The Evolving Landscape:  
A Landscape Management System  
or "We Talk Succession, But We Don't Practice It"

In Partial Fulfillment of the Requirements for the Degree of:  
Bachelor of Landscape Architecture  
Ball State University

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**ABSTRACT**

Title: The Evolving Landscape: A Landscape Management System
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Landscape architects often prize themselves on working with a media that is living, ever-changing: growing. Yet, with all of our talk about growth, we never practice succession. We never fully take upon ourselves the challenge of an evolving landscape.

My goal for this comprehensive project was to create a process by which succession might, truthfully, be used as a means for design. Using a portion of the Ball State University Campus, I explored how background material regarding successional theory, landscape ecology, model landscape management techniques could be combined with a site's ecological and cultural history, and functional needs to produce a landscape which could change as it modified its environmental conditions. Effort was made to understand a new order of maintenance based upon natural, not human, timetables.

The development of a species-specific successional plant palette (where time, not aesthetics, assumes the major role) further supported the philosophy and reality that the natural world we live in is in constant transition. By understanding and upholding this basic principle, the landscape architect can begin to design for, not against, succession.
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These caring individuals included my parents, my roommates (especially Kim and Shari), and Professor Gary Oliver, my thesis advisor.

Thank you, Jeff, for supporting me, and allowing me ("Did you have any choice?") to use your personal computer and raid your cupboards.

My most sincere thanks, however, must go to Professor John Russell for his having opened me up to this challenging, rewarding, and lifelong pursuit of true successional design.
CHAPTER 1
Introduction to the Project

Landscape architects often pride themselves on working with a media that is living, ever-changing, growing. Yet, with all of our talk about growth, we never practice succession. We never fully take upon ourselves the challenge of an evolving landscape.

Our profession, by its very nature, should be a dynamic process, yet our designs have traditionally not embodied change. Landscape architecture is also supposed to be multidisciplinary, yet we have turned our backs upon our environmental peers because we have reckoned landscape architecture as ecology and landscape architecture as fine art to be at opposite ends of the spectrum.

The environmental fields, however, offer a diversity of practical theories which could lend themselves well to a higher and more complex understanding of the nature, the goal, and the ends of landscape architecture. Landscape ecology, especially, holds potential for bridging the gap between the natural sciences and environmental design. The discipline looks past the heterogeneity of ecosystems to the similar structure which pervasively establishes each unique system. The focus of landscape ecology is trifold:

"(a) the distribution patterns of landscape elements or ecosystems,
(b) the flows of animals, plants, energy, mineral nutrients, and water among these elements; and
(c) the ecological changes in the landscape mosaic over time" (Forman vii).
Not only have we landscape architects turned our backs on our environmental peers, but we have turned aside from our landscape gardener heritage. Landscape gardeners, such as Gertrude Jekyll, Sir Lancelot Brown, and Jens Jenson (who, by the nature of his work, might be labelled as a landscape gardener), intimately knew the lives of the plants with which they worked. Now, many landscape architects are complacent with leaving the detailed plant palette to a horticulturist or whatever is available at the wholesale nursery. Landscape architects do not have to become estate gardeners once again, but we do need to reacquaint ourselves with the true nature of our media. As Henry Moore looked at the essence of wood in creating his sculptures, so might we take a closer look at the essence of our basic media: plants.

As we dropped our role as landscape gardeners, we also washed our hands of the concerns of maintenance. Some landscape architects do collaborate with the maintenance team on such matters as mowing patterns, snow removal, annual installation, and these are important. These are also short-term considerations which do not look beyond maintenance except as a daily chore.

