surrounding society. In this way, campus's act almost as a demonstration, embodying the ideals at a society's core.

Today, a typical campus aesthetic is easily recognized, a language that we understand, but which has taken thousands of years to evolve. As society changes, pieces and parts of the campus aesthetic are carried through, creating a layered palimpsest of campus design aesthetics and expectations. This is the vocabulary we expect to read in the campuses of today, but what is its origin? In this chapter, the long history of the connection between academy and landscape will be summarized, ending with the question: What comes next?

Plato's *Akadēmeia*



Figure 1. Plato conversing with his pupils¹

The word *academy* has its origin in the Greek word *Akadēmeia*, meaning "The grove of *Akadēmos*"². Founded by Plato in the 4th century BCE, the institution began in a grove of olive trees beyond the city walls of Athens, a sacred grove named for the Greek hero of the Trojan War *Akadēmos*)³. Often credited as among the earliest, if not *the* earliest, institutions of higher learning, *Akadēmeia* was a destination —people from across Greece gathered here to research, theorize, and discuss the universe. Lectures focused on mathematics, natural science, astronomy,

¹ Ancient Greece - History and Heritage. Ancient Greece - History and Heritage .
<https://wizzley.com/ancient-greece/>. Accessed April 27, 2020. <https://wizzley.com/ancient-greece/>.

² "Academy (n.)." Online Etymology Dictionary. Douglas Harper. Accessed April 27, 2020.
<https://www.etymonline.com/word/academy/>.

³ Trelawny-Cassity, Lewis. "Plato: The Academy." Internet Encyclopedia of Philosophy. Accessed April 27, 2020. <https://www.iep.utm.edu/academy/>.

dialectics, philosophy, and politics, taught first only by Plato and then joined by other prominent philosophers and sophists (including Aristotle, who would go on to found his own academy⁴). As Athens flourished, an energetic center of culture and thinking, Plato's *Akadēmeia* flourished alongside it — the sacred grove gaining a religious precinct and public gymnasium³.

The first institution of higher learning, nestled within the silver-leaved olive trees, lasted until 86 BCE, when the *Akadēmeia* was destroyed by fire; a likely casualty of the siege of Athens.

Though the institution was not reconstructed, academies continued to thrive in Greece, dispersed like seeds from Plato's parent *Akadēmeia*. Institutions of higher learning continued into the Roman era⁴.

It wasn't until the rule of Justinian I, the Eastern Roman Emperor from 527 to 265 AD, that the academy began to flounder.⁴ Justinian I believed that philosophical schools, with their Greek origin, were tainted with polytheism and, therefore, heretical. Academic institutions were permanently closed.⁵

Though the enlightened school of learners, seeking answers to questions of the nature of the universe, no longer lived in the olive groves beyond Athens, Plato's *Akadēmeia* is often cited as the first recorded example of higher learning. The medieval ages brought a period of darkness, but when the Renaissance sparked in the 17th century, scholars and philosophers of the Age of

⁴ "What Was Plato's Academy and Why Did It Influence Western Thought?" DailyHistory. Accessed April 27, 2020. https://dailyhistory.org/What_was_Plato's_academy_and_why_did_it_influence_Western_thought?

⁵ Hussey, Joan Mervyn. "Justinian I." Encyclopædia Britannica. Encyclopædia Britannica, inc., February 17, 2020. <https://www.britannica.com/biography/Justinian-I>.

Enlightenment looked back to ancient Greece, remembered Plato's *Akadēmeia*, and, inspired, copied it.



Figure 2. School of Athens Fresco by Rapael, 1509⁶

The Medieval University

Cathedral schools, the university's precursor, were overseen by the cathedral clergymen. At their beginning, aspiring priests were the school's only students, but later they enrolled a broader range — boys of noble blood or boys aspiring to positions in the church or state, yet the schools often taught less than 100 students.⁷

⁶ School of Athens http://gogeometry.com/geometric_art/school_athens_perspective.html

⁷ The Editors of Encyclopaedia Britannica. "Cathedral School." Encyclopædia Britannica. Encyclopædia Britannica, inc., June 27, 2013. <https://www.britannica.com/topic/cathedral-school>.

The earliest medieval universities arose in the High Middle Ages, surfacing in Italy, England, France, and Spain. Schools were set up wherever there was space, often in churches. When the schools grew too large for the churches, they began to build separate specialized campuses, the architecture of religion (in particular the monastery) was a heavy influence on the campus⁸.



Figure 3. Meeting of doctors at the University of Paris⁹

Monasteries were designed as small self-sufficient cities. Farms, stables, and wineries surrounded the complex, supporting the monasteries' independence¹⁰. Placed prominently in the monastery's layout was the church, the center of activity around which secondary buildings were organized, arranged as a series of cloisters. Originating from Latin, the word *cloister* means

⁸ "Medieval Universities." History Learning. Accessed April 27, 2020.
<https://historylearning.com/medieval-england/medieval-universities-index/medieval-universities/>

⁹ Image source: <https://historylearning.com/medieval-england/medieval-universities-index/medieval-universities/>

¹⁰ "Medieval Monasteries: Facts, Types, Architecture & Functions." School History. Accessed April 27, 2020. <https://schoolhistory.co.uk/notes/medieval-monasteries/>.

“closed place”, the architecture of the cloister creates an open space isolated and guarded from the dangers of the world outside¹¹. A quadrangle is closed off on each side by tightly fitted buildings, arcades running along their facades, pillars holding up the weight of the open passages and dotting the borders of the inside green space¹²

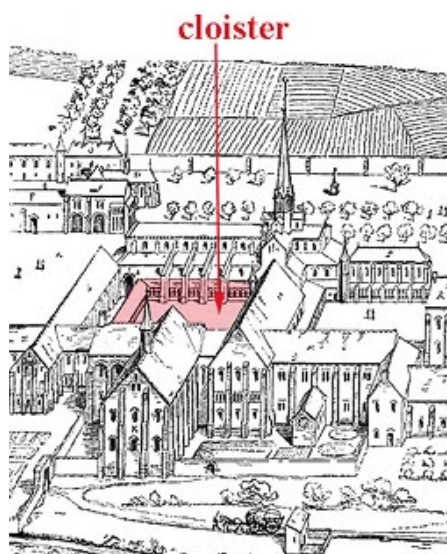


Figure 4. Drawing depicting a cloister of a medieval monastery¹³

This architectural language is associated with the *Hortus conclusus*, the medieval enclosed garden, suggesting pureness and impregnability and often depicted in medieval artwork as a backdrop for the Virgin Mary, as a reference to the Garden of Eden, or in association with the

¹¹ “Cloister.” Glossary of Medieval Art and Architecture. Accessed April 27, 2020.
<https://www.pitt.edu/~medart/menuglossary/cloister.htm>.

¹² “Cloister.” Glossary of Medieval Art and Architecture. Accessed April 27, 2020.
<https://www.pitt.edu/~medart/menuglossary/cloister.htm>.

¹³ Cloister. Glossary of Medieval Art and Architecture. University of Pittsburgh. Accessed April 27, 2020.
<https://www.pitt.edu/~medart/menuglossary/cloister.htm>.

Old Testament¹⁴. Religious life and principles were built into the structure of the monastery, inseparable from the architecture, so when universities rooted in religion began laying out plans, monasteries were the model they copied.



Figure 5. The *Hortus conclusus*¹⁵

Oxford, the oldest English-speaking University still existing, began enrolling students as early as 1096. In medieval England, where the Church was a dominant, powerful force, higher education and religion were closely intertwined. Oxford and Cambridge, another of the earliest medieval universities in England, developed alongside their respective towns, Oxford and Cambridge. The model of the Monastery, closed-off and independent, provided separation and a defensive advantage.¹⁶ Although no longer for reasons of self-defense, the separation of campus and town

¹⁴ “Hortus Conclusus.” The National Gallery. Accessed April 27, 2020.
<https://www.nationalgallery.org.uk/paintings/glossary/hortus-conclusus>.

¹⁵ Image source: <https://artsandculture.google.com/asset/the-little-garden-of-paradise-upper-rhenish-master/pQEwgEtFSO-tiw?hl=en>

carried through campus design — the campus functioning as its own city, distinctive and enclosed. Quadrangles and cloisters were carried through campus architecture, later traveling across the Atlantic and establishing in the early form of colonial campuses of the United States, cementing themselves in our collective consciousness as an expected component of a well-designed campus.¹⁶

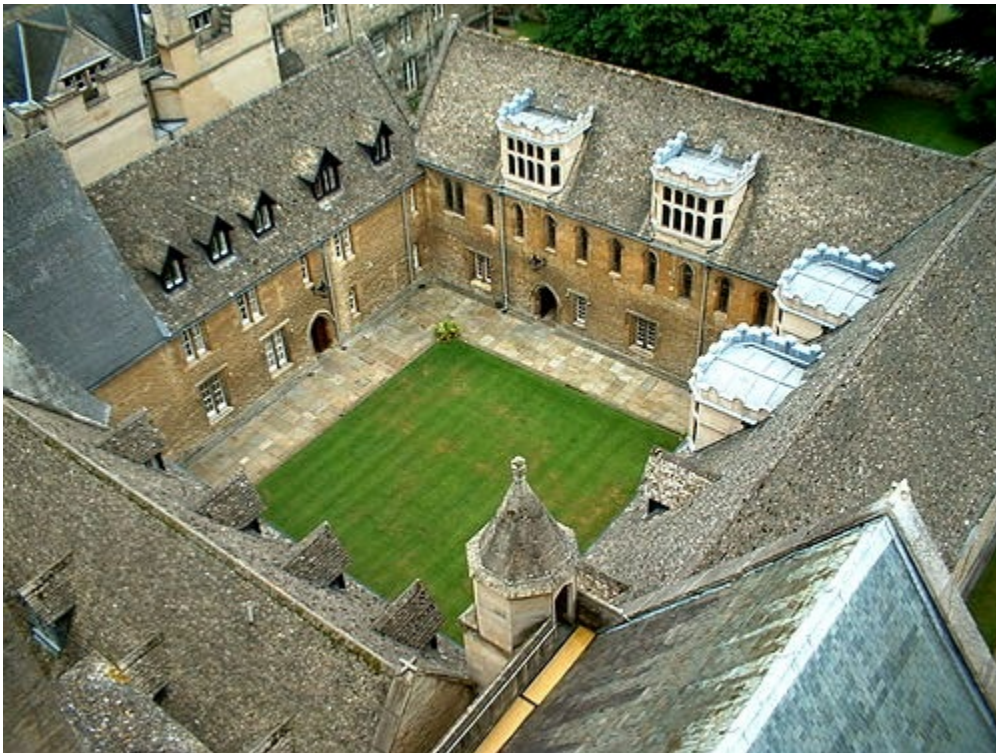


Figure 6. Aerial View of the Mob Quad at Oxford University¹⁷

¹⁶ Turner, Paul Venable. *Campus, an American Planning Tradition*. New York: Architectural History Foundation, 1984.

¹⁷ Image Source: <https://www.campusoxford.com/what-is-a-quad/>

The American University

Taking precedence from Europe, the earliest colonial universities began as deeply religious and inwardly focused institutions — adjacent to but separate from the nearby small towns that were potential contaminants to the pure scholarly mind. Nevertheless, the organization of colonial colleges varied from their European ancestors, a result of sometimes a lack of resources, sometimes of differentiating ideals. Harvard, the oldest American university (established 1636), began as one building and evolved into an open quadrangle, distinct from the closed quadrangles of Oxford. Partially this was a precaution: the stone of the medieval universities resisted fire; the wood used in colonial construction did not. But the Puritan influence of New England — there is reminiscence of a village green found in the buildings' layout. For decades, religious and European forms remained powerful forces in shaping the earliest American Universities.

Then, a dramatic turning point. Thomas Jefferson (founding father, politician, lawyer, architect) single handedly redefined the nature of the American campus, stitching American ideas into the university fabric with clever idealist forms and structures. Before Jefferson, higher education was inseparably religious and offered to only the wealthy, which contradicted sharply with Jefferson's beliefs. With a solid education, Jefferson believed, the average American citizen could learn to defend his liberties and defend democracy — he is quoted saying: "It is safer to have the whole people respectively enlightened than a few in a high state of science and the

many in ignorance.”¹⁸ Jefferson, believing fervently in democracy and separation of church and state, criticized the European inspired New England universities as elitist and ecclesiastical, their architecture unsuitable for democratic learning. He wrote: “Much observation and reflection on these institutions have long convinced me that the large and crowded buildings in which youths are pent up are equally unfriendly to health, to study, to manners, morals, and order.”¹⁹

Jefferson designed instead what he called an “academical village”. The University of Virginia boasts a lush green lawn, its edges defined by neatly placed pavilions. At the university's center, where traditionally a church would stand, Jefferson fixed the University library, modeled on the Pantheon, recalling antiquity. The campus opened up on one side to face the landscape, a departure from the tightly closed structure of European Universities. Like Plato's *Akadēmeia*, the University of Virginia's campus was an egalitarian utopia for thinkers to gather and democracy to thrive.

¹⁸ “Thomas Jefferson's Plan for the University of Virginia: Lessons from the Lawn .” National Park Service. U.S. Department of the Interior. Accessed April 27, 2020. <https://www.nps.gov/articles/thomas-jefferson-s-plan-for-the-university-of-virginia-lessons-from-the-lawn-teaching-with-historic-places.htm>.

¹⁹ “Thomas Jefferson's Plan for the University of Virginia: Lessons from the Lawn .” National Park Service. U.S. Department of the Interior.

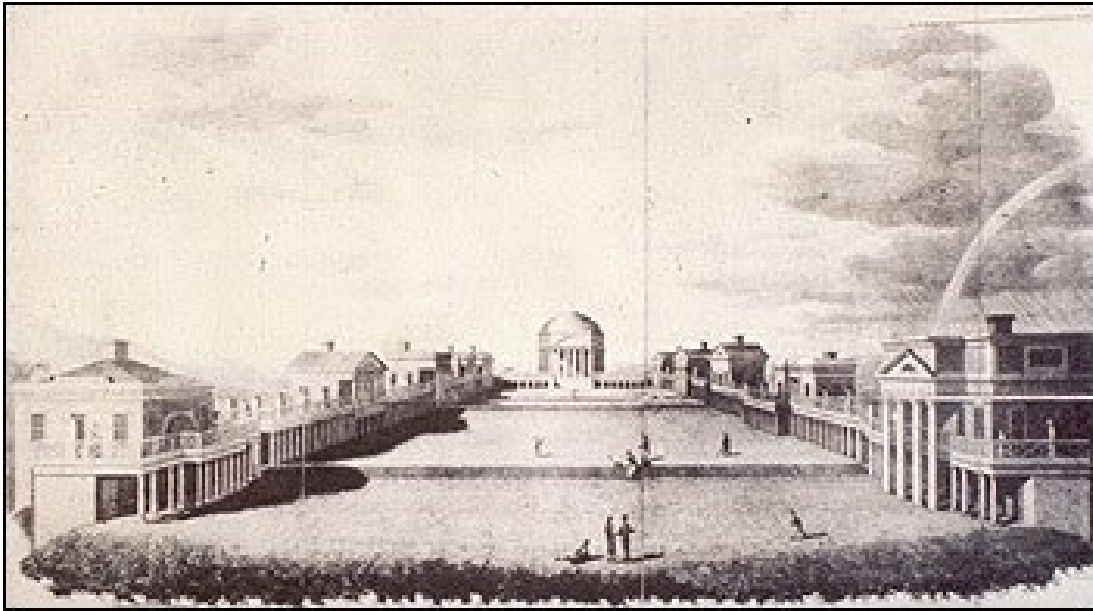


Figure 7. The University of Virginia²⁰

The University of Virginia was a pivot away from the tight structure and high walls of preceding campuses. Jefferson turned his back on many key aspects of European campus design, but in doing so he turned to face the English estate. A landscape design movement arising in England in the 1760s, the Picturesque created landscapes that were controlled portraits of nature. Soft sweeping lawns, carefully spontaneous plantings, subtly framed vistas, gently curving lines, architectural structures made to look weathered and archaic, the Picturesque Movement characterized the English estate. On trips to England, Thomas Jefferson visited and admired the picturesque gardens — so different from the strict geometry of France and the untamed landscapes of America.²¹ Inspired, Jefferson packed up picturesque design principles and

²⁰ Image Source: <https://www.nps.gov/articles/thomas-jefferson-s-plan-for-the-university-of-virginia-lessons-from-the-lawn-teaching-with-historic-places.htm>

²¹ Wilson, Richard Guy. "Thomas Jefferson's Architectural and Landscape Aesthetics: Sources and Meaning." Lifetime Learning. University of Virginia, May 25, 2015. <https://alumni.virginia.edu/learn/2015/05/25/thomas-jeffersons-architectural-and-landscape-aesthetics-sources-and-meaning-final-part/>.

brought them home with him — his own estate, Monticello, was built to embody the English picturesque.



Figure 8. Monticello and the picturesque²²

Olmsted's Impact: The Stanford Campus

Fredrick Law Olmsted, like Thomas Jefferson, was a student of the picturesque. Olmsted, often referred to as the father of landscape architecture, played a tremendous role in the design of American public space, responsible for many of the most beloved American parks,

²² Image source: <https://www.visitcharlotteville.org/things-to-do/history-museums/monticello/>

neighborhoods, and campuses and single handedly changing the nature of American urban design.

Olmsted's philosophies were distinct in an important way. Many of his ideas he gathered from the writings of William Gilpin and the drawings of Humphrey Repton, great forces of the picturesque movement. However, Olmsted was unique in his sense of the importance of place — Olmsted believed fiercely that designs were most beautiful when integrated carefully with the natural landscape, and throughout his career advocated for the importance of providing people with democratic, accessible, and naturalistic green spaces. When he designed, Olmsted carefully tailored his interventions to fit seamlessly with their surroundings, customizing his solutions to what was already, and what stretched just beyond, the site.

Fredrick Law Olmsted's career began in the mid-nineteenth century, aligning with a period of national expansion. In the 1860s, transcontinental railroad and the Homestead Act coincided to push Americans Westward. Closely behind, the Morrill Act of 1862 spread higher education throughout the US, forming land grant colleges (such as Penn State) and further expanding American higher education.²³

²³ Turner, Paul Venable. *Campus, an American Planning Tradition*. New York: Architectural History Foundation, 1984.



Figure 9. The Stanford campus²⁴

In 1869, Leland Stanford drove the last spike, the golden spike, into the transcontinental railroad. With a fortune to spend, the railroad tycoon set his sight on founding a new university: Stanford.²⁵ The campus would live as a memorial to his deceased son. Stanford commissioned Olmsted, the renowned landscape architect whose expertise was in high demand. Yet the two men butted heads, each with their own vastly different world view, each with their own dream of the perfect campus design. Olmsted proposed for the university to integrate quietly into the foothills of the estate, creating a campus which would unfold subtly and gracefully, hugging the slopes of the landscape.²⁶ Stanford bluntly turned Olmsted's proposal down. A memorial to his son, the university would be grand and bold and fearless, and Stanford lowered the campus off the foothills and stretched it out across the flats of the estate. Stanford desired the formal and venerable structure of the New England University, and Stanford was built with a church and a series of quads.

²⁴ Image Source: <https://stanfordmag.org/contents/a-gentleman-s-quarrel>.

²⁵ Arnold, Daniel. "A Gentleman's Quarrel." STANFORD magazine, 2017. <https://stanfordmag.org/contents/a-gentleman-s-quarrel>.

²⁶ Arnold, Daniel. "A Gentleman's Quarrel." STANFORD magazine, 2017. <https://stanfordmag.org/contents/a-gentleman-s-quarrel>.

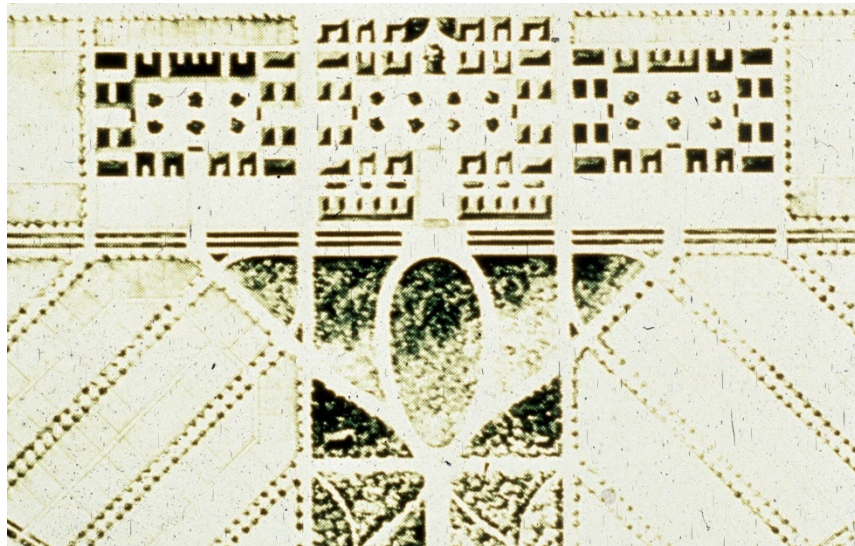


Figure 10. The Stanford plan: a compromise²⁷

Forced to sacrifice much of his control, Olmsted relented to many of Stanford’s demands, but he stood firm when Stanford asked for the wide-open lawns of green grass he had seen on his trips to the universities of New England. They would be better off, Olmsted explained, to look to Spain for inspiration — the Mediterranean climate of California was not conducive to the thirsty green lawns New England’s climate could support. More than a century before the Californian xeriscape trend of today, Olmsted understood that native plantings were the more logical option. When tracing the patterns of the natural landscape, of the native vegetation, Olmsted knew design is stronger and place is more memorable. Stanford conceded, and the main quad was paved and filled with circular planters holding native Californian plants and trees. Cathy Blake, the current director of campus planning, comments in an article in the *Stanford Magazine* on Olmsted’s plant palette for the University, saying that his choices “seem to anticipate global warming and multiyear droughts” by prioritizing perennial natives. Blake tells

²⁷ Image Source: <https://125.stanford.edu/olmsteds-master-campus-plan/>

the reporter that today, she can use Olmsted's planting plans with hardly any change.²⁸ Despite Olmsted's frustrations with Stanford, the Palo Alto campus had shifted the conversation on campus design in the American West. The seed was planted for native plants and regionally appropriate architecture. Less than a century later, Olmsted dream of a campus seamlessly integrated with the landscape was realized.

The Santa Cruz Campus: Melding with the Landscape



Figure 11. Boardwalks at UC Santa Cruz²⁹

The University of California at Santa Cruz, characterized by sloping topography and towering redwoods, is a 2000-acre campus designed to harmonize with nature. On three sides of the campus California State Parks and nature preserves drift across the horizon. The UCSC campus

²⁸ "Olmsted's Master Campus Plan." Stanford 125, August 28, 2018. <https://125.stanford.edu/olmsteds-master-campus-plan/>.

²⁹ Image Source: <https://tclf.org/uc-santa-cruz-may-develop-its-east-and-west-meadows>

is beautifully attuned to, and accommodating of, its surroundings. Here, there is a poignant and wonderful sense of place.

Founded in the late 1950s, the campus was planned by renowned Landscape architect Thomas Church, a pioneer of modernism and creator of iconic Californian landscapes such as the Donnell Garden. Decades after Fredrick Law Olmsted's death, his mission was continued in the hands of Thomas Church — The UCSC campus's design was largely influenced by Olmsted's Yosemite Report.³⁰

On a trip to California, Olmsted had toured the landscape of Yosemite, and, enamored with the startling beauty of steep cliff faces and ancient sequoia trees, he penned the historic report: Yosemite and the Mariposa Grove.³¹ With passion and reverence, Olmsted argued for minimal human intervention in natural scenery. In the report, Olmsted argues: "This duty of preservation is the first which falls upon the State under the Act of Congress, because the millions who are hereafter to benefit by the Act have the largest interest in it, and the largest interest should be first and most strenuously guarded."³² The report is thought to have provided the basis for, and the creation of, Yosemite National Park.

³⁰ "Olmsted's Master Campus Plan." Stanford 125, August 28, 2018. <https://125.stanford.edu/olmsteds-master-campus-plan/>.

³¹ Oakes, Bob, and Shannon Dooling. "150 Years Ago, Olmsted Released His Historic Yosemite Report." wbur, August 7, 2015. <https://www.wbur.org/news/2015/08/07/olmsted-yosemite-report>.

³² Yosemite and Mariposa Grove, Preliminary Report 1865.



Figure 12. Yosemite National Park

Recognizing the purity and grandeur of the land before him, Thomas Church planned the UCSC campus with Olmstedian principles in mind: the campus is situated on a “series of marine terraces,” transected by stretches of ravines.³³ Church writes about his vision for the campus in 1962, saying: “The wall to wall forest carpet will disappear and, in its place, must come – not the asphalt jungle, not the standard campus we have always known, not an automobile under every redwood – but a vast area in which to live and stay. It must be magnificent in conception, daring and forthright in its architecture – but gentle be the hand it lays upon the land.”³³ The vision came to pass. Ten distinct colleges form clusters of buildings, not emulating a specific architectural style but instead each cluster camouflaging quietly into its local natural setting. The landscape of the campus is complex, embracing the presence of shaded quarries, sunny meadows, redwood forests, sloping hills, and enticing views of the Pacific Ocean.

³³ Whitesides, Amy. “U.C. Santa Cruz May Develop Its East and West Meadows.” The Cultural Landscapes Foundation. Accessed April 27, 2020. <https://tclf.org/uc-santa-cruz-may-develop-its-east-and-west-meadows>.



Figure 13. A meadow at UC Santa Cruz³⁴

For decades, the UCSC campus lived quietly between lush meadows and beneath the Redwoods. But time has worn at the campus, and as the University expands and demand for space grows, Church's vision is sometimes forgotten and sometimes threatened. For some, the wild open meadows are seen not as tranquil escapes and places of reflection, but as unclaimed building ground. Some battles were lost, and many were fought and won. Olmstedian principles have stood time's test, and so has the USCS campus.

Recommended by Church, Robert Royston (another prominent Modernist landscape architect) designed the UCSC amphitheater in 1967. Cradled by rocky topography, the amphitheater is perfectly situated in the campus's forested ravines, seeming almost to have been sculpted by the forces of nature rather than built by the hands of men — a stage juts out asymmetrically from a rocky outcrop, a jagged evergreen proudly standing in the frame, a rocky cliffside as backdrop.

³⁴ Image Source: <https://tclf.org/uc-santa-cruz-may-develop-its-east-and-west-meadows>



Figure 14. Amphitheater design concept sketch by Robert N. Royston³⁵

For decades after its construction the amphitheater was the center of celebration and community at UCSC. But years wore down the wooden benches and steps, and the amphitheater was forgotten. But in 2016, the amphitheater was repaired and renovated, its capacity increased, and has resumed its historic role as beloved and sacred ceremonial space.

³⁵ Quarry Amphitheater . Quarry Amphitheater at Santa Cruz . University of California Santa Cruz. Accessed April 27, 2020. <https://quarry.ucsc.edu/>.



Figure 15. The iconic amphitheater of UC Santa Cruz in disrepair³⁶



Figure 16. The iconic amphitheater of UC Santa Cruz, restored³⁶

Conclusion

The tie between campus and landscape has a long history, beginning in the olive groves outside of Athens's city walls. From the strict separation of campus and surrounding the of medieval universities, to the picturesque country campuses ushered in by Jefferson, to campuses like UC Santa Cruz, following

³⁶ Image source: <https://tclf.org/quarry-amphitheatre-uc-santa-cruz-restored-former-glory>

Olmsted's principles to camouflage cleverly with the surroundings, we have constantly rethought and reworked the nature of the tie between campus and landscape. Often that relationship is a manifestation of how we, as a society, view our place within the land.

The University Park campus has been directly or indirectly influenced by the campus traditions and designs outlined in this chapter. Established as a Pennsylvania's land grant university, the landscapes of Pennsylvania were always a crucial component of Penn State's character. As the University of Virginia was built to look out towards the landscape, Penn State began tucked into the sloping and forested valleys of central Pennsylvania, hugged by mountains on three of its four sides. Unlike the design of Santa Cruz, the University Park campus was never planned at conception to integrate with the land, but settled at the bottom of Nittany Valley, hugged by the rolling Pennsylvanian hills, how could it not?

Beginning in the days of Thomas Jefferson and furthered by Fredrick Law Olmsted, American campus designers and planners have often pushed for a connection of the campus to the land. Today, our relationship with the landscape is rapidly shifting in the face of climate change, habitat loss, and environmental degradation. As environmental issues become a priority, we are searching for ways to more live more subtly on the land. Universities are designed to reflect the values of the society they exist in. How will our campuses begin to morph to reflect the values and priorities of today?

Chapter 2

PENN STATE'S UNIVERSITY PARK'S LANDSCAPE

The University Park Campus



Figure 17. A women's outdoor art studio in the 1890s

Founded in 1855, the original Penn State campus began as the agricultural grounds of the Farmer's High School, established as Pennsylvania's land grant university. The campus's location was bargained for by wealthy iron furnace owners of Centre County who could see the end of Pennsylvania's iron era and sought a new investment in the region: education.

200 acres of the Centre Furnace's property, settled at the base of the Nittany Valley and composed of forest and farmland, were given to the Farmer's High School. Frederick Watts discussed the agreed-upon campus landscape, claiming that property had "the most essential

advantages of soil surface, exposure, healthfulness and centrality."³⁷ At this time, it was believed that to be properly educated, students must be surrounded by wilderness and protected from the evils and temptations of cities. The isolated package of land chosen for the Farmer's High School was in proximity of a few small towns (Boalsburg and Bellefonte), but was otherwise secluded surrounded by wilderness and separated from urban life, allowing for students to focus solely on their studies.

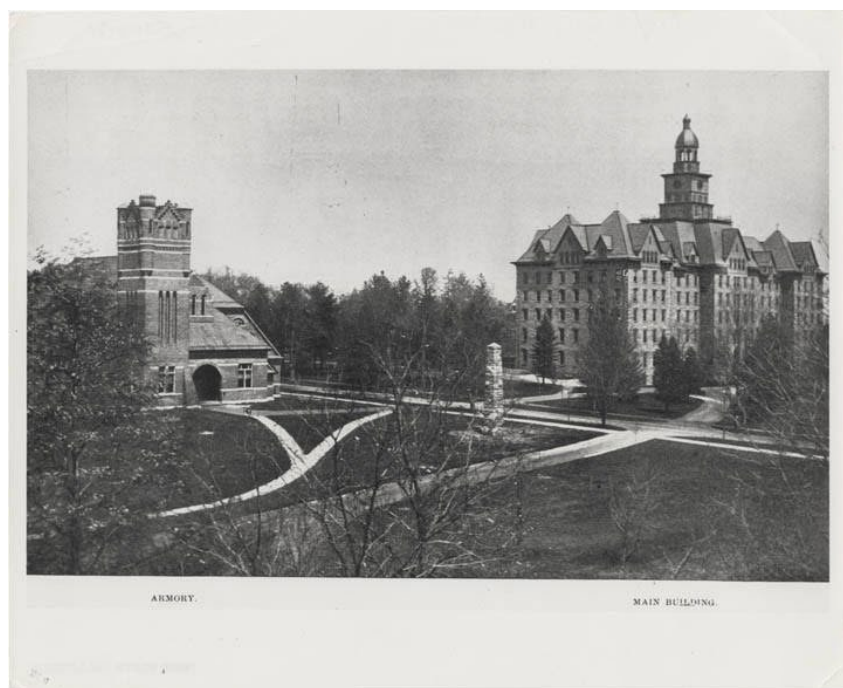


Figure 18. The rebuilt Old Main (right), Pattee Mall (center), and the Armory (left)³⁸

³⁷ Young, W. S. *The Agricultural College of Pennsylvania*. Place of publication not identified: publisher not identified, 1862.

³⁸ Campus in the 1860s . Penn State University Libraries . Penn State. Accessed April 27, 2020. <https://libraries.psu.edu/about/collections/penn-state-university-park-campus-history-collection/penn-state-illustrated-0>.

The school began with a single building: Old Main. With five stories and three wings, the original Old Main was larger than the Old Main of today. Classes and student and teacher rooms were housed within Old Main, a center from which all campus activity stemmed. Old Main was commissioned by a professional architect, but the task of planning the school's physical layout was delegated to Fredrick Watts and Hugh McAllister. Around Old Main Building, a barn, a farmhouse, and outbuildings were placed: practicality as the focus (rather than the Olmstedian principles of subtle design and connection to landscape that would influence campus design in the second half of the nineteenth century). William G. Waring, a horticulturist, laid out the grounds, trees, and shrubs of the campus in the romantic style popular during the pre-Civil War period.³⁹

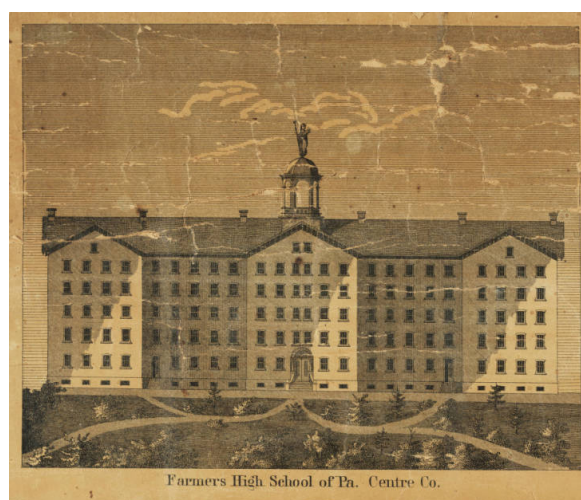


Figure 19. The Farmer's High School 1861⁴⁰

³⁹ Bezilla, Michael. "Penn State: an Illustrated History." Penn State University Libraries. Penn State, August 12, 2019. <https://libraries.psu.edu/about/collections/penn-state-university-park-campus-history-collection/penn-state-illustrated-0>.

⁴⁰ Walling, Henry Francis. Farmer's High School 1861. Penn State University Libraries. Penn State, n.d. <https://digital.libraries.psu.edu/digital/collection/1861map/id/23/rec/11>.



Figure 20. Engraving of the University Park campus by Richard Rummell, 1910⁴¹

Many campuses, such as the campuses of Stanford and Santa Cruz discussed in Chapter 1, began with a clear and commanding master plan. Although there has been inevitable change and deviation, these two campuses are fundamentally defined by their original vision. Penn State's campus has undergone more spontaneous growth and evolution. Beginning as one building and evolving over time to the beautiful campus we have today, Penn State has gone through many series of growth spurts, at times growing in a thoughtful way, at times growing in a practical way, at times thoughtfully correcting mistakes made while growing in a practical way. Like

⁴¹ Image Source: <https://news.psu.edu/photo/329234/2014/10/07/1910-birds-eye-view-pennsylvania-state-college-richard-rummell>

Pollock Road, parts of campus which were once territory of the automobile have been reclaimed and re-designed, gradually turned to pedestrian havens.

The campus has evolved over decades into one of the top ten most beautiful campuses in the US. Often praised for its beauty and uniqueness, the campus is filled with immaculate green lawns, canopy trees, and beautiful planting designs, all interspersed with iconic spaces. In recent years, the campus has morphed and built to reach new design and ecological goals, implementing green roofs and rain gardens and planting native plants, diverse tree species, low-mow grasses, ecological plantings, and meadows. Thoughtful and dedicated minds and hands at the Office of the Physical Plant (OPP) have, over the years, tightened and improved the fabric of the University Park campus to create the beautiful campus of today.