By not integrating maintenance into our designs, we can only leave ourselves open to professional and clientele disappointment. Too often, we are only too quick to absolve ourselves of any site responsibility once a project has been implemented. Clients are given no clue as how to best manage their new investments. "Management" is left in the hands of the maintenance crew, which, not knowing the design intent, maintains the site in a singular time dimension from its own perspective of what is important. Without a goal, maintenance is applied as to a machine: trees are pruned to maintain a specific mass, annuals planted in the same manner on an annual basis, only to be ripped out at the same time in the fall. Maintenance is for the status quo; performed like clockwork with little consideration for the plants' sense of time. We have no reason to believe that our intended design will come to fruition, if we leave no means of reaching the ends.
Goal and Methodology

Landscape architecture, as with any profession, continually needs to question itself, the assumptions it has made, and the direction in which it is heading. We talk succession and now is the time to explore how we may practice it. My goal is to explore and develop a system by which succession might, truthfully, be used as a means for design. The methodology I used determined the structure of this paper:

1. **Background: Data Collection and Analysis**
   Essential to any research project, I gathered background information on ecological succession, landscape ecology, and models of landscape management. I also reviewed traditional landscape architectural theory on planting design and the human environment, as well as the potential roles of plants.

2. **Site Analysis**
   Cultural geographers and historians study their craft so that we may understand our history, our roots. In conducting a site analysis, landscape architects often look at the human history of the site alongside its present functional uses and needs. To better understand the potential vegetative roles, I felt it important to understand the ecological history of the site.

   In brief, the site chosen for this thesis is what might presently be called the Library Quad on the Ball State University Campus in Muncie, Indiana. University officials view this space as potentially becoming the new center of activity on campus. The present 1960’s design is out-moded and does not fully meet circulation, education, and relaxation needs. The campus context of the Library Quad offers the challenge of synthesizing social needs with ecological structure and change. A more detailed site analysis is described later in the paper.

3. **Program Formulation**
   Having used the site and experienced it in all seasons for four years, I had a good idea as to its functional needs. Assuming the role of the client, I drew up a functional program.
4. Phasing and Zoning
Functional areas in the "climax design" were paralleled with a stage of secondary succession. Zones, then, were created which required different management techniques based upon the point of succession at which they were implemented and their function.

5. Concept Generation
A wasteful process (of trash paper) which allowed me to better visualize the changes which the site might go through as growth occurred.

While steps 2 through 5 were occurring, I developed a more decisive Successional Plant Palette.

6. Coordination of Plant Palette with Successional Design
The design generation was at the conceptual level concerning the plant palette. I understood the basic growth characteristics of the pioneer, intermediate, and climax stages, but I designed the concept, for the most part without specific species. In step 6, I made the marriage between the concept and the palette more complete.

7. Management Guidelines Development
By understanding the characteristic changes the landscape would undergo and having set performance criteria for safety and function, I could then draft basic management guidelines.
Assumptions

So that I might concentrate my studies on the design implications of ecological succession, I made several assumptions, which I have listed here.

1. The validity of now-contested successional theories is, for this project's purposes, upheld.
2. The Ball State University context would be similarly developed. As such, the campus environment, itself, would become a learning environment: diverse, stimulating, and a new order for campus design. As a whole, the campus could offer a diversity of microclimates and habitats.
3. I am the Client. I am Ball State University.
4. Something outside of the campus norm is encouraged.
5. The present Ball State plant nursery will be redeveloped into a native plants nursery. Therefore, the native palette, which I have adhered to, will be available. This native nursery would also offer another educational opportunity.
CHAPTER 2

Background

In the human landscape, plants have the potential of taking on several roles: ecological, communal, sociological, aesthetical, functional, and successional.

Ecological and Communal:

There are two basic plant systems to consider for successional development: the individual system and the population system (Carpenter 14). The individual system solely encompasses how the individual plant interacts with the environment around it. The population system goes beyond the isolated individual to how plants within a community interact with each other.

A plant community might be looked upon as an aggregation of plant (and animal) species within a place and time (Forman 590) or, more succinctly, a plant community is comprised of species which are able to grow and survive in a similar environment (Carpenter 7). "Similar", not "same", because each plant modifies its immediate environment in a distinct manner; hence, the idea of the niche is created. A plant may modify microclimatic factors (light, humidity, temperature), nutrient availability, soil, etc. in its own self-serving way, thus, establishing its niche within the larger scheme of the community. Niche development allows species populations to overlap; each plant interacts with the next, and collectively the plant community affects its environment.