Figure 21. Low-mow grasses at the Barbara O. and James R. Korner Tower Terrace

Hort Woods – A History



Figure 22. Hort Woods' canopy⁴²

The Hort Woods of today is located on the northern edge of the University Park campus. Bordered on the east by the North Residence Halls and the Stuckeman Family Building, on the north by the busy arterial street Park Avenue, and on the west by the Childcare center, Hort Woods (proper) is a quiet and secluded niche of the campus that, when asked, many students and professors will tell you they aren't familiar with. A path cuts through the forest. Nowhere on the path can a person lose the sound of cars driving past or lose the sight of red brick or green oxidized copper. Yet it is a unique place on the University park campus — a place where, despite its larger setting, birds can be heard and fallen leaves are left through winter to turn to soil.

⁴² Hort Woods Canopy. Penn State University Libraries . Penn State, <https://digital.libraries.psu.edu/digital/collection/psuphoto/id/250/rec/8>.

Hort Woods is not known to every person who works at or studies on the Penn State campus, but to those who know it, it is often a special place. In the theatre building the windows of the classrooms take up the entire wall facing the forest. Sitting on the second story, looking out at the rustling branches of the canopy and the dappling sunlight on green leaves so close to the windows, students have a view otherwise only had by climbing the trees. The Stuckeman Family Building, angling itself to hug the woodlot, is designed so that the large windows of the library face the forest understory. Comfortable armchairs placed are placed in a row before the windows, as if facing a movie screen — students who go there to study (or to nap) make a beeline for these chairs, glancing up from laptop screens now and then to watch the swaying limbs of the trees and the occasional student walking the woodland path. For many, Hort Woods is a beloved part of campus, a part of campus that gives a personality to the cluster of Arts and Architecture buildings huddled around it.

Today, Hort Woods Proper and the Hort Wood's Remnant (a sliver of forest also once a part of the larger Hort Woods, located along Curtin Road beside the Spiritual Center) are designated heritage groves, protected from future encroachment by Penn State's heritage tree program. There are trees in Hort Woods which have stood since before the conception of Penn State. Before the campus was established beside it, Hort Woods was an indistinguishable piece of the dense cover of forest that blanketed Nittany Valley. Upon Penn State's founding in 1855 when the campus began to take form, land was converted to agricultural fields, dirt roads, and test gardens, serving the needs of the Farmer's High School. A section of forest close to the Old

Main building was left standing, a resource of fuel to heat campus buildings.⁴³ The campus forest came to be known as Horticulture Woods (shortened to Hort Woods today).



Figure 23. Old Main and Hort Woods seen from downtown State College, 1890⁴⁴

For the better part of a century, Hort Woods extended west to the Nittany Lion Inn, south to Pollock Road, and north beyond where Park Avenue now crosses, covering a large swath of what today is highly developed central campus. The central campus we know is a tight landscape quilt patterning of paths, quadrangles, lawns, asphalt, concrete, mulch, and plantings, yet where Hort

⁴³ Conservation with Eliza Pennypacker, Department Head, Landscape Architecture, April 20th, 2020.

⁴⁴ View of Old Main and Other Campus Buildings from Town. Penn State University Libraries. Penn State, 1890. <https://digital.libraries.psu.edu/digital/collection/psuphoto/id/250/rec/8>.

Woods once reached, ancient trees still stand, shading grass and mulch where there once was understory shrubs and delicate spring ephemerals. These ancient trees, present through a large portion of central campus (beside Pattee Mall, behind the Old Botany building, in the shade of the Nittany Lion Inn), tell a story of an earlier University Park.



Figure 24. A remnant canopy tree from the original Hort Woods

In the mid-twentieth century, conservationist movements arose to defend the forests covering Mt. Nittany. A great success, the conservationists managed to preserve a fiercely loved symbol of Penn State and the character of State College. The movement to preserve Hort Woods did not end as happily. In his book, *Conserving Mount Nittany: A Dynamic Environmentalism*, author Tom Shakely describes this as a tragedy, writing “While Mount Nittany is the obvious, visible

symbol of the Nittany Valley, Hort Woods was once an obvious symbol of the campus — but one that became a casualty of a progressive spirit of building out the physical campus.”⁴⁵



Figure 25. Mt. Nittany in the 1940s⁴⁶

Subtle and insidious, the threat to Hort Woods did not happen in one fell swoop. Hort Woods disappeared slowly — a sliver or chunk of trees at a time. The trees of the forest were no longer needed to fire the campus furnaces, and (in an era of practicality in Penn State’s campus design), the woods were seen as less of an amenity and more as unoccupied space to be developed. As

⁴⁵ Shakely, Tom. *Conserving Mount Nittany: A Dynamic Environmentalism*. Nittany Valley Press, 2013.

⁴⁶ Image Source: Penn State University Libraries, University Park History Collection

buildings and parking lots were added and the campus's edges were pushed out, much of what was Hort Woods gradually succumbed to the blades of the chainsaw.

The fight to preserve the campus forest began in the 1940s and persevered for twenty years, the battle cry taken up by students, professors, alumni, and townspeople. In 1961, close to the movement's final defeats (the beginning of the construction of the Arts & Humanities building), David L. Cowell submitted a piece to the *Centre Daily Times* making one of the last pleas for the forest's salvation. Cowell wrote: "It is a part of Penn State, a little sylvan which distinguishes our campus from Penn's, Pitt's and Temple's asphalt canyons. The Arts and Humanities building will contain man's art and music, but Shostakovich and Hindemith cannot begin to uplift a man's soul like the Wood Thrush. Is there an artist who can match the inspiration of the Hort Woods tapestry in October?"⁴⁵

In *Conserving Mount Nittany: A Dynamic Environmentalism*, Shakley draws a striking comparison to Philadelphia's Fairmount Park. The first public city park created in the United States, Fairmount Park was founded in 1812 and stretches over two thousand acres. Woodlands and wetlands weave within the historic park's boundaries, cleaning the water of the city. The Philadelphia Historical Society calls the creation of Fairmount Park "a pioneer effort in the conservation and ecology movement."⁴⁷ For over two hundred years the park has contributed to the ecological and social health of the city, becoming a destination and an icon rooted firmly in

⁴⁷ "University City Historical Society." Fairmount Park. Accessed May 1, 2020. <http://uchhs.net/HistoricDistricts/fairmountpark.html>.

the architecture of Philadelphia. In his book, Shakley suggests that Hort Woods could have been the Fairmount Park of the University Park Campus — an escape to the natural world buried in the city’s (or campus’s) dense center. Like the meadows and quarries of the campus of UC Santa Cruz, Hort Woods might have become a defining force in shaping the nature of the University Park campus. Instead, the value of the campus woodland was ignored by planners until it was nearly gone — reduced to a secluded remnant.

The question remains, has the legacy of the ancient and sprawling presence of Hort Woods gone for good? Shakley writes in his book: “The loss of Hort Woods was achieved over time. The work of building up a fresh inheritance is achieved over time, too.”⁴⁸



Figure 26. Hort Woods in winter⁴⁹

⁴⁸ Shakely, Tom. *Conserving Mount Nittany: A Dynamic Environmentalism*. Nittany Valley Press, 2013.

⁴⁹ Image Source: <https://digital.libraries.psu.edu/digital/collection/psuimages/id/462/rec/64>

Chapter 3

ABOUT FORESTS

The Forests of Pennsylvania

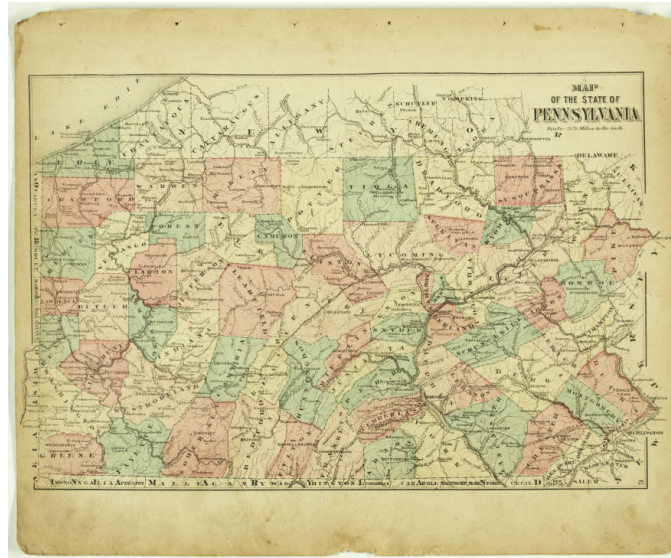


Figure 27. Map of Pennsylvania from an atlas published in 1874

The word *Pennsylvania* translates to “Penn’s Woods,” named by the state’s Quaker founder. Looking out upon the lands allotted him, forests blanketing the rolling hills, the sloping valleys, and the vast plateaus, William Penn named the land in an acknowledgement of the forest’s unbroken presence.

Before the arrival of European citizens, Pennsylvania was home to communities of Indigenous People. While Europeans valued land as a resource to be controlled and conquered, Indigenous Americans had a more holistic understanding of the landscape and the human presence within it.

Broadly speaking, the marks that Indigenous people had on the land before the arrival of European settlers were subtle and unobtrusive.

When the first European settlers came to Centre County, they encountered nearly undisturbed old-growth forests. Centuries of forest life cycles created soil that was rich, fertile, and ideal for farming. Pennsylvania was settled and acres of primeval forest were cleared, replaced with family farms.

For Pennsylvania, the first half of the nineteenth century was an era of ironmaking. To make iron required charcoal, to make charcoal required wood, in large and constant quantities — Pennsylvania was optimal for ironmaking *because* of its forests. Centre county boasted approximately twenty ironmaking furnaces and forges— in an 1876 publication, it was estimated that 300,000 bushels of charcoal were needed each year to sustain the county’s furnaces.⁵⁰ Sawmills, too, were prevalent; there were approximately forty-five sawmills in Centre County in 1810 and sixty in 1847.⁵⁰

⁵⁰ “Natural Resources - Forest Resources.” Centre County PA, n.d.
<https://centrecountypa.gov/DocumentCenter/View/349/forest?bidId=>.



Figure 28. Centre Furnace⁵¹

To feed the hungry demands of the furnaces and mills, thousands of acres of virgin forest were cut down, felled logs dragged and carted away to be burned or sawed apart. Forests of the valleys untouched by agriculture and forests of the steeper mountains, before safe from the plow, were felled, the landscape of Centre County stripped bare.

As a result, much of the forest that grows in Pennsylvania today is second-growth forest, re-established over decades. Many who look to the lush green mountains that frame State College would never guess that a century before, the mountainsides lay bare, stippled with the stumps of cut-down trees. This is a testament to the resiliency of the Pennsylvanian forests. Shorn to the

⁵¹ Centre Furnace Stack . Centre History . Centre County Historical Society . Accessed April 27, 2020. <https://www.centrehistory.org/events/history-talk-the-history-of-centre-furnace/highres-furnace-2/>.

ground, the forests grow back again. Ever determined, the landscape of Pennsylvania always returns to forest.

The Eastern Deciduous Forest

Centre County falls within the band of eastern deciduous forest, a type of temperate deciduous forest. Predominantly populated by trees which drop their leaves in fall and sprout them again each spring, the temperate deciduous forest is a uniquely magnificent display of the cycle of a year. Mostly composed of pine-hemlock-hardwood forest species and oak-chestnut forest species, the hardwoods that are most common in Centre County are northern red oak, red maple, black oak, chestnut oak, scarlet oak, shagbark hickory, and mockernut hickory, the softwood species most common are hemlock, white pine, and pitch pine.⁵²

Eastern deciduous forests are stratified. Forming the canopy layer are the tallest trees, whose leaves have unimpeded exposure to the sun above them. In the eastern deciduous forests, mature canopy trees vary in their heights, from 60 to 100 (or more) feet. Beneath the canopy layer, where sunlight is partially obstructed, smaller trees evolved to tolerate (and even require) the filtered sun from the understory tree layer. Beneath the understory layer is the shrub layer, and, closest to the forest floor, is the herbaceous plants and fern layer. Adapted to low light levels, the herbaceous plants living in forests know to flower early and quickly, producing seeds before the trees above them leaf out and hide the sun. Creeping between all the neatly stacked layers, the

⁵² “Natural Resources - Forest Resources.” Centre County PA, n.d.
<https://centrecountypa.gov/DocumentCenter/View/349/forest?bidId=>.

vine layer uses the structure of the forest to occupy any attainable sunlit space. Beneath all, often forgotten, the root layer is unseen below the surface, but is a complex system on its own.

The stratification of the forest creates many habitats (layers), allowing a range of plant species to coexist within the same vertical space. White oak's deep roots, seeking water and nutrients to bring to leaves high above, do not compete with the shallower roots of the witch hazel, which are no threat to the yet shallower roots of the dainty wild columbine. White oak leaves require direct rays of sun, so the white oak grows to be the tallest in the forest. The feathery leaves of the wild columbine, unable to reach very high off the forest floor, evolved to require the sunlight less. In a healthy temperate deciduous forest each layer is present, each niche occupied by plants evolved to occupy it, all available sunlight filtered through the layers and absorbed, all space within the root layer claimed. When all layers are intact, the forest is self-sustaining and healthy — space and resources are shared, the presence of each layer contributing to the creation of the condition for the others.

When a layer is disturbed (or eliminated), forest health declines. By damaging one layer of the forest ecosystem, space is left unoccupied and the other layers are affected, eventually causing a disruption in the entire system.

After a disturbance invasive plants move in to occupy newly available space. Forests used for logging are often overwhelmed by invasive shrubs; when trees are felled, new sunlight pours into the forest floor and the shrubs are given opportunity to take root and establish a presence. Once established invasive shrubs can spread quickly, outcompeting native perennials for space and for sun, creating wild dense thickets of forest found anywhere where there is disturbance (highways,

many city woodlots, etc.) Once disturbed, an effort is needed to return to healthy forest ecosystem.



Figure 29. Hartley Woods⁵³

Forty-two acres to Hort Wood's four, Hartley Woods lies behind the College Heights neighborhood and the Penn State Arboretum (which Hartley Woods belong to). Like Hort Woods, Hartley Woods' story is much older than the story of Penn State — undoubtedly, the two woods were once part of the same great forest. Most of the trees standing in Hartley woods exceed 140 years of age; a gigantic white oak tree growing in Hartley Woods that died in 2000 was determined to have been growing since 1673.⁵⁴

⁵³ Hartley Woods . n.d. Centre Daily Times. <https://www.centredaily.com/news/local/news-columns-blogs/article165047217.html>.

⁵⁴ Mulhollem, Jeff. "Native Forest Plants Rebound When Invasive Shrubs Are Removed." Penn State News. Penn State , May 14, 2019. <https://news.psu.edu/story/574315/2019/05/14/research/native-forest-plants-rebound-when-invasive-shrubs-are-removed..>

So close to maintained yards carefully planted with exotic species in College Heights (the bordering neighborhood), the ancient woodlot became overrun by invasive shrubs in the late twentieth century, shrubs growing densely beneath the canopy trees and outcompeting native understory. At one time, nearly 40% of the shrubs, forbes, and vines growing beneath the (mostly native) canopy trees were determined to be invasive. Largely ignored, Hartley Woods existed this way for over two decades.

In 2012, Penn State researchers began a seven-year-long study of Hartley Woods. Over the course of the study (lasting seven years) researchers removed eighteen species of invasive shrubs from the understory of Hartley Woods: an attempt to gage the effect of invasive shrub removal on potential reemergence of native understory species. The study was overwhelming and shockingly successful — researcher Erynn Maynard Bean commented in an article published in the May 2019 Penn State Newsletter, saying: "The regeneration of native plants that we saw where invasive shrubs had been removed exceeds what we expected from looking at uninvaded parts of the forest."⁵⁵ Bean continues later in the article, explaining: "A lot of people think that when you remove invasive shrubs you have to plant natives, and that is obviously helpful but difficult to afford on a large scale. But there are native plants in the forest that are mixed with the invasives, and if you maintain the removal, the natives will come back in and take over."⁵⁵ The experiment in Hartley Woods is a success story: with invasive shrubs removed, the forest was given an opportunity to heal, re-establishing the delicate balance of native plants within forest layers. Three years after the beginning of the invasive shrub removal project, work began to

⁵⁵ Mulhollem, Jeff.

create trails through Hartley Woods.⁵⁶ Since the start of the Hartley Woods trail project, over a thousand students have volunteered with the staff of the Arboretum to help create and maintain the trails, forging a personal connection with the ancient woodlot just behind Penn State's botanical gardens.



Figure 30. Hartley Woods before (bottom) and after (top) the removal of invasive shrub species over the course of seven years⁵⁷

⁵⁶ “Living Plant Collections.” The Arboretum at Penn State. Penn State . Accessed April 27, 2020. <https://arboretum.psu.edu/gardens/living-plant-collections/>.

⁵⁷ MAYNARD-BEAN, ERYNN. Plants in Hartley Woods. Penn State News. Penn State , n.d. <https://news.psu.edu/story/574315/2019/05/14/research/native-forest-plants-rebound-when-invasive-shrubs-are-removed>.

Following winding trails of Hartley Woods today, it is common to run into hikers and joggers enjoying the quiet forest landscape. Hartley Woods is both a valuable social and ecological amenity to the people of State College. Quoted in the Penn State newsletter, Erynn Maynard Bean describes the impact of her team's findings, saying "Native plants in the understory contribute to the health and stability of the forest ecosystem. Native shrubs do not reach the same density in the understory as invasive shrubs do, and that has implications for bird, insect and even forest amphibian communities."⁵⁸ Over seven years, the removal of eighteen shrub species, the healing of a broken forest, has provided a lasting social and ecological benefit to the Penn State community.

⁵⁸ Mulhollem, Jeff. "Native Forest Plants Rebound When Invasive Shrubs Are Removed." Penn State News. Penn State, May 14, 2019. <https://news.psu.edu/story/574315/2019/05/14/research/native-forest-plants-rebound-when-invasive-shrubs-are-removed..>



Figure 31. Native flowers of Hartley Woods found after the removal of invasive shrub species ⁵⁹

Hort Woods Intervention

In 2012, around the time the seven-year-long experiment was beginning in Hartley Woods, an intervention in Hort Woods Proper was planned.⁶⁰ Prior to the project, invasive trees and shrubs (such as Norway Maple and Honeysuckle) had a tight grasp on Hort Woods, forming dense thickets very different from the original Hort Woods. Deciding that the woodlot should

⁵⁹ MAYNARD-BEAN, ERYNN. Plants in Hartley Woods. Penn State News. Penn State , n.d. <https://news.psu.edu/story/574315/2019/05/14/research/native-forest-plants-rebound-when-invasive-shrubs-are-removed>.

⁶⁰ “Hort Woods Rehabilitation Project to Begin Soon.” Penn State News. Penn State, February 13, 2012. <https://news.psu.edu/story/151747/2012/02/13/hort-woods-rehabilitation-project-begin-soon>.

exemplify the Pennsylvanian forest, the Office of the Physical Plant planned an intervention to combat the presence of invasive species.

Technical assistance and oversight for the intervention was given by the School of Forest Resources, the Horticulture Department, and the University Tree Commission.⁶¹ Invasive species were removed in the winter, the voids left behind replaced with native trees, shrubs, and forbes the following spring (including white oak, pignut hickory, serviceberry, spicebush and black cohosh). Invasive seedlings were removed and the spreading lawn beneath the canopy trees was restored again to forest floor.⁶¹

The intervention was an aggressive move, eliminating many of the most tenacious invasive species and steering the direction of Hort Woods off a less-recoverable path. Yet the project was one step towards a full restoration of Hort Woods: complete restoration management of the forest should lessen with time but be strategic and ongoing. Invasive species must continue to be removed to give native plants the advantage needed to securely establish communities. As proven in Hartley Woods, when given the chance, natives plants win the fight.

⁶¹ "Hort Woods Rehabilitation Project to Begin Soon." Penn State News. Penn State, February 13, 2012. <https://news.psu.edu/story/151747/2012/02/13/hort-woods-rehabilitation-project-begin-soon>.

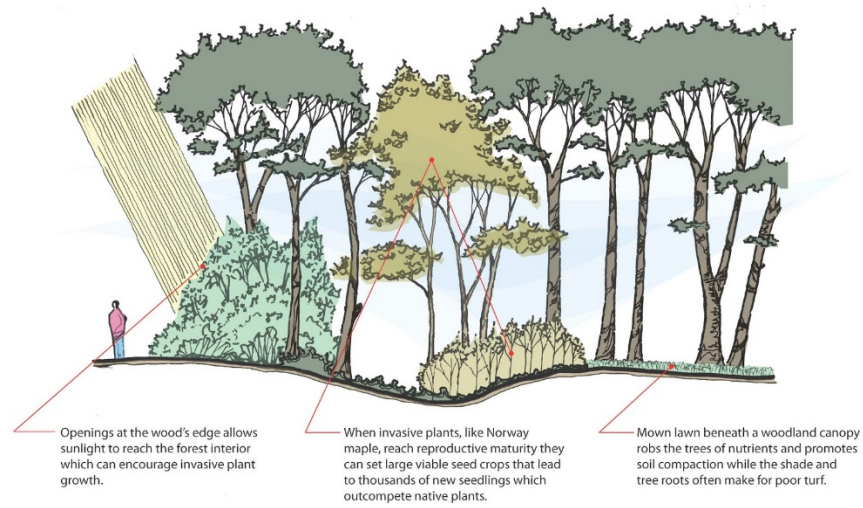


Figure 32. Hort Woods before invasive species removal (drawing by Derek Kalp)

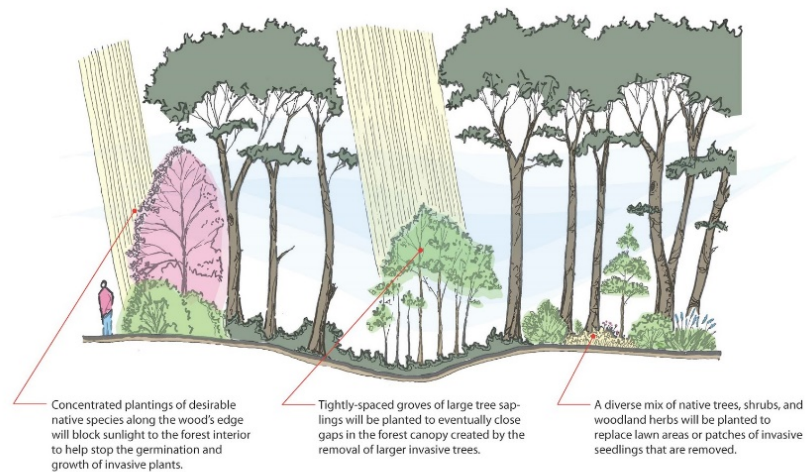


Figure 33. Goals of invasive species removal (drawing by Derek Kalp)

Ecological Benefits of Forest

Today, there are over 17,000 trees on the University Park campus, providing the campus with shade and beauty. The trees are well-cared for; the heritage trees and groves program ensures the long-term protection of the campus's oldest and most unique trees.

An enormously beneficial ecological amenity for urban areas, trees filter and cycle water, provide oxygen, reduce the threat of heat islands, absorb carbon dioxide from the atmosphere (one of the major greenhouse gases contributing to climate change), and provide habitat for a handful of species.

Ecologically, however, trees alone cannot replace the value of a complete forest ecosystem. Forests naturally supply ecosystem services impossible to replace or mimic, providing habitat to sustain wildlife, absorbing and cleaning rainwater (allowing for a healthy water cycle), improving soil health, preventing erosion, lowering the impact of urban heat islands, and absorbing harmful greenhouse gases. The following drawings demonstrate the ecological differences between two scenarios found on campus: canopy trees covering lawn and canopy trees as part of a complete forest system.



Figure 34. The losses of lawn



Figure 35. The benefits of forest (drawings by Hannah Gomez)

As forests are the natural state of Pennsylvania, changing our landscapes from forest to anything else (lawn, maintained gardens) demands effort — an input of energy is required to suppress the forest's natural growth. Mowing, leaf-blowing, and the application of herbicides and pesticides are methods for maintaining lawns and gardens, all with significant environmental consequences: polluting the air, polluting streams, and harming wildlife. The more of our land that is lawn or maintained gardens, the more passive harm we commit when we lose the environmental benefits of what would have been forest, and the more active harm we commit through the techniques of suppression.

Due to human settlement and activity, forest cover has drastically declined in Pennsylvania, vanished forests replaced with agricultural fields, hard-scape, buildings, and lawns. Rapid and drastic changes in composition are causing landscapes to lose both the capacity to maintain natural cycles of nutrients and water and the ability to sustain life. This pattern is happening not only across Pennsylvania or across the United States, but around the globe — there is now no place on Earth not impacted by humans.

As we battle habitat loss, soaring extinction rates, and climate change across the world, we will need to soften the force of our footprints on the land, decreasing disturbance and creating space for wildlife.

The Patch–Corridor–Matrix

A well-known concept of ecology, the Patch-Corridor-Matrix model is applicable to a large range of scales. The model conceptualizes the structure of habitats within a landscape to understand the movement and patterns of species in a landscape. A simplified description will summarize the basic principle of the patch-corridor-matrix and explain the model's relevance to this thesis.

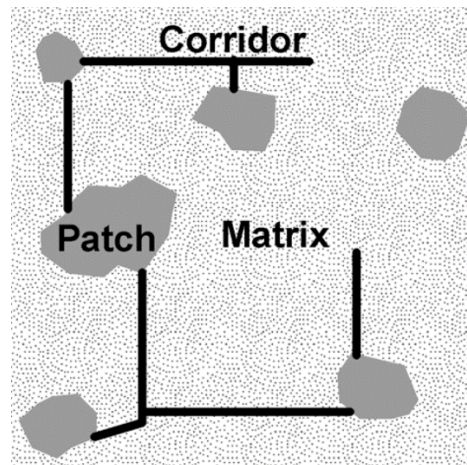


Figure 36. The Patch-Corridor-Matrix⁶²

In the Patch-Corridor-Matrix, patches within the Matrix represent a specific habitat or ecological condition. When the larger landscape is considered, patches create a mosaic on the land, the tiles of the mosaic representing areas of habitat that provide resources required for a population to

⁶² Image Source: https://www.researchgate.net/figure/The-patch-corridor-matrix-landscape-model-The-landscape-consists-of-habitat-patches_fig6_258148987

live and reproduce. Corridors connect patches, not large enough to provide habitat but allowing for movement between areas that do. The interstitial spaces that connect the patches and corridors, not habitable or traversable to the species considered, is referred to as the matrix.

Populations of a species living within forest ecosystems require patches of forest that contain the resources and space to survive and reproduce. When a patch is too small to maintain the population, the population declines. If patches are connected by corridors, individuals can move from patch to patch, gaining access to the resources of all connected patches. Corridor connections between patches of habitat is often the difference between a population's growth or decline. On a greater scale, corridor connections between patches of habitat is often the difference between survival or extinction.

When considering forests at Penn State in the patch-corridor-matrix model, we could consider Hort Woods as one patch and Hartley Woods as another. Currently there are no clear corridor connections between the two patches, no easy way for forest-dwelling species to traverse between them. Yet, if we increase corridor connections on the University Park campus, the campus's habitat quality and biodiversity will improve — if we add more forest patches to corridor connections, the campus will improve more.

Enormous strides have been made by Penn State and by the Office of the Physical Plant in the past few decades to create a green and conscientious campus. To address the ecological challenges that we, as humans, face together across the world, the next few decades will require fast and dramatic changes to the ways we exist with the land. Penn State has an opportunity to

spearhead change. Helping to normalize healthy ecological landscapes, the careful application of forest habitat is an opportunity to influence the perspectives of students and visitors, igniting a cultural change in our expectations of what a landscape should/must be. By increasing forest cover on campus, Penn State saves costs in maintenance but also contributes to larger savings in environmental costs: regaining habitat and improving ecosystem service quality and strengthening our connection to the land.

Social Benefits of Forest

Often overlooked, there are important social and cultural benefits to forests and other natural landscapes.

The word *biophilia* originates from Greek roots, translating to “love of life”. First named by Erich Fromm, a social psychologist, the word’s popularity grew when in the 1980s American biologist Edward O. Wilson began to use biophilia to describe a movement addressing the social and psychological consequences of human separation from the natural world. Wilson described this phenomenon, saying, “Biophilia is the innately emotional affiliation of human beings to other living organisms...life around us exceeds in complexity and beauty anything else humanity is ever likely to encounter”. The theory behind biophilia states that as humans evolved in forest and grasslands, our bodies adapted to exist within the landscape — we have not had time to adapt to the rapid and drastic ways our interactions with nature have declined within the last two

centuries. The overwhelming disappearance of a consistent connection to nature has resulted in negative mental, psychological, and physical effects, impacting us as individuals and as a society.⁶³

We have used the word for four decades, but we continue to unveil the biology behind biophilia. In an interview on NPR podcast Hidden Brain, Ming Kuo (professor and researcher of environmental sciences at the University of Illinois Urbana-Champaign) describes the connection between nature and human health, which she has studied for over thirty years.⁶⁴ Kuo explains on the podcast: “So, for instance, one of the things we find is that when you look out at a green landscape, even from indoors, your heart rate will go down, and you'll change from sympathetic nervous activity over to parasympathetic nervous activity, which is basically going from what we call fight or flight into tend and befriend mode. So, it has these very systematic physiological impacts on us, which we also know have long-term health outcomes associated with them.”⁶⁴ A result of a decrease in parasympathetic activity is a decrease in ability to concentrate and an increase in stress, which (in high or frequent amounts) causes and contributes to chronic health conditions.

Kuo describes another study she was involved in, examining the impact of nature on natural killer cells within the body (a type of white blood cell vital to battling tumors and viruses).

⁶³ “The Economics of Biophilia.” Terrapin Bright Green, May 1, 2014.
<https://www.terrapinbrightgreen.com/reports/the-economics-of-biophilia/#what-is-biophilia>.

⁶⁴ Vedantam, Shankar. “Hidden Brain.” Hidden Brain (blog). National Public Radio, September 10, 2018.
<https://www.npr.org/transcripts/646413667>.

Researchers measured the natural killer cell count of subjects after they had spent a three-day weekend in a forest preserve and found that, on average, natural killer cells were increased by 50% (after a three-day weekend in a nice urban area, there was no average increase). 30 days after the three-day weekend in a forest preserve, when subjects were examined again, they still showed (on average) a natural kill cell count of 25% above the baseline number. This study demonstrates the impacts of natural landscapes on human physical health as being significant and long-lasting.⁶⁴

An ancient practice in Japan, Shinrin-yoku roughly translates to “forest bathing”.⁶⁵ Shinrin-yoku is practiced through restorative, regenerating walks through natural landscapes, primarily forests. Studies on Shinrin-yoku has shown the practice to have measurable health benefits, including decreased stress and blood glucose levels. Americans on average spend 93% of their time indoors, but even a short time spent regularly surrounded by forest has a positive impact on mental and physical health.⁶⁵

An increase in access to natural green spaces in proximity to the busiest parts of campus will have an impact on student mental and physical health, decreasing stress levels as students face upcoming exams and project deadlines. Corridors of forest within the central campus which create avenues to larger natural recreation areas (Hartley Woods, the Arboretum, etc.), would provide new amenities for recreation and engagement.

⁶⁵ Li, Qing, and Forest Bathing: How Trees Can Help You Find Health and Happiness. “The Benefits of 'Forest Bathing'.” Time. Time, May 1, 2018. <https://time.com/5259602/japanese-forest-bathing/>.

Boston's Emerald Necklace

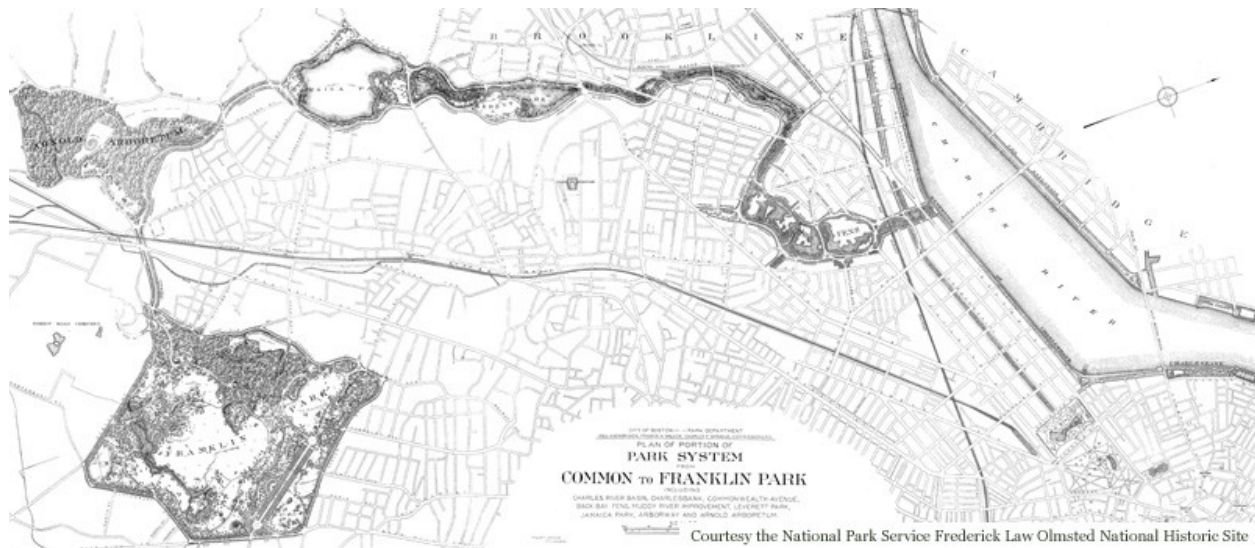


Figure 37. Olmsted' 'Emerald Necklace' plan⁶⁶

An iconic example of a system of green patches with essential social and ecological function is Boston's Emerald Necklace. The treasure of the city, Boston's Emerald Necklace was designed between 1878 and 1895 by Fredrick Law Olmsted. A five-mile long ribbon of forests, meadows, marshlands, and parkways circling the city's urban core, the emerald necklace is one of the largest projects ever undertaken by the city of Boston and is possibly the world's first urban greenway.⁶⁷ As in Central Park, Olmsted designed the Boston greenway following his belief that city dwellers need sanctuaries from the chaos and clamor of urban life. Olmsted was quoted in 1870, saying, "We want a ground to which people may easily go when the day's work is done,

⁶⁶ Image Source: <http://www.olmstedfilm.org/about/>

⁶⁷ Bilis, Madeline. "The History Behind Boston's Treasured Emerald Necklace." Boston Magazine. Boston Magazine, May 15, 2018. <https://www.bostonmagazine.com/property/2018/05/15/emerald-necklace-boston-history/>.

and where they may stroll for an hour, seeing, hearing, and feeling nothing of the bustle and jar of the streets where they shall, in effect, find the city put far away from them...”⁶⁸ Olmsted believed that natural spaces, like the emeralds he linked together in Boston, are indispensable assets to healthy cities. He considered his work in Boston to be the most important of his career.⁶⁹

150 years later, Olmsted’s emerald necklace still strings together a handful of Boston’s most beloved and iconic landscapes. The success of the design has pioneered a movement in urban greenways — today, cities and towns across the globe find inspiration in the emerald necklace of Boston, stringing together emeralds of their own.