Stratification. The interactions, the relationships, within a community are the thrust of ecological studies. Interactions often lead to competition for resources: light, water, nutrients, and soil. Competition within a stand arises when different species have similar requirements. The plants must vie for the same location and "may the best plant win!" Over time, competition either results in the extinction of a recessive species or self-modification of its habitat in order to maintain its existence within the community. This constant contest to gain dominance subsequently leads to the stratification of the community. The vertical layering, can be quite complex within a woodland.
Stratification is, thus, the result of, and from, competition and availability of resources. In the woodland setting, the overhead canopy often creates a series of shady layers within the understory. As one moves down towards the forest floor from the canopy, one encounters a diversity of adaptations in leaf structure, physiology and life cycle to accommodate the decrease in light. The herbaceous layer is especially affected and, to cope with the shortage of this fundamental resource, species may develop life cycles attuned to the daily and seasonal changes of light, while others may develop a shade-tolerant physiology. Yet other species have light requirements which change with growth. The American beech (Fagus grandifolia) is a fine example of the latter adaptation. While the poplar, with its fast growth rate, is quick to take advantage of any openings in the canopy, the beech maintains a steady growth underneath the shade of the canopy until it crowds out its former competitors. In time, the beech will become one of the dominant species in the woodland.

In the woodland setting, light is controlling factor of community structure, but other components must not be forgotten: soil, mineral nutrients, water, humidity, and so on. The limited availability of certain resources within a community force the creation of niches in order to survive. The greater the number of niches, the greater the species diversity. A failing of many human-developed landscapes is their simplicity, or lack of niches. The resultant systems are artificially maintained and the ecological richness which attempts to pervade the system is kept out at a high energy cost.

Community Definition. Humans have a need to label and some have defined plant communities by the dominant species, e.g., the Beech-Maple and Oak-Hickory forests. A community can often be recognized as a stand, a spatial landscape component with natural or arbitrary boundaries (Carpenter 74). Each stand is unique, but within a given region, a similarity among stands can be recognized. The clustering of similar stands results with
the concept of the plant association, and the next step in the hierarchy, the cluster of association, is the plant formation (Carpenter 75). The eastern United States, for example, is characterized by the North American temperate deciduous forest formation, to which the above-mentioned Beech-Maple and Oak-Hickory forests belong. The ecologist Pierre Dansereau placed the formation and association within their global context, and the table and diagrams to the left further explain the spatial placement of his conceptual dimensions of the environment.

A hierarchy is, thus, set: similar (local) stands are grouped under (regional) associations, which may further be placed under (continental) formations. Distinct formations can be recognized as components of a (global) plant formation-type. Here, one can begin to understand the logic of introducing species to an ecosystem. Comparable communities under a formation-type can be recognized despite their classification within different formation. These communities, for example, the European Beech-Maple forest and the North American Beech-Maple forest, may be taxonomically distinct, yet still have morphological similarities (Robinson 163). Some will argue that this is no basis for species introduction, but given a plant's predisposition for a particular community (which does not threaten the structure of the community), in a human-modified environment there is nothing wrong with a non-native species, especially if it has a unique functional or aesthetic value not

Dansereau’s Dimensions of the Environment (Robinson 166)

<table>
<thead>
<tr>
<th>Environmental unit</th>
<th>Major control</th>
<th>Area covered</th>
<th>Type of response</th>
<th>Vegetation unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biosphere</td>
<td>Medium (physical)</td>
<td>World</td>
<td>Ecological</td>
<td>Various</td>
</tr>
<tr>
<td>Biocore</td>
<td>Climate (meteorological)</td>
<td>Region</td>
<td>Structural</td>
<td>Formation-class</td>
</tr>
<tr>
<td>Climate</td>
<td>Climate (meteorological)</td>
<td>Landform</td>
<td>Structural and floristic associations and subordinate series associations</td>
<td></td>
</tr>
<tr>
<td>Habitat</td>
<td>Topography and soil (pedologic)</td>
<td>Layer</td>
<td>Sociological</td>
<td>Union</td>
</tr>
<tr>
<td>Synusae</td>
<td>Macrosite (micro-geological)</td>
<td>Niche</td>
<td>Sociological</td>
<td>Union</td>
</tr>
<tr>
<td>Biotope</td>
<td>Micronsite (micro-meteorological or biological)</td>
<td>Niche</td>
<td>Micronetic</td>
<td>Micronotic or aggragation</td>
</tr>
</tbody>
</table>