Figure 38: A gem in the necklace⁷⁰

⁶⁸ “Frederick Law Olmsted.” The Emerald Necklace Conservancy. The Emerald Necklace Conservancy. Accessed April 27, 2020. <https://www.emeraldnecklace.org/park-overview/frederick-law-olmsted/>.

⁶⁹ “Emerald Necklace.” The Cultural Landscape Foundation. Accessed April 27, 2020. <https://tclf.org/landscapes/emerald-necklace>.

⁷⁰ Emerald Necklace Bridge . Great Runs . Accessed April 27, 2020. <https://greatruns.com/boston-the-emerald-necklace-fall/>.

Chapter 4

THE CARE AND CREATION OF FORESTS

Care of Forests: Management vs. Maintenance

Traditional gardens demand a hefty input. For a traditionally beautiful garden to remain traditionally beautiful, gardeners must weed, trim, mulch, plant, and remove, on a regular and never-ending cycle. To keep them, traditional gardeners must continuously invest time, energy, and money into ensuring that the garden stays static. This is a battle against nature itself — the inexhaustible force of succession constantly pulls the garden in new directions: plants grow and die, new plants move in, plant's populations spread or fade away. To fight these natural processes is the role of the traditional gardener. The battle to keep the landscape static is referred to as maintenance.

While traditional horticulture practices divorce themselves from ecology, adaptive management embraces it. Maintaining a landscape requires a prevention of change. Adaptively managing a landscape requires change to be accepted as inevitable, planning and allowing for its occurrence. To practice adaptive management requires an understanding of ecology and a knowledge of how plants species interact with each other — the role of the adaptive manager is not to dictate the landscape, but to guide it gently down a healthy and desired road, allowing for nature to make a majority of the decisions and only interfering to keep it steadily on-course.

Once established, adaptively managed landscapes require minimal intervention, cutting costs in time, energy, and environmental pollution. Aesthetically, adaptively managed landscapes mimic

wild landscapes, remaining beautiful throughout the year's cycles. While maintained landscapes require time to reach maturity, leaving bare patches of mulch between plants for a few years, adaptively maintained landscapes blanket the ground soon after their implementation. Their constant change is an advantage to their beauty.

Creation of forests: Matrix planting

A movement in planting design pioneered by such people as Pete Oudolf, matrix ecology shares many of the same principles with Adaptive Management. Focused on creating and filling the layers of a plant community, matrix plantings side-step many of the largest energy costs of traditional gardening. Structural plants provide interest and form while matrix plant populations grow to fill available spaces between structural plants, eliminating empty space where weeds would traditionally invade. The goal of the matrix planting is for chosen plants to form a dense and layered community, self-sustained and undemanding of the need to weed or mulch.



Figure 39. A matrix planting on the University Park campus at the intersection of Shortlidge Rd. and East College Ave.⁷¹

⁷¹ Image source: Google Maps

Creation of Forests: Phases

The creation of forest, while visually organic when completed, requires thoughtful strategy. A successful forest requires that the land be properly prepared, strategically planted, and thoughtfully managed. If done correctly, created forests reach a stage considered beautiful relatively quickly compared to more maintained landscapes (which often require long stretches of time to reach maturity). With careful management, forests naturally adjust to fill empty spaces and rearrange their composition — a largely self-sustaining system. The diagrams on the following pages break the process of creating forest spaces into four phases: preparing, planting, growing, and establishing.

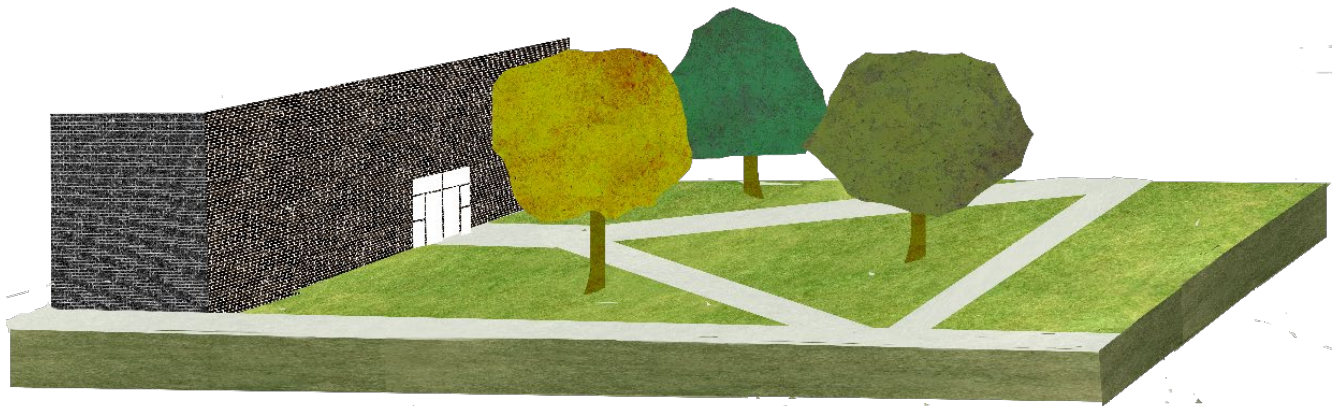


Figure 40. A typical campus building entrance with lawn and trees

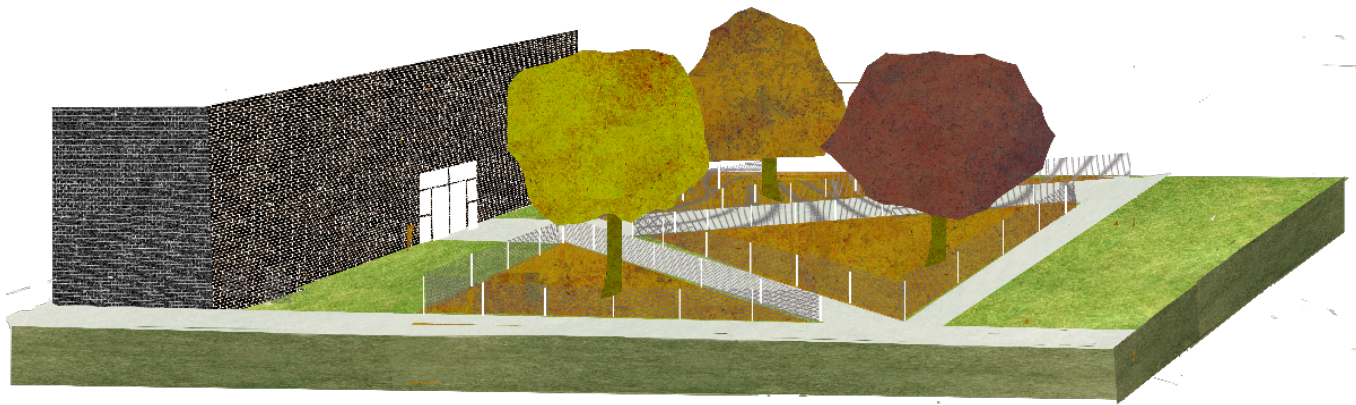


Figure 41. Phase One: Preparing

Phase One: Preparing

- Cover planned forest areas with leaf cover collected from campus areas
- Allow for leaves to compost and improve topsoil health
- Install temporary low mesh fences around planned forested areas to prevent disturbance and contain leaf cover

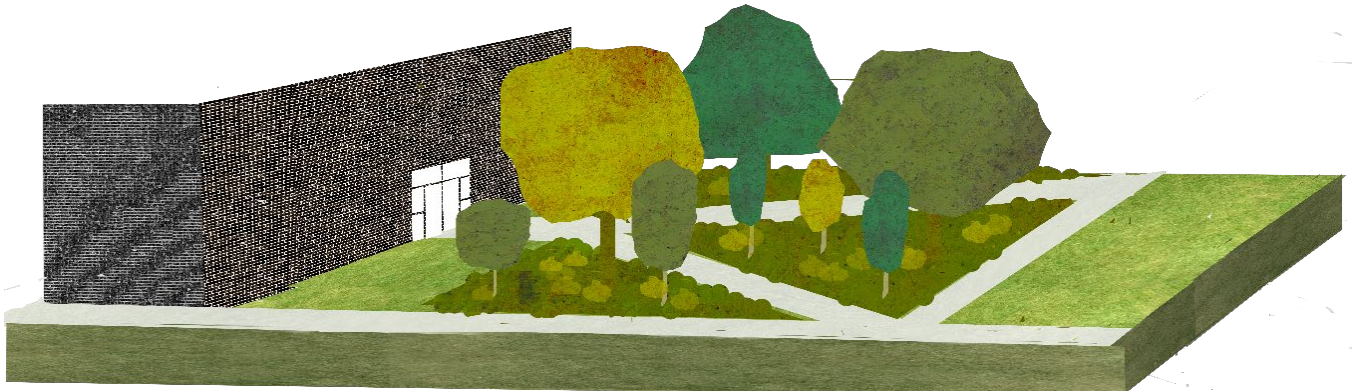


Figure 42. Phase Two: Planting

Phase Two: Planting

- Install a combination of fast-growing and slow-growing canopy trees to quickly establish canopy cover but ensure a later presence of desirable canopy trees
- Install understory plant communities based off principles of ecological gardening and matrix planting
- Limit shrub layer in areas where visibility should be maintained



Figure 43. Phase Three: Growing

Phase Three: Growing

- Allow for desirable slow-growing canopy trees to compete with fast-growing trees, providing an advantage to slow-growing species when necessary
- Eliminate invasive plants when necessary
- Allow for plant communities to shift and compete
- Welcome desirable volunteer plant communities



Figure 44. Phase Four: Adjusting (drawings by Hannah Gomez)

Phase Four: Adjusting

- Allow for desirable slow-growing canopy trees to outcompete fast-growing trees, consider eliminating fast-growing species if necessary or if a safety threat is posed
- Continue to allow plant communities to change and evolve
- Maintain transparency if necessary

Chapter 5

THE DESIGN OF FORESTS



Figure 45. Birdhouses beside a forest path (drawing by Hannah Gomez)

Perception is a pivotal factor in successful ecological design. A landscape can be healthy and ecologically functional, but if it does not fit with our standards of beauty, its function is easily undervalued or disregarded. The standards of beauty we hold to landscapes are defined by the standards of our surrounding society, limiting what is and is not accepted as beautiful. Often, ecological landscapes are quickly perceived as messy, unintentional, and forgotten. In her ground-breaking essay, “Messy Ecosystems, Orderly Frames,” landscape architect Joan Nassauer describes design techniques that shape ecological landscapes to fit within the public perception of acceptable beauty, creating awareness of intentionality.⁷² Nasseuer writes: “As much as our

⁷² Nassauer, Joan Iverson. “Messy Ecosystems, Orderly Frames.” USDA Forest Service. USDA, n.d. https://www.ncrs.fs.fed.us/pubs/jrnl/1995/nc_1995_nassauer_001.pdf.

affection for the cultural concept of nature would lead us to believe otherwise, people do not know how to see ecological quality directly. We know how to see ecological quality only through our cultural lenses, and through those lenses, it may or may not look like nature.”⁷² An important component of this strategy is to create “cues to care”, employing recognizable design vocabulary to demonstrate intention and purpose and weaving those cues into the design fabric.

Messy Interior, Orderly Frame

According to Joan Nassauer, winning cultural acceptance of ecological landscapes “requires placing unfamiliar and frequently undesirable forms inside familiar, attractive package.”⁷³ The “messy interior” is a healthy and functioning ecosystem. Without the presence of an “orderly frame” (which can take many forms) the “messy interior” is often overlooked or undervalued, but the presence of a purposeful frame, intention in design is clearly declared, and the “messy interior” ecosystem is more easily accepted. When considering a forest ecosystem placed on the University Park campus (the messy interior), orderly frames to consider are:

- a. Mowed grass border
- b. Dotted boulder border
- c. Maintained planted border
- d. Post-and-chain border, only when required

⁷³ Nassauer, Joan Iverson. “Messy Ecosystems, Orderly Frames.” USDA Forest Service. USDA, n.d. https://www.ncrs.fs.fed.us/pubs/jrnl/1995/nc_1995_nassauer_001.pdf.

(a.-c. illustrated below)



Figure 46. No border

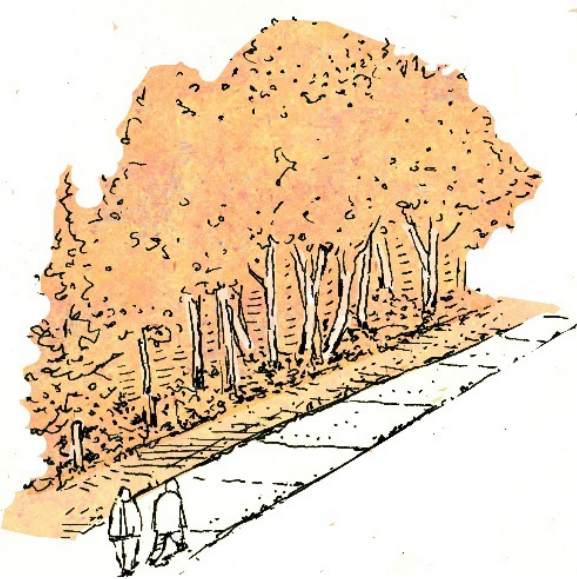


Figure 47. a. mowed grass border



Figure 48. b. dotted boulder border

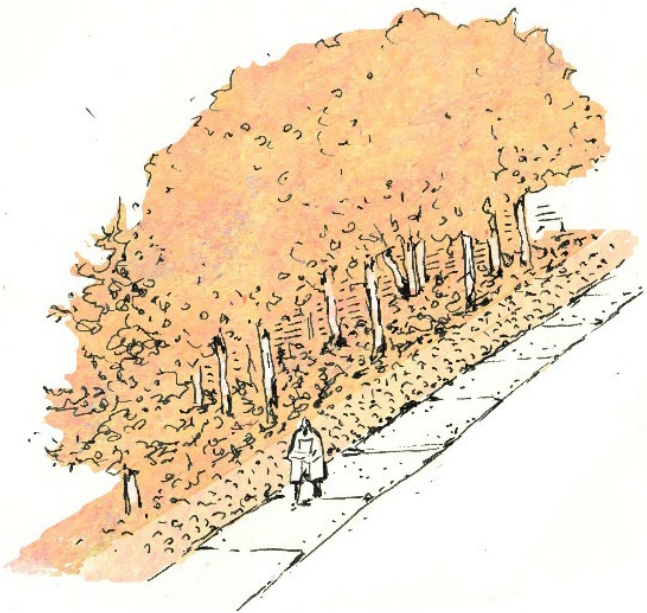


Figure 49. c. maintained planted border (drawings by Hannah Gomez)

Visual and Social Cues

“Cues to care”, familiar details that alert people to beauty and intentionality, is a strategy introduced by Joan Nassauer. These cues can be natural (a bird perched on a tree branch or a spring ephemeral blooming alongside a path), or social (students studying together on a bench or researchers conducting on animal populations). Altogether, cues work to spark recognition, opening eyes to the forest’s value and increasing our willingness to accept and appreciate. Visual cues to be strategically applied in forest pockets are:

- Place bird houses and bird feeders in prominent locations — details like these create recognition of wildlife presence and ecological importance.⁷⁴
- Plant bulbs (such as tulips and daffodils) and familiar/showy species near path edges. Even if these are not native or wildflowers, they are more familiar to the campus landscape and will help to emphasize intention.⁷⁴
- Locate pots filled with showy plants at path intersections and non-forest/forest transitions. Potted plants will provide year-long detail and interest close to eye level.
- Include benches, outdoor classrooms, gathering places, research stations.
- Include art installations and sculptures within the forested areas. In Hort Woods Proper and Hort Woods Remnant, there are successful examples of art nestled between the trees. Encourage forest art installations in studios and in fellowships and residencies.

⁷⁴ Conservation with Eliza Pennypacker, Department Head, Landscape Architecture, April 20th, 2020.



Figure 50. "Wink" Sculpture in Hort Woods Proper



Figure 51. Silhouette sculpture in Hort Woods Remnant

Managing Public Perception

As forest cover is pivot away from the traditionally manicured and maintained campus landscapes, it is essential to be aware of and the public perception of implemented forests. As discussed earlier, when people are unaccustomed to encountering them, adaptively maintained campus forested areas can be perceived as messy or mistakes. Design strategies that communicate the purpose and benefit of forest areas are an irreplaceable tool to combat this misconception. To supplement design strategies, it will be helpful to employ additional strategies of creating public acceptance and appreciation. Possible tools and methods for communicating to the community the values of the forest are as follows:

- Collaborating with Penn State newsletters and the *Centre Daily Times* to write articles explaining the goals and benefits of the forestation project
- Involving students in planting installations
 - This has been done successfully on the Hartley Woods Trail, the Arboretum Pollinator Gardens, and Schreyer tree planting activities⁷⁵
- Including forest designs and forest installations as projects for Landscape Architecture students, architecture students, fine-art students, and horticulture students
- Creating research grants and artist residencies focused around the campus forest
- Promoting visible engagement with the forest by encouraging use of outdoor classrooms, research stations, gathering areas, and art installations

⁷⁵ Conservation with Eliza Pennypacker, Department Head, Landscape Architecture, April 20th, 2020.