Dansereau’s dimensions of the environment “A, the three biocycles in which land is subdivided into four biocores, B, an example of a formation within the forest biocore and of the several habitats determined by topography, C, a single upland association with its four layers, D, the lowermost layers of the spruce-fir with their ultimate subdivisions, the biotopes” (Robinson 167)
found within the native palette.

**Landscape components.** Within a landscape, there are components which might lend themselves well to managed landscape design: ecotones, patches and corridors.

An ecotone is the overlapping of two plant communities. The increased heterogeneity of this environmental component results with a local increase of species diversity. This horizontal structure may be abrupt, or succint (Forman 60). An abrupt ecotone is a narrow overlap of two ecosystems. When the overlap is wide, mosaic patches of each community intermix. Within an urban environment, the mosaic can introduce a natural relief from monotonity. Through time, the communities might modify their shared environment such that their overlap becomes a succinct continuum (Forman 61).

The key difference between "natural" and traditional horticultural design is the exploitation of the ecotone (Ruff 120). Traditional design creates a harsh line between ecological communities as well as functions. Conceptually, an ecotone can allow for "breathing space" or temporary overload within a design. Ruff asserts that a minimum ecotone width of 90 feet is necessary from woodland to grassland (Ruff 121). This width, however, can vary depending on how abrupt or succint the designer envisions the ecotone. By laying out circulation perpendicular to ecotonal change, landscape monotonity might be avoided.

Patches are non-linear surfaces which differ in appearance from their surroundings, often comprising their own niche within the landscape (Forman 83). Disturbance, chronic-repeated and remnant patches are largely the result of environmental modification. Disturbance patches are caused by a natural, or human-forced, activity which places the area at a new stage in the successional continuum (Forman 85). Chronic-repeated patches are caught in a cycle of disturbance, eg., fire purposefully set to clear a patch, or the mowing of a meadow (Forman 87). These might be of special value to the landscape designer in that the landscape is not left to succeed upon its own, but kept within a revolving cycle of change. Remnant patches are the inverse of disturbance patches in that they surround an unchanged area, eg., an area where fire might have jumped over (Forman 89).

Environmental resource and ephemeral patches are two patch types with distinct time patterns. Environmental resource patches are long-lived and strongly tied to their geography and soil, eg., a peat bog in a depression (Forman 93). Ephemeral patches, eg., ephemeral wetlands, are more attuned to the annual climatic
cycle (Forman 97). These raise the possibility of taking advantage of unique annual changes in the context of a slowly evolving landscape.

All of the aforementioned patch types may be introduced and managed. Some, such as disturbance patches, may require specialized management, e.g., controlled burning. Patches offer the potential of creating a series of rooms within an environment or, on a singular basis, can create a niche with a special sense of place.

Corridors also have wide-ranging possibilities, and, given their linear structure, they are especially adaptable to the urban environment. Corridors are narrow strips of land which differ from the matrix on either side (Forman 123). These range from hedge rows, to streams, to freeways. Line corridors are narrow components of a landscape matrix, whereas strip corridors are wide enough to establish edge and interior species (Forman 142). Overall, connectivity or the presence of breaks are major characteristics of the corridor (Forman 127). The corridor has the potential of tying together a series of contrasting communities or functions; it may be the means for unifying a diverse landscape. Traditional boulevards, with their special plantings, are corridors. Greater attention might now be made to connect these corridors not only functionally and aesthetically within the landscape, but ecologically as well.

Sociological, Aesthetical and Functional

The university campus offers a unique challenge to landscape architects. Almost a city unto itself, campus design must deal with issues such as circulation, housing, recreation, and so on, along with the classroom itself. "Whatever the model selected, campus planning generally comprises the arrangement of buildings and spaces created between building" (Marcus 54). The spaces between buildings are often ignored for both the potential to tie the campus together as well as to fulfill the wellness requirements of the students and faculty; the sociability of the spaces are forgotten for axes and sight lines.

A 1981 study by a Berkely landscape architecture class reported on a social nature of a campus which might be better fulfilled. The report dealt with "home bases, front porches, back yards, and favorite spaces."
Each student and faculty member views a particular building on campus as "home base." For example, architecture student refer ("lovingly") to the "archie building" as their "home away from home." Like a residence, these buildings have a front porch, front yard, and, sometimes, a back yard.

The front porch, the main entrance of a building, is a critical transitional space for casual meeting, socializing, eating, and studying. Here occurs the greatest concentration of use. The Berkley study concluded that this area needs more space around it which could be used for the above activities. The front porch should be a sun trap - somewhere to catch the first warm days of spring. The front porch should also reflect a feeling of partial enclosure [territoriality?], slightly apart from the mainstream of other campus circulation (Marcus 55).

"Buildings seem to expect something from us" (Marcus 55), be it study, work, or class, while the outdoors expect nothing. The Berkley report suggested that the outdoor environment is the calming antidote to the indoor pressures as well as relief from the physiological stresses of buildings: air conditioning, fluorescent lighting, video display terminals, building materials pollution (Marcus 56). The front yard, or area in front of the main entrance should be subtly organized on the front notion. Lawn areas in sun and shade offer visual and choice diversity (Marcus 56).

With the growing use of ad hoc building placement on campuses, few buildings have a "back yard." The backyard is partially enclosed and, being more connected with its built context, creates a greater sense of territoriality. Here, there are possibilities for more quiet, unhurried, sheltered use, as opposed to the front yard which become common turf (Marcus 56). The back yard might be used as a place to study quietly or eat lunch, but also presents the opportunity for classroom use. The human being, like other animals, tends to stick to edges, and so seating should be grouped around edges or islands. Moveable seating, when possible, provides even more choice. The enclosed courtyards of Oxford and Cambridge are examples of well-developed back yards (Marcus 57).

The Berkley survey also revealed that people liked both "urbanity" and "greenery" (Marcus 59). Looking at the future, though, people tended to favor "open spaces and "greenery" over "malls" and "plazas" (Marcus 59). Could successional design slowly replace the former?
The aesthetical and functional roles of plants are widely documented, and, while considered in the plant palette and final design, they will not be discussed within this paper. For my own purposes, I have reviewed Robinette's *Plants, People, and Environmental Quality*

**Successional:**

As mentioned previously, climax vegetation is often used to define a given community. the concept of climax vegetation is a part of the succession theory originally introduced by F.E. Clements in 1916 (Robinson 161). Succession is defined as: the directional species replacement process, often leading through a series of recognizable stages to a climax community (Forman 600).

There are two basic forms of succession: primary and secondary. Primary succession occurs with the establishment of a plant where there was no previous soil base (Austin 20). We landscape architects, however, are mostly concerned with the process of secondary succession which occurs on disturbed sites. The irony of succession is that the plant, by modifying its environment, inevitably leads itself to extinction (Carpenter 78). This process continues until a community is established which is at a self-regenerative equilibrium: hence, a stable climax.

In determining the plant palette for a given site, it is important to understand a plant's role within an association's succession. Along this line, plants can be roughly divided into pioneer and climax species (as well as intermediate, or gap phase, species). Pioneers are aggressive, quick-growing in their youth, and sun-loving. Given an open site, these species are best able to compete. Climax species, however, tend to be slow of growth and shade-tolerant. While the pioneer species dominate the canopy for the early part of secondary succession, climax

![Conceptual secondary succession (Austin 21)](image)
species are able to tolerate the low photosynthetic levels beneath the canopy, and upon maturity, they out-compete the pioneers and also destroy the latter's ability to reproduce.

The concept of successional landscape management is not entirely new and the following examples illustrate some of the working concepts.