Perception of Safety

One of the most frequently used arguments in fights against urban forests is the potential perceived threat to safety forest cover could impose. This argument should not be ignored — poorly designed or poorly managed forests in the wrong location *can* increase perceived threats. When designing forested landscapes, safety concerns must be a priority; design techniques to decrease threat perception should be carefully considered and applied in vulnerable areas. Perceptions of safety are dependent on forest location, forest size and attributes, and human patterns. Factors to consider when evaluating a space for potential perceived threats to safety are listed below:

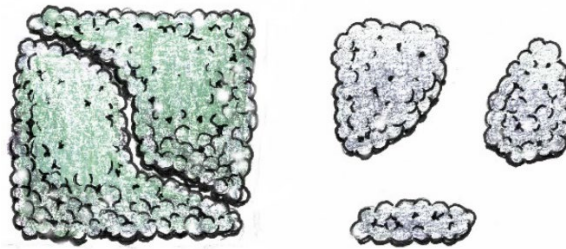
Location and Context

Forest patches surrounded by building facades with windows and entrances tend to feel safer than forest patches surrounded by windowless building facades or parking lots (as noted by the reference to the Theatre Building in Chapter 2).

Human Patterns

Areas with a larger human presence tend to feel safer than areas without one. However, forests with a large human presence are less healthy and less ecologically beneficial. The ecological health and potential perceived threat to safety should be evaluated, placing forests with less human presence in areas only used through the day or easily avoidable at night.

Size



Smaller and further-apart patches of forest tend to feel safer than large forest patches without breaks or clearings, however, large patches of forest with more connections are ecologically healthier and more beneficial. Like the conditions above, the ecological health and potential perceived threat to safety should be evaluated, placing larger patches of forest in areas where the perceived threat to safety is low.

Transparency



Figure 52. Section diagram of forest with a dense shrub layer



Figure 53. Section diagram of forest with a minimized shrub layer, increasing the forest's transparency (drawings by Hannah Gomez)

Visibility through or to the outside of forest increases feelings of safety. Where the perception of danger is high, designers should decrease shrub density and keep understory plantings low, managing plantings so that transparency through the understory is maintained.

Buffer



Figure 54. A forest path with no buffer



Figure 55. A forest path with a designed buffer (drawings by Hannah Gomez)

Distance between pedestrians and the forest edge can increase feelings of safety. Where the threat of danger is high, establish a buffer zone between path edge and forest edge (grass, more formal low plantings, etc.) near major pedestrian corridors (especially those traveled at night).

Hort Woods Proper and Hort Woods Remnant

When considering the perceived threats of forest landscapes, it is helpful to contrast forested areas already existing within the central University Park campus: Hort Woods Proper and Hort Woods Remnant.

Hort Woods Proper, a large patch of forest with a somewhat dense understory (when shrubs are leafed out), has no buffer between the path edge and the forest edge. Under certain circumstances these qualities would have an impact on the perceived threat to safety, yet Hort Woods proper is surrounded on most sides by academic buildings — most pedestrian traffic through the forest occurs in the day as students walk between buildings. The path through Hort Woods is not a major pedestrian path; at night, the forest is easily avoided.

Hort Woods Remnant, on the other hand, rests against Curtain Road, a busy street with more pedestrian traffic and difficult to avoid at night. Although the forest remnant has a dense understory (currently there is no management of dense invasive shrubs), the remnant is thin enough that a pedestrian walking past can see easily through the forest pocket to the other side. A mowed grass strip provides a buffer between the sidewalk edge and the forest edge. It is the transparency, size, and buffer that prevent Hort Woods Remnant from appearing threatening.

Collection, Movement and Patch Spaces

To begin to understand how “cues to care” design techniques should be applied, a categorization of types of campus spaces was developed for this thesis. The categories defined are: Collection, Movement and Patch Spaces. When considering areas of the campus to potentially forest, determining a space’s category will describe strategies for the spaces design as well as its social or ecological priority.

The categorization system considers existing and potential forest spaces on the Penn State campus to provide a basic framework so that appropriate design applications can be tailored to each space. The three categories presented cover a broad scope of campus spaces, not intended to be strictly definitive or absolute, but rather to allow for a shared conversation to continue.

1.) Collection Spaces:

Examples: Old Main Lawn and Fisher Plaza

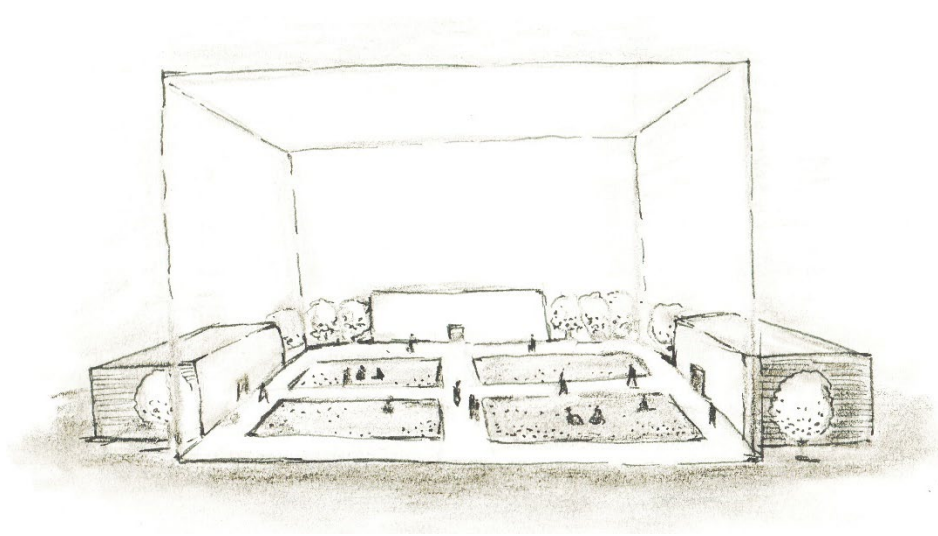


Figure 56. Illustration representing the general characteristics and uses of Collection Spaces

Characteristics of Collection Spaces

Cohesively designed and with clear edges, Collection Spaces have clearly intended use. Any architecture associated with intentional spaces has an obvious relationship to and permeability with the outside space. Collection Spaces have a large concentration of people with high pedestrian traffic. People gather in the space for longer periods of time.

Often, Collection Spaces have an overlay of ceremonial value (Old Main Lawn, Hub Lawn, the Peace Garden). If considered for forestation, ceremonial Collection Spaces should be approached cautiously and minimally.

Goals of Reforesting Collection Spaces: Social

- Increase acceptance of forested campus areas
- Increase visibility and awareness of forest ecosystems
- Exemplify native Pennsylvanian forests, provide gathering spaces and outdoor classrooms and forest engagement areas
- Provide beauty and shade
- Allow for art installations

Strategies for the Design of Collection Spaces:

- Include a high density of “cues to care” and design details
- Allow for prevalent seating, open areas, and gathering spaces
- Manage forest plantings more intensely
- Design transition zones of highly maintained plantings around forest borders

2.) Movement Spaces:

Examples: northern Pugh Street/Henderson Mall past Pollock Road, behind Paterno Library

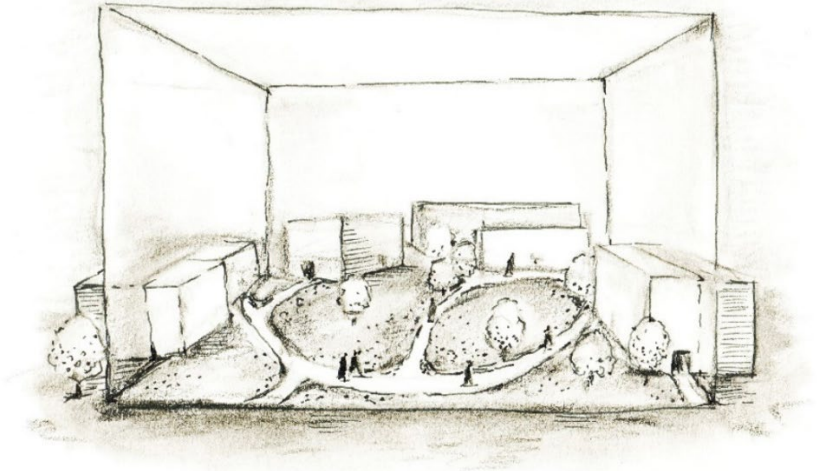


Figure 57. Illustration representing the general characteristics and uses of Movement Spaces

Characteristics of Movement Spaces

Movement Spaces are not intended for gathering but have high pedestrian traffic. The edges of movement spaces are unclear or inconsistent, and any architecture associated with movement spaces has an unclear relationship or is less permeable with the outside. Often, Movement Spaces favor practicality over design and are made up of fragment pieces, frequently covered in unoccupied lawn or mulch. These spaces have a higher potential for ecological forest cover in

central campus than Collection Spaces, and a high capacity to link forest spaces together, but have less potential to become large uninterrupted forest spaces.

Goals of Reforesting Movement Spaces: Creating corridors to Patch Spaces, linking Collection Spaces

- Allow for smooth transitions between Collection Spaces
- Link spaces to create larger swatches of forest
- Create ecological corridors between forest patches
- Encourage acceptance and appreciation of campus forests

Strategies for the Design of Movement Spaces:

- Maintain a high density of “cues to care” to encourage acceptance and appreciation of campus forests
- Form linkages between Collection Spaces, adjacent Movement Spaces, and Patch Spaces
- Manage less intensely than Collection Spaces but more intensely than Patch Spaces

3.) Patch Spaces:

Examples: Hartley Woods, Lewis Katz Building Lawn

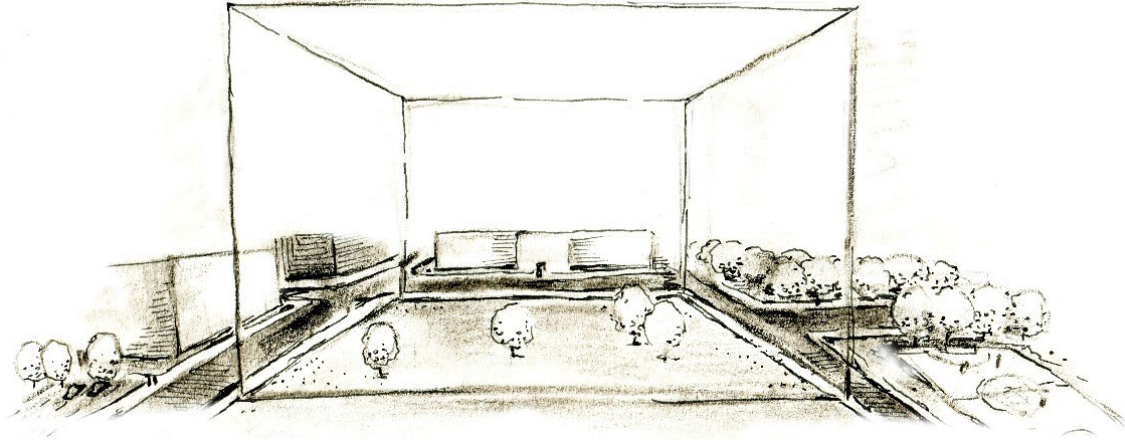


Figure 58. Illustration representing the general characteristics and uses of Patch Spaces
(drawings by Hannah Gomez)

Characteristics of Patch Spaces

Patch Spaces are areas with low pedestrian traffic and gathering spaces, covering significantly large areas of land. They have a uniformly applied surface cover (existing forest cover, unprogrammed grass fields, little-used hardscape). Patch Spaces are unoccupied by structure and have little to no relationship to or permeability with the surrounding architecture. Not intended for regular or high-volume human use, Patch Spaces are ideal for locating forest patches with high ecological value.

Goals of Reforesting Patch Spaces: Create forest spaces with high habitat quality and ecological function

- Limit human presence
- Establish healthy and self-sustaining forest layers for minimal maintenance

Strategies for the Design of Patch Spaces:

- Create clear and intentional borders around forest
- Allow for limited trail and path circulation
- Encourage connections to surrounding forest networks to create ecological corridors

The Overarching Goals of the Forest Network

The above framework, categorizing the campus into Collection Spaces, Movement Spaces, and Patch Spaces, is intended to initiate conversations that further the creation of the forest network. The framework provides a way to conceptualize the function of the forest spaces in relation to the people of the University Park campus and to the ecosystem services that forests provides, ultimately creating a forest network which, to the fullest capacity, benefits both the humans and the environment of University Park — including forest spaces which regularly accommodate moving and gathering people, and including also spaces which are only minimally uninterrupted by a human presence. Ideally, networks of forest would connect this full range of spaces, creating a campus forest which, simultaneously, fulfills the needs of people while strengthening the ecological health and services of the land.

Chapter 6 . AN AFFORESTATION MASTERPLAN FOR THE UNIVERSITY PARK CAMPUS



Figure 59. Areas within the core University Park campus identified as priority areas for campus forest



The above map, created in collaboration with Derek Kalp (a landscape architect in the Department of Campus Planning and Design) identifies areas of the core University Park campus

with high potential for forest cover. Using this map, four focus regions of the campus for establishing forest networks are outlined within this chapter: The Historic Woodlot and Canopy Forest Sweep, The North Atherton Forest, The South-East Campus Forest, and The North Henderson (Pugh St.) Mall Forest.

This thesis does not propose that all areas of campus identified above be blanketed in forest, but rather that each area be considered strategically using design techniques from Chapter 5. In some areas of campus identified open spaces for gathering or views to important vistas must be carefully accommodated for, thoughtfully allowing for the forest to open and maintain key visual relationships — the Lewis Katz Building's library window visual connection to Mt. Nittany or the Business and Forestry Building axis to the arboretum being two examples. In other areas of campus identified, forest cover and open areas/clearings for recreation and gathering should be balanced to fulfill the social needs of the space — Fisher Plaza (a Collection Space with high pedestrian traffic and gathering potential) being an example.

Connecting Historic Woodlots and Canopies

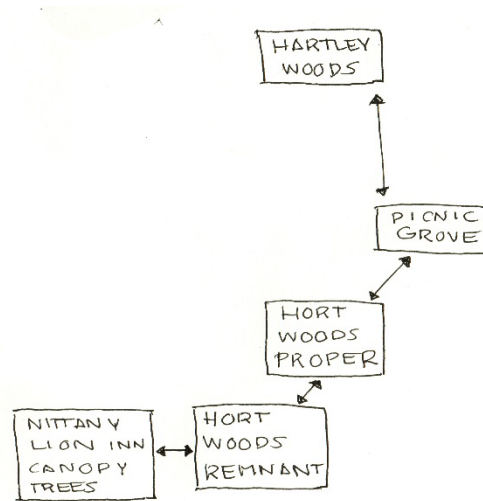


Figure 60. Schematic of historic woodlots and canopies to be connected

The areas connecting historic woodlots and canopy cover on the northern University Park campus are recommended as priority areas for forestation. This connection creates a green sweep of forest between previously isolated forest spaces, establishing a clear identity for the north-west quadrant of the University Park Campus. The green sweep acts comparably to the Emerald Necklace of Boston, creating a linked series of green spaces with social, cultural, and ecological value.

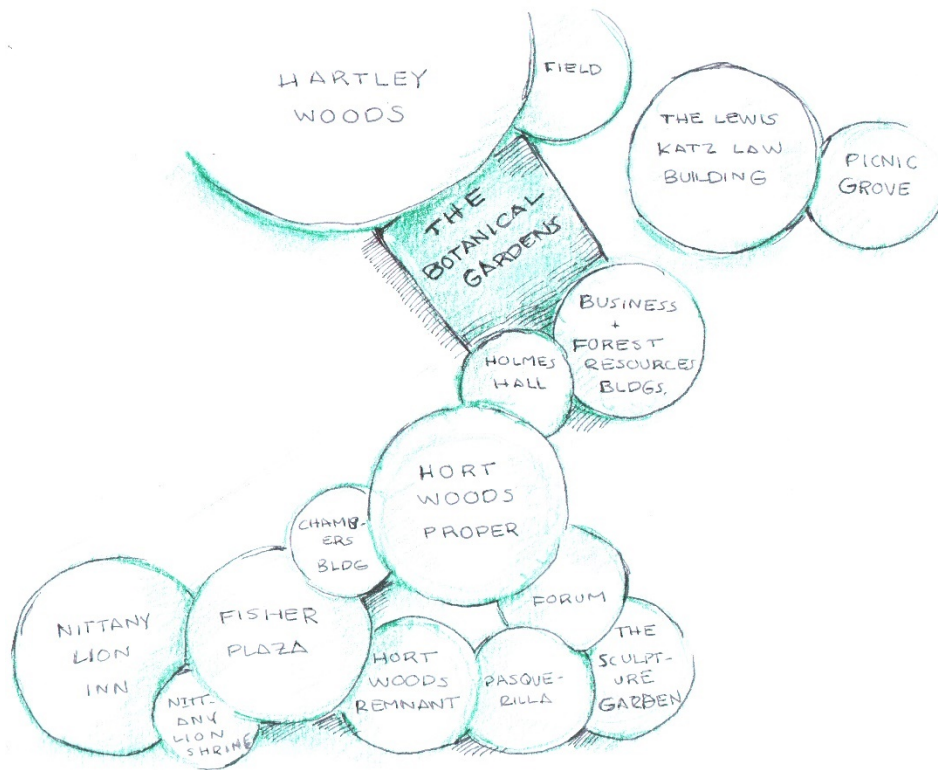


Figure 61. Schematic of connecting campus spaces to form a sweep of forest

The above diagram demonstrates the connections between on the northern edge of the core University Park campus. When forested, the above spaces identified as ideal for forest cover will connect historic woodlots and canopies previously isolated within the campus, creating a sweep of green forest traveling from the Nittany Lion Inn and ending in Hartley Woods.