_Naturalization Project for the National Capital Commission (Ottawa)_
_Hough, Stansbury + Michalski Ltd._

Hough and associates looked at naturalization and urban forestry as means of diversifying the urban setting. Naturalization “brings an ecological view to the design and maintenance of the urban landscape; natural process rather than horticultural technology forms its underlying framework” (Hough 17). There are four reasons to plant in an ecological manner: conservation, appearance, diversity and economy (Colvin 10) and, especially in the university setting, one might add a fifth: education.

The work for the NCC looked at three reforestation process categories: plantation, managed succession, and natural regeneration. Managed succession was of the most interest. Developed in Britain and Holland, this approach is based on natural succession assisted through human management (Hough 26). the techniques under this approach do not initially ameliorate the soil conditions (as horticultural practice usually does), but rather use pioneer or fast-growing nurse species to “improve soil drainage, fix nitrogen, stimulate soil micro-organisms and create a microclimatic environment more suited to the development of climax vegetation” (Hough
Each stage of managed succession has a different (social and ecological) function, visual character and plant association, yet all are tied together through time to the climax stage.

There are three alternatives within the managed succession approach:

*Alternative 1:* Here, a 100% pioneer mix is initially planted. The climax species are introduced after the canopy has closed, and slowly take over the canopy.

*Alternative 2:* Pioneer and climax species are planted at the same time on the cleared site. This approach requires perhaps more precise thinning in order to assure healthy growth and to avoid allowing too much light on the climax species.

*Alternative 3:* Planting occurs in nuclei or planting islands spaced 45 to 60 feet apart throughout the site. Within each nucleus are clumps of pioneer and climax species. After canopy closure, some of the pioneers are thinned while still retaining partial shade. Edge species are also left to mature and, given time, these species invade the gaps between the islands. As the closed and open character of the site changes, the social functions might change their placement within the site.

**Teesside Parkway Planting**

*Brian Clouston and Partners*

This project gives an example of parkway planting and emphasizes the choice to diversify the age and height of a stand from the initial planting. Trees were planted in mixes of low, medium and high heights, thus allowing the designer to

![Managed succession, alternative 3: nucleation](image)

![Teesside parkway planting concept](image)
avoid the monotony of a single-height screen (Cobhan 318), even more visual diversity is derived from mixing trees and shrubs.

Gustavsson's thinning and coppicing regimes

late, light thinning. The result was a stand of closely spaced trees and a high canopy. This offers an opportunity to create a feeling of boundary to a site, while still allowing for easy pedestrian passage. Regime B requires early, heavy thinning and results with the formation of a "forest room" with a defined low ceiling and floor. The third regime, C, Gustavsson termed a "low woodland type" and results from a cyclical coppice system and requires species which give hearty shoots. The social effect is a screen. Heavy thinning, regime D, creates a high canopy which allows for the creation of a one-level coppice understory. the final regime requires a complex management scheme of thinning and coppicing, yet creates the most diverse and layered composition. (Tregay 280)
CHAPTER 3
Successional Plant Palette

Initially, I thought that putting a species-specific successional plant palette together would be a "piece of cake." The icing soon melted when the readily-available skeleton framework of secondary succession became the only available framework. I began to make assumptions concerning the landscape and associations.

When we look upon a landscape, we often characterize it by the dominant species. For example, upon looking at the old quadrangle at Ball State University, one would see a landscape dominated by a remnant oak-hickory association and, thus, call that area "oak-hickory." Often, however, when we label the landscape so, we tend to think of the landscape as permanently being that character. The canopy may grow higher and different herbaceous species may find their way into the landscape, but that landscape will remain so. Or so we think. We tend to forget that the landscape is in constant transition.

Christy Woods, a disturbed woodland area on the BSU campus, is purposely left to its own devices with minimal human interference. Now, the oaks and hickories, which have characterized the woods for several decades, are being slowly dominated by the beeches and maples and their associates. The landscape is, clearly, in a state of transition, which has slowly developed. Because the human landscape is normally kept frozen within a singular timeframe, we have a difficult time understanding or recognizing change.

Association composition is in a constant state of transition. From the skeleton of succession, I began to look at the species associated with the few species which were placed within succession. Characteristics which I used to further rationalize the resulting successional plant palette included shade tolerance, growth rate, and drought and moisture tolerance. Much of my analysis was supported by Gary L. Hightshoe’s Native Trees, Shrubs & Vines for urban and Rural America.

The species are placed within the following pages according to where they generally might be found within the secondary succession continuum. Their presence could well extend before and after their placement. My aim was to present the overall change in species composition.
ANNUALS
Shasta Daisy
Lancelot Coreopsis
Plains Coreopsis
Purple Coneflower
Blanket flower
Dame's Rocket
Lewis Blue Flax
Black-eyed Susan
Gloriosa Daisy

ASTERS AND GOLDENRODS
Smooth Aster
Rigid Goldenrod
New England Aster
Skyblue Aster
Old-field Goldenrod

Smooth Sumac
(Rhus glabra)

PERENNIALS AND GRASSES
White Wild Indigo
Stiff Coreopsis
Rattlesnake Master
Dragonhead
Black-eyed Susan
Golden Alexanders
Blue Flax

New Jersey Tea
Pale Purple Coneflower
Prairie Purple Clover
Mountain Mint
Culver's Root
Lanceleaf Coreopsis
Bush Clover
Carolina & Prairie Roses
(Rosa carolina & setigera)

Hawthorn epp.
(Crataegus spp.)

Common Honeylocust
(Gleditsia triacanthos)
Black Locust
(Robinia pseudoacacia)

Box Elder
(Acer negundo)

American Plum
(Prunus americana)
Red Mulberry
(*Morus rubra*)

Blackhaw Viburnum
(*Viburnum prunifolium*)

Pignut Hickory
(*Carya glabra*)

Common Ninebark
(*Physocarpus opulifolius*)

Indiangrass Coralberry
(*Symphoricarpos orbiculatus*)

Chinkapin Oak
(*Quercus muehlenbergii*)
Bur Oak
(Quercus macrocarpa)

Allegany Blackberry & Fragrant Thimbleberry
(Rubus allegheniensis & odoratus)

Common Sassafras
(Sassafras albidum)

Black Cherry
(Prunus serotina)
Eastern Black Walnut
(Juglans nigra)

Common Hackberry
(Celtis occidentalis)

Jerseyta Ceanothus
(Ceanothus americanus)

Shagbark Hickory
(Carya ovata)

Eastern Redbud
(Cercis canadensis)

Gray Dogwood
(Cornus racemosa)
Bitternut Hickory  
(*Carya cordiformis*)

Butternut  
(*Juglans cinerea*)

Green Ash  
(*Fraxinus pennsylvanica lanceolata*)

Ohio Buckeye  
(*Aesculus glabra*)
Common Chokecherry  
*(Prunus virginiana)*

American Hophornbeam  
*(Ostrya virginiana)*

Common Pawpaw  
*(Asimina trioba)*

American Hornbeam  
*(Carpinus caroliniana)*

Nannyberry Viburnum  
*(Viburnum lentago)*
Northern Red Oak
(Quercus borealis)

Common Witchhazel
(Hamamelis virginiana)

Black Maple
(Acer negrum)

Flowering Dogwood
(Cornus florida)

Common Spicebush
(Lindera benzoin)
Smooth Hydrangea
(Hydrangea arborescens)

Atlantic Leatherwood
(Dirca palustris)

(Tilia americana)
American Linden

Pagoda Dogwood
(Cornus alternifolia)
Sugar Maple
(*Acer saccharum*)

American Beech
(*Fagus grandifolia*)
CHAPTER 4
Site Analysis

Contextual site analysis

After gaining an understanding of landscape ecology, succession, and models of landscape management, I next turned to the site. Traditional site analysis often encompasses site conditions and functions, and direct (political) context. However, to truthfully employ succession as a means of site design, it is imperative to understand the site from its larger, bioregional context, as well as its history - ecological and cultural (that is, the human context and its role).

Stepping back from the library quad site of Ball State University in Muncie, Indiana (note: all are political definers), I looked at the regional climax area: the beech-maple association. This association lies entirely within the area covered by the last, or Wisconsin drift (Braun 307). "This youthful land surface contrasts with the great unglaciated territory of middle and lower latitudes of the United States" (Braun 307). As a result, these soils are rich with nutrients, not having been leached through time.

Time. Once again, it plays a silent, but important, ecological role. The conditions in this glaciated area - temperature, rainfall, soil - all support the beech-maple association. This land is still young, however, by geological standards: only 20,000 years old (Braun 6). Over time, plant-soil relationships may prove not to be in total equilibrium and the soil, via root uptake or groundwater leaching of nutrients might change to a more acidic composition. This would then favor a more coniferous or acidic plant community. I draw this example as a reminder that the landscape is in constant transition and changes are being wrought which can not be appreciated or calculated within human understanding.
The fertility, though, of the beech-maple forest is evidenced today by the great agricultural base which much of this area has become. Unfortunately, much of the beech-maple association (and prairie and wetlands) on this continent was removed for human exploitation of the soils.

I next took a step closer to view the library quad upon the Tipton Till Plain, which, in Indiana, provides the basic boundaries of the beech-maple forest. The Tipton Till Plain, a wide band which runs through central Indiana, is the result of the Wisconsin drift. There were several shifts in dominant species composition from the mixed mesophytic forest as the receding ice drift allowed vegetation to migrate northward. The advancement of the oaks during the post-glacial xerothermic (a dry and hot period) delayed the migration of the beech-maple association in Indiana (Lindsey 283). At the time of Indiana’s settlement, the beech-maple forests were still undergoing compositional changes (Lindsey 283).

The Tipton Till Plain, however, offers optimum soils for the beech-maple association and the climatic conditions are also highly favorable. Various topographic and edaphic (soil) conditions supercede in controlling local community composition. The beech-maple association is best developed on north- and east-facing slopes, whereas the oak-hickory forest is best developed on south- and west-facing slopes. The beech-maple association favors the resulting cooler and moister conditions.

Looking now to the Ball State University (BSU) campus context, one finds an educational institution which is an important part of the Muncie community. The present BSU landscape is underdeveloped. An opportunity is being missed to combine the university’s goal to promote the wellness lifestyle concept with the physical environment. The
wellness concept looks at diversifying and balancing the individual, yet the university has done little to diversify the campus environment to offer a wide range of potential experiences and activities. Students, faculty and staff need more than open circulation areas; they need chairs and benches; turf areas they can sit upon, play and relax in; shaded area, areas for privacy, public events, formal occasions....in short, diversity.

In this thesis, I have taken only the library quad - a small, but vital, chunk of the university - yet the entire campus could be analyzed and redesigned according to potential vegetative types in order to offer a diversity of landscape and functional experiences and educational "tool" for the university and community. Therefore, the library quad might be managed eventually as beech-maple forest, but the area directly to the east - between the Whiting Business building and the Noyer complex (student dormitories) would be maintained as an open field community to accommodate recreation.

Finally returning to the site's immediate context, the library quad is bounded by the College of Architecture and Planning (CAP) building, Bracken library, Whiting Business (WB) building, and McKinley Avenue to the north, south, east and west, respectively. The site presently functions about 95% of the time as a circulation area - the buildings and parking lot being the major pedestrian traffic generators. There are six benches - hardly accommodating to potential users. Posts and chains are "strategically placed" to prevent pedestrians from crossing over turfed mounds. These also succeed in keeping people from relaxing on the immaculately maintained lawns. The space amply accommodates the biannual UniverCity event - a week-long celebration of universal themes - as well as individual colleges' graduation ceremonies. At these times, the space is animated and greatly appreciated.

University officials would like to carry this father and see the library quad redefined as a true quadrangle. As the university continues expansion northward, it needs a core area for activity. Various colleges have expressed the need for outdoor classroom space and, as an academic quadrangle, this space could better provide for the wellness of students, faculty and staff.
Site Analysis
Site zones were analyzed by their opportunities (+) and constraints (-).

College of Architecture and Planning building:
- A disproportionate amount of asphalt and glass surfaces makes the area subject to heat and glare