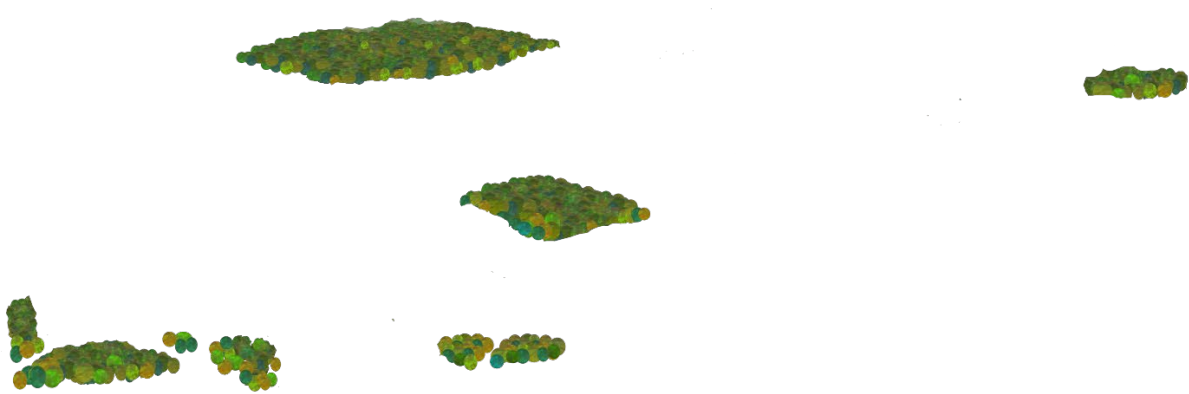


Figure 62. Diagram of historic woodlots and canopies on the northern edge of the central University Park campus

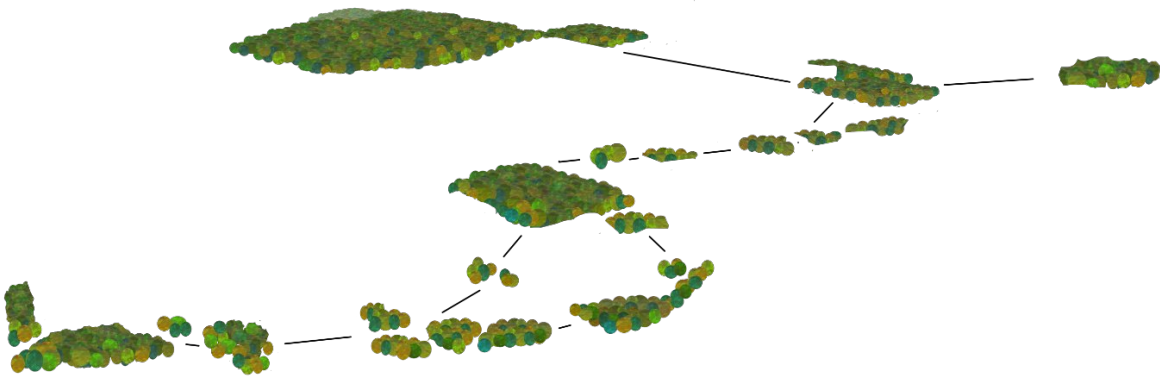


Figure 63. Diagram of forest connections between existing historic woodlots and canopies on the northern edge of the central University Park campus.



Figure 64. Bird’s eye perspective of existing historic woodlots and canopies on the northern edge of the central University Park campus

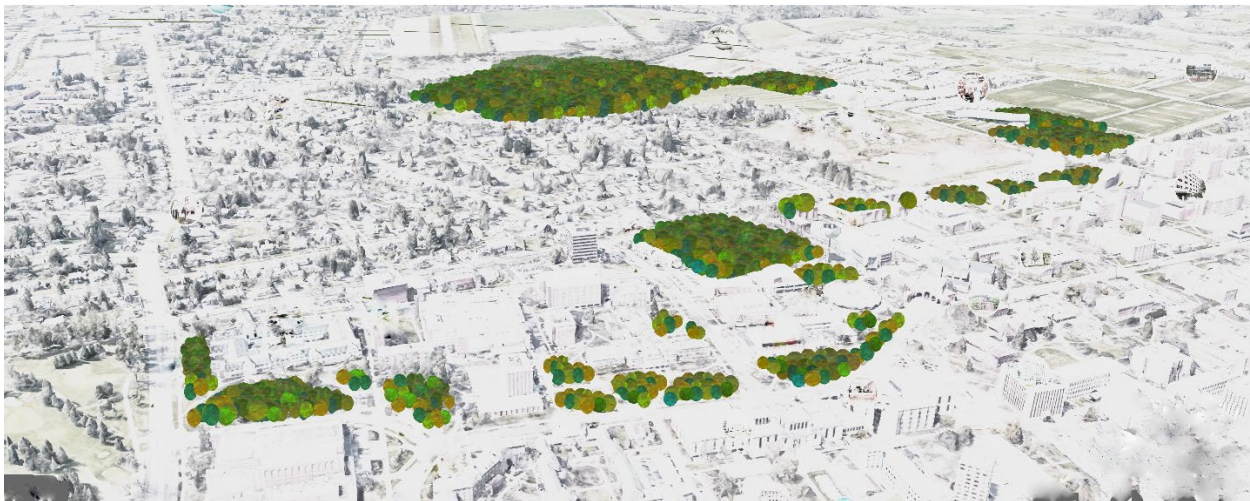


Figure 65. Bird’s eye perspective of forest connections between existing historic woodlots and canopies on the northern edge of the central University Park campus.

The proposed forested areas of campus link the historic woodlots and canopies on the northern edge of University Park, creating a “sweep” of forest spaces through the campus.

Bejeweling the University Park Campus



Figure 66. Olmsted's "Emerald Necklace" plan (discussed in Chapter 3), flipped to best show visual similarities



Figure 67. Drawing of proposed forest sweep through northern campus, connecting historic woodlots and canopies.

A linkage of green spaces within the urban fabric, this proposed network is a scaled-down and forested comparison to Boston's "Emerald Necklace," providing a continuous green way through the campus (as the Emerald Necklace does through Boston) and connecting prominent green spaces such as Hort Woods, the botanical gardens, and Hartley Woods.

Fisher Plaza: Existing

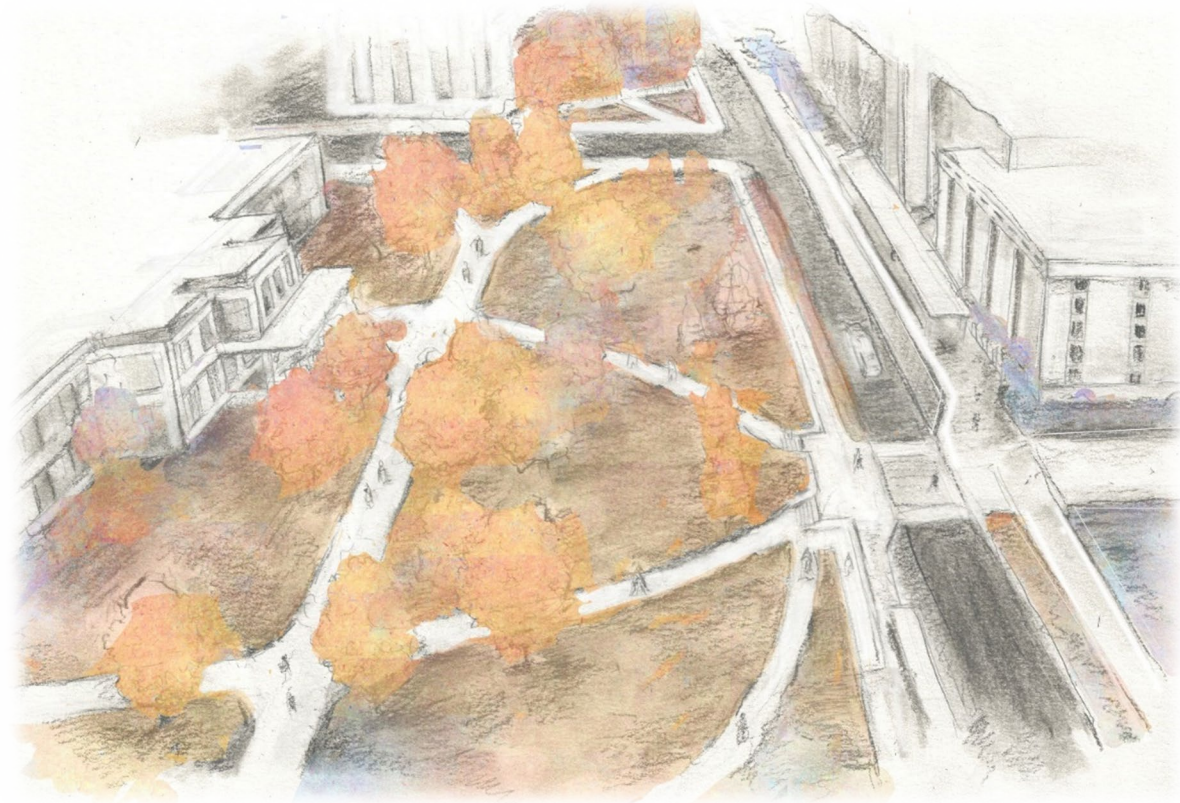


Figure 68. Drawing of the existing Fisher Plaza on the University Park Campus (drawings by Hannah Gomez)

Fisher Plaza, once falling within the boundaries of what was Hort Woods, is a quiet plaza on the north of the University Park Campus. The plaza's design has been updated since its construction of the mid-twentieth century, reducing the amount of paving and improving the plaza's entrance along Curtin Road. Today, Fisher Plaza retains the minimalist style it was first designed to have — the design materials are primarily lawn, paving, and declining Honey Locust trees. The Office of the Physical Plant has identified the opportunity to rethink the nature of Fisher Plaza.

Fisher Plaza: Proposed

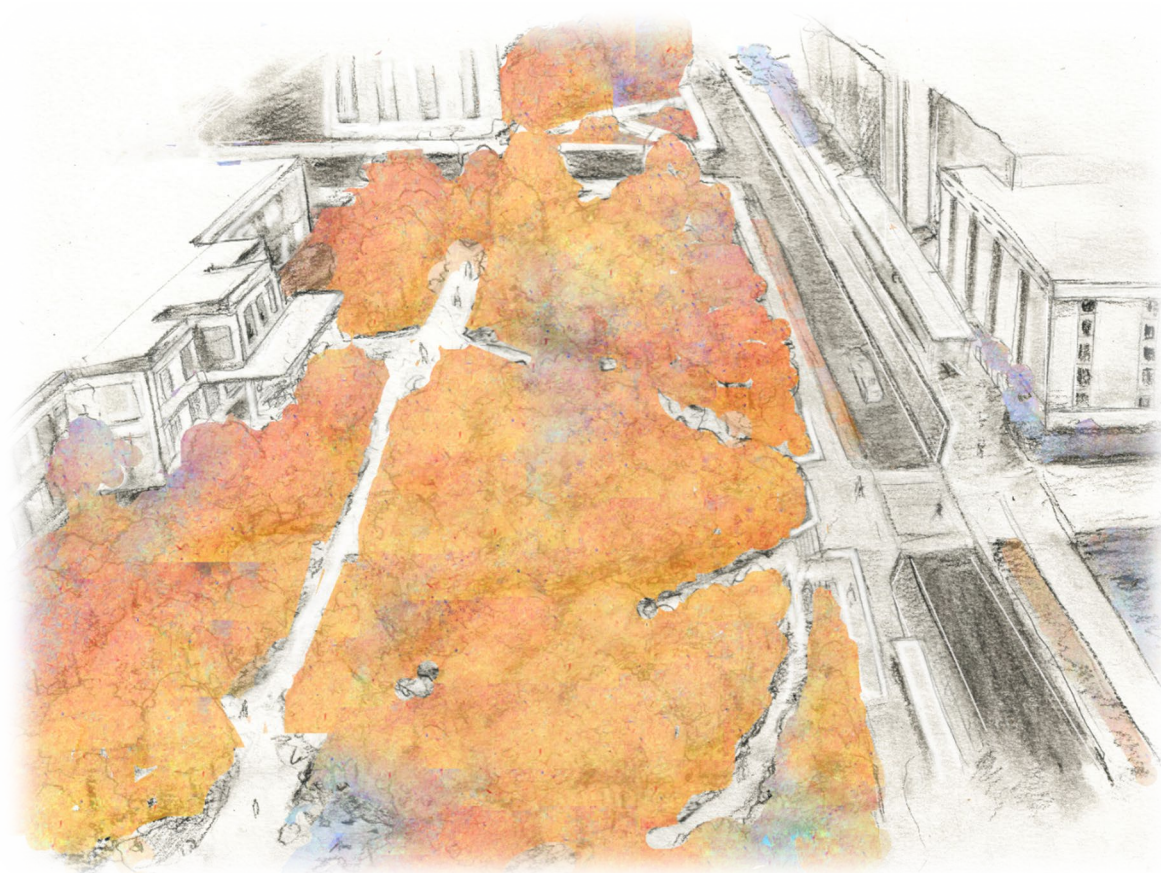


Figure 69. Drawing of Fisher Plaza with proposed forest cover, completing the link between the Nittany Lion Inn Shrine/Inn Forest and the Hort Woods Remnant Forest

Determined by the Office of the Physical Plant to be an area of campus ripe for updating,⁷⁶ there is an opportunity for Fisher Plaza to become a key forest link along Curtin Road — the plaza sits between the canopy of the Nittany Lion statue and the Nittany Lion Inn (to Fisher Plaza’s west) and the remnant of Hort Woods forest (beside the Pasquerilla Spiritual Center, to Fisher Plaza’s

⁷⁶ Conversation with Derek Kalp, Landscape Architect in the Department of Campus Planning & Design at the Office of the Physical Plant

east). Fisher Plaza is an ideal chance to incorporate forest cover in a prominent campus space, linking historic woodlots and providing needed improvements to the plaza's design.

Using the categorization framework outlined in Chapter 5, Fisher Plaza is determined to be a Collection Space: defined by clear edges, permeability between architecture and landscape, heavy pedestrian traffic, and high potential for gathering. Because of the plaza's key social use, visual cues (which signify the purposeful intention of the forest in the plaza's design) should be present throughout the plaza — details such as bulb plantings along path edges and art installations within the understory will encourage positive engagement with and ease apprehension of the new forest. Gathering spaces, ranging from outdoor classrooms to intimate groupings of boulders or benches, should be incorporated into the design, creating space for people to be within the understory.

The new design of Fisher Plaza will strengthen its sense of place, integrating with surrounding forest spaces and taking part in a cohesive identity for the campus's north-west region. As a Collection Space, Fisher Plaza provides an opportunity to showcase the native forests of Pennsylvania, supplying beauty and strengthening the relationship between people and landscape. Fisher Plaza will become a destination: a place to eat lunch beneath the canopy trees, to watch birds fly between branches above, or to walk between buildings when the weather starts to warm, delicate spring ephemerals framing the paths.

The North Atherton Forest Network



Figure 70. The North Atherton Forest Network.

Identified as a region of campus with high potential for forestation, the green areas on the map above indicate spaces in this region of campus to be considered for forest. A campus forest along North Atherton would enhance the experience of pedestrians, bikers, and drivers along North Atherton Street and the surrounding campus spaces. The network would connect with the existing historic tree canopy of the Nittany Lion Inn, bringing the canopy south towards College Ave.

The South-East Campus Forest Network



Figure 71. The South-East Campus Forest Network

Identified as a region of campus with high potential for forestation, the green areas on the map above indicate spaces in this region of campus to be considered for forest. The south-east region of the campus has low pedestrian and vehicular traffic, containing many Patch Spaces. This region has the potential for high biodiversity. As the design of the campus evolves and parking lots are minimized, the campus forest in this region will have more opportunity to expand.

The Northern Henderson (Pugh St.) Mall Forest Network



Figure 72. The Northern Henderson (Pugh St.) Mall Campus Forest Network

Identified as a region of campus with high potential for forestation, the green areas on the map above indicate spaces in this region of campus to be considered for forest. The southern portion of the Henderson Mall, running along Old Main Lawn, is a historic part of the campus's design and not ideal for forest. After crossing Pollock Road, the design of Henderson Mall becomes much less structured (primarily movement spaces). This part of the mall connects with the back of the Paterno library and the spaces south of Hort Woods, all areas with high potential for forest.

Ideally, forest would create a transition along Henderson Mall. A pedestrian walking along Henderson Mall from downtown would pass from the formal lawns of Old Main to the forest of Hort Woods, following a gradient of forest spaces between the two.

Chapter 7 CONCLUSION: A NEW CAMPUS FOREST AT UNIVERSITY PARK



Forest, the natural cover of the Centre County landscape, has played an important role in the history of Pennsylvania and The Pennsylvania State University. At Penn State's beginning as an agricultural school, "Horticulture Woods" (today known as Hort Woods) once covered a large swath of the campus. As the university grew, Hort Woods was slowly eroded (not deliberately, but gradually and little by little. In an era of dramatic expansion from a small agricultural school to a university housing thousands of students, much of the forest within the core University Park campus was cut down and built over — the idea for conservation not considered until only a small fragment of the campus forest remained. Today, a fraction of Hort Wood's canopy trees still stand within Hort Woods' new and tighter boundary, and scattered within the original Woods' boundary, lone survivors can still be found, original Hort Woods canopy trees now shading lawn and mulch where there once was understory. Rich and fertile, the soil beneath the trees remains ideal for forest growth, proven by the success of recent tree plantings.⁷⁷

⁷⁷ Conversation with Derek Kalp, Landscape Architect in the Department of Campus Planning & Design at the Office of the Physical Plant

Demonstrated by an experiment (conducted by Penn State researchers from 2012 to 2019) in nearby Hartley Woods, when the forests of the campus are properly managed and freed from the clutches of invasive species, self-sustaining communities of native plants establish and thrive. Exercising strategic management of existing and new campus forest spaces will, in the long term, establish healthy forest ecosystems and lessen the amount of energy inputs required, decreasing both financial and ecological costs.

To recreate the presence of forest once found on a much larger piece of the campus would be to strengthen the campus's ecological health, connecting patches of forest ecosystem with corridors and increasing the biodiversity of the campus. The presence of forest within campus spaces will benefit the well-being of students, faculty, and staff, and will contribute to a cohesive identity for chosen regions of the campus. This thesis presents a conceptual framework to reconsider the forest cover of Penn State's flagship campus and, based on the framework outlined in Chapter 5, a design strategy to unite the remaining fragments of historic woodlots and canopy with newly created forested spaces, sweeping across the northern edge of the core campus. Beginning at the Nittany Lion Inn and arcing through campus to end in Hartley Wood, the proposed forest sweep follows Olmstedian principles of design as campus integrates with landscape.

Like Platos' academy, the utopia of learning and culture named for its home among the trees of *Akadēmos*, a connection of the campus to its native landscape would strengthen the campus's sense of place. In a natural progression of University Park's design, the campus forest will bring Penn State closer to reaching its ecological goals, setting a precedent to be followed and further

enhancing the beauty of what is already one of the country's most beautiful college campuses:

Penn State's University Park.

Appendix A

Letters for the *Centre Daily Times* Archives chronicling the battle to save Hort Woods

November 18, 1948, Editorial, *Centre Daily Times*

“In a letter in Tuesday’s Collegian the Hort Woods bobbed up again — a letter from alumnus and faculty member Harold E. Dickson. He pleads for the preservation of that woodland tract on North Campus “as is.” “It is the last remaining portion of this campus to retain the wilder tag of a Penn State which has vanished,” he wrote.....”but we are not as site as he seems to be that the way to preserve that area against “despoliation” is to keep it “untouchable” In its present “untouched” condition it looks like a forgotten or neglected portion of the campus, an area just waiting to be utilized for building purposes when somebody gets around to it. Perhaps if it were allowed to be judiciously touched up, it might be more untouchable, if Harold can follow that reasoning. Harold said further “Only in Hort Woods can the laves now fall in autumn to lie throughout the winter”

November 20, 1948, Editorial, *Centre Daily Times*

“Many Penn State people — students, alumni, faculty — would like to see the “Hort Woods” area of our Campus preserved in a natural state. While there has been no announced intention of placing buildings in it, disturbing rumors to that effect keep cropping up. Nobody has said that buildings will not go there. Even now the largest of the trees in it are being felled with ominous frequency. In its way the situation is not unlike the forgotten case of Mt. Nittany when a landmark was saved from despoliation in the nick of time. In the fall of 1921 students enthusiastically proposed branding the flank of Mt. Nittany with a huge S, either of whitewashed stones, or, as later suggested, of planted evergreens. Money was collected and the project was on the point of being carried through. But Fred Lewis Pattee, beloved teacher and author of the verses of “Alma Mater”, publicly protested making a billboard of this “most distinctive feature of our landscape”. Opposition was aroused and the move was stopped. Other funds were afterward used to better purpose when the unscarred Mt. Nittany was purchased by Lion’s Paw for the College. I think Dr. Pattee today would agree that the Hort Woods tract, too, is worth preserving. It is the last remaining portion of this Campus to retain the wilder tang of Penn State which has vanished, but which he would remember. All the rest has been transformed into a well-tended and landscaped suburban lawn on large scale. Only in Hort Woods can the leaves now fall in autumn to lie throughout the winter, instead of being scooped up by the gasoline powered leaf rakers. Preservation of this spot can only be assured by making it officially untouchable. All Penn State graduates, and undergraduates might in some manner be pressured to have these woods set aside and dedicated as a memorial grove — perhaps as a living memorial to soldiers, but in any case, as on to an older Penn State. No funds would be needed. Little should be done to the place other than to keep it intact as a natural retreat of plant and animal life. But surely steps ought to be taken to do this before other irrecoverable decisions are made and we are left holding nothing but regrets.

November 26, 1948, Mrs. A. W. Cowell, *Centre Daily Times*

“To the Editor: Most colleges endeavor to have preserved on their campus’s sections of wild woods as laboratories for Nature Education, forestry, and zoology students. The Hort woods should be so considered. It is the last place on the campus for the bird watcher and the growth of the town removes other such places to impossible distances for the daily student of birds. Except for a few woodpeckers, starlings, and sparrows there are no birds in the Inn woods because food and shelter have been removed. The large trees in the Inn woods are dying as forest trees always do when the natural mulch is removed. The same would happen in the Hort woods should they be cleaned up. I thought at one time that the very attractive new plantings on the campus would draw an increasing number of birds on migration. Such is not the case. Finding large numbers of species grows increasingly difficult except in the Hort Woods. Let us help Mr. Dickson in his effort to save these woods before it is too late.”

November 27, 1948, H. H. Arnold, *Centre Daily Times*

“The Hort Woods is sometimes spoken of in a sentimental tone as a kind of antique, while at the same time it is regretfully designated a neglected woodlot or an unimproved part of the College campus. Much is being said these days about the conservation of natural resources. Is there anything in the woods worth preserving? What follows aims to be an inventory of the contents of this strip of woodland from the point of view of a nature lover. Although Hort Woods cannot be called a fragment of “virgin forest”, since it was completely cut over in the early history of the College and is consequently a second growth, still it must represent pretty nearly the native forest of this region, and the soil can hardly have been disturbed after the first cutting. The trees are now White Oaks and Scarlet Oaks in about equal proportions, with Black Oaks as a close third. Incidentally, one who has missed the coloring of the Scarlet Oaks along the drive and at the picnic ground this October has missed a real treat. Other trees are represented in the Woods in smaller numbers. There is quite a growth of young Locusts at the south corner, and in late May they are covered with fragrant blossoms. It may not be commonly known that in hot August afternoons the leaves also have a similar fragrance, as I have noticed many times in passing. The undergrowth in the Woods contains a great many seedling Wild Cherries, a few feet tall and in early spring these put out their delicate green while the branches above still seem dry and dead. The earliest green, however, is that of the Ash-leaved Maples, of which there are several in the center of the Woods. The Wild Cherry, as well as the Sweet Cherry, are no doubt so well represented because of seeds dropped by the large flocks of blackbirds that come in the fall. It is to be supposed that the Pines were better represented in the original forest, but there are now only a few left, an occasional Pitch Pine, a White Pine by the east walk, and another in the center. This tree provides a carpet of fallen needles and overshadows a log for a resting place, that is usually adorned in fine weather with a couple of lovers. Besides Red Maples (a fine one by the drive), and the Mockernut Hickories, a number of species are represented by small trees or mere saplings: Flowering Dogwood, Alternate-leaved Dogwood, Walnut, Sassafras, Quaking Aspen, Bigtooth Poplar, Linden, and Tulip Tree. Of the smaller trees, and the larger ones as well, the last to retain its green leaves in the fall is the Buckthorn. There are several of these, and it is also a common small tree in the woods north of State College, and in the uncultivated islands of the College farms. It seems likely that all these were planted by birds from berries gathered

originally from a College nursery that is said to have occupied a section east of the present College mall. There is a venerable specimen of this tree at the end of the walk from Old Main toward the Home Economics building. The Burnthorn is, then, most likely one of a group of trees that have escaped into the Hort Woods. Among other escapes, the most numerous seems to be the Norway Maple, the Ash-leaved Maple, mentioned above, the Ailanthus (of A Tree Grows In Brooklyn fame), White Mulberry, Horse Chestnut, Catalpa, Kentucky Coffee Tree, and Alder Buckthorn (*Rhamnus frangula*), all coming quite clearly from parents of the Campus, and all coming from the dumping of raked leaves, twigs, and fruit. They are for the most part small, and badly overshadowed by the native trees. In this group belongs a sapling of about twenty feet in height and two inches thick of an exotic tree called Zelkova (species *serrata*). We have seven of these trees on the campus, all large and flourishing, the largest just north of Main Engineering. It measures 10 feet, 11 inches, in girth and was photographed this summer by a tree enthusiast from Danill, a Dr. Baldwin. But that is another story. A few other saplings of the same species in the Hort Woods lead me to think the tree has escaped there and I begin to wonder if this East Asian tree has anywhere else taken to the wilds in our country. In addition to the trees that have escaped into the Woods a number have been added by planting. Small Red Pines are scattered here and there and have grown very slowly, while the solid planting of this tree at the north center has thriven splendidly. They are now about thirty years old as can be determined by the successive whorls of branches. Near this same corner is a small planting of Pine Oaks. Along the edge of the Woods, Sugar Maples, White Birch and Red Bud have been set out in recent times. The shrubs and vines of the Hort Woods may to some give it an unsightly appearance, but we should not forget that they serve as cover for the birds and chipmunks and also keep the fallen leaves in place as protection for the wild flowers. There are the usual and often annoying Blackberries, and also Raspberries, Enderberries, and even Wineberries and Wild Black Currants. The west side has an abundance of Sumac. Panicked Dogwood and Prairie Willow are found, and the Low Pale Blueberry, that we would expect to find no nearer than the Barrens of the mountains. As you descend the path toward the Library, there are on the left several large bushes of Squaw Huckleberries. The berries are large and remain green, seeming never to ripen. But in September when they begin to fall from the plant, they have a delicious flavor, not unlike gooseberries. For years the writer has had them all to himself. By the end of June a low shrub called New Jersey Tea is found abundantly in bloom in the north part of the woods. It is a feathery cluster of creamy white flowers. If the seed pods are gathered later for a winter bouquet, after a few days in the warmth of a room they construct and snap the seeds to a considerable distance. Walkers on the north-south path will find the center of the Woods, near the White Pine, a large colony of Japanese Knotweed. It is not properly a shrub, and dies down to the ground in winter leaving a multitude of hollow canes. Then it shoots up in the spring with remarkable vigor and speed reaching the height of about five feet. (note on page 118) As in the case of trees, a few shrubs seem to have escaped from the campus: Jet Bead, Bush Cranberry, and I have even found the common Garden Current, The Yews and Rhododendrons on the lower side must have been planted there, but Forsythia and Mock Orange father back could have come from the dumping of refuse plants. The vines of the Woods are the Riverbank Grape and the Virginia Creeper. The latter is especially abundant in the section neighboring the greenhouse. It offers the first red coloring in our autumn foliage. If in the late autumn or earliest spring when the ground is free of snow, you should venture from the beaten path among the brambles, you would find several evergreen plants nestled among the leaves and moss. They are Wintergreen and Partridge Vine, each with their bright red berries. You will find too, Shinleaf and two species of Pipsissewa with

their glossy leathery leaves. In June, these last have a pretty fragrant blossom about the size of a dime and shaped like a crown. The early spring flowers, the ones that come while the trees are still bare, seem to prefer the sunny south-west side of the Woods. Here you will find the Wind Flower or Rue Anemone, the Early Everlasting (that the children call Pussy Toes), the Early or Hispi Buttercup, Common Cinquefoil, and Blue-eyed Grass, that looks like a tiny iris on a spear of grass. On this side, too, there is an abundance of a plant called Heart Shaped Alexanders, a plant of the parsley family with very pretty thick leathery root leaves. Another plant of this family found in the same general section, but blooming much later, is the White Flowered Angelica. As the leaves start out on the trees the spring flowers come on in quick succession. Bellwort and Smooth Solomon's Seal are common in the north-west section in the places where they have not been covered by a recent dumping of clay soil. There are a couple of colonies of the Wild Lily-of-the-Valley on the side toward the students' gardens. At about commencement time there is plenty of the Wild Geranium, the flower that blooms when the Wood Thrush sings. And an occasional specimen of the Four-leaved Milkweed may be found. This delicate flower, the earliest to bloom of the milkweeds, has a fragrance and a mysterious appeal that is hard to account for. Indeed, the charm of wildflowers in general seems to come from their clear-cut individuality. They have style. May I merely mention a few names. Readers will recognize old friends, and some may care to look them up in books. By mid-summer you may look for Saint John's Wort, Wild Onion, Goose Grass, Bush Honeysuckle, Carson Flower, etc. Bunch Flower is usually a cluster of lily-like leaves that rarely puts up a flower stalk. Add Cow Wheat and two species of White Lettuce (*Prenanthes*). By early July Tick Trefoils begin to bloom. There are several species, the one called *grandiflorum* being our earliest. A little later you may find the small triangular pods sticking to your clothing. The species commonest in the Hort Woods is the one with the leaves on one stem and the flowers, and consequently the pods, on another entirely different leafless one, perhaps the better to deceive the unwary traveler. August rains bring up the Indian Pipe or Ghost Flower. This small plant is entirely devoid of green and seems to be made all of wax. It impresses one as a rarity, and we are surprised to find that it is found over nearly all of North America as well as Japan and the Himalayas. And speaking of rarities, we have in the Hort Woods an orchid, Coral Root, a small inconspicuous thing, and an orchid, nonetheless. Our woods in late summer are likely to gleam with an abundance of the White Snakeroot, a shade-loving relative of the distasteful Boneset. With us it competes for space with the White Wood Aster, that is not very attractive individually, but effective in mass. There are also wide colonies of the root leaves of the Large Leaved Aster. These curious leaves send up a flowering stem. It is possible that we should especially prize our colony of the Whorled or Mountain Aster. It is located where the paths cross at about the center of the Woods. I have seen this striking plant nowhere else near State College. Of the Goldenrods we need only to mention the one that is called Silverrod, and then the Wreath or Blue-stemmed Golden-rod. This one has none of the coarse structure usually associated with the type. As the name indicates the flowers are scattered in small clusters along a smooth blue stem. The Stout Goldenrod is a true giant. Gray lists it as "rather rare", but there are at least a dozen specimens on the slopes of the Woods facing the campus. As in the case of the trees and shrubs some cultivated flowers have escaped into the Woods. I have found Lemon Lilies and Lilies of the Valley. On the left side of the path entering from the greenhouse road is a large area covered with a plant of the parsley family, Gout Weed or Garden Pest. It is quite attractive with its solid mass of green held late in the fall, but it may become a true pest in rock gardens. A legitimate improvement of the Hort Woods might be the addition of a few missing species of our common wildflowers such as Blood Root, Wild

Ginger, Columbine, Jack-in-the-Pulpit, etc., with a few of our common wood ferns, Polypody, Christmas fern, etc. The writer is naturally alarmed at any talk of “improvements” for the Woods. There are always those who wish to convert it into a park. Evidently much more would be lost than gained. If we throw away our heritage the coming generations will arise and not call us blessed.”

November 29, 1948, Editorial in the *Centre Daily Times*

“Although the original Times editorial asserted that the destroying of the trees to make way for new construction was a shame, it was not the major point of the article. It simply pointed out that the College campus retain a rural touch, keeping in line with State College and Centre County, as opposed to the jam-packed skyscraper effect of a New York, Philadelphia, or Pittsburgh institution of learning. It appealed for a retention of the campus as it looks today — or looked a few years back — by spreading out rather than confining new construction to the boundaries of the campus as they are generally accepted. That’s strictly a personal observation from a layman — but one shared even by landscape architects, foresters, and perhaps others who may know something about rural beauty.”

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ACADEMIC VITA

HANNAH GOMEZ

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EDUCATION

	The Pennsylvania State University
Aug 2015 - present	College of Arts and Architecture <i>Bachelor of Landscape Architecture</i>
Aug 2016 - present	Schreyer Honors College
Aug 2019 - Dec 2020	Akademie für internationale Bildung <i>Bonn, Germany</i>
May 2018 - June 2018	Barcelona Architecture Center <i>Barcelona, Spain</i>
May 2019 - June 2019	Aboriginal Art and Culture Studies <i>New Zealand & Central Australia</i>

WORK EXPERIENCE

Summer 2019	Bradley Site Design Internship <i>Washington D.C.</i> <ul style="list-style-type: none">Created construction and implementation detailsManaged marketing and social media accountsOrganized material and sample libraries
Summer 2017	Campus Planning and Design Internship <i>The Pennsylvania State University</i> <ul style="list-style-type: none">Worked on a wide variety of projects on multiple Penn State campusesAssisted in public space and planting designs, visual and written communication, and the production of construction documents
Summer 2018 - Present	Art Class Instructor <i>Penn State Center for Arts and Crafts</i> <ul style="list-style-type: none">Led classes on landscape sketching, drawing, jewelry making, and polymer clay sculpting for students and facultyFacilitated free crafting events for Penn State students
Summer 2018	Teaching Assistant <i>Penn State Center for Arts and Crafts</i> <ul style="list-style-type: none">Practiced leadership and communication skillsGuided children ages 6 - 13 to develop artistic abilities and creativity

RECOGNITIONS

- ASLA Pennsylvania Delaware Chapter Student Merit Award | *2019*
- Excellence in the Study of Landscape Architecture Award | *2016, 2017, 2019*
- Veronica Burns Lucas Travel Award | *2018*
- William E. And Julia Neo Clark Excellence Scholarship | *2018*
- Reuben and Gladys Golumbic Scholarship Award Finalist | *2018*
- Dean's List | *2015 - present*

SKILLS

- | | | | |
|---------------|------------------|---------------------|----------------------|
| • Adobe Suite | • Sketching | • ArcGIS | • Sketchup and Rhino |
| • AutoCAD | • Hand-rendering | • Model Fabrication | • Microsoft Office |

LEADERSHIP & INVOLVEMENT

- Landscape Architecture Student Class Representative | *2018 - 2019*
- Landscape Architecture Leaders Member | *Penn State | 2017 - present*
- Historic Preservation Roundtable Member | *2019 - present*
- National Organization of Minority Architecture Students Member | *2017 - present*
- Assistant Scenic Designer | *Penn State Thespians | 2017*
- Volunteer at The Butterfly Garden at Tudek Park | *2016 - present*
- Latino Outdoors Member | *2018 - present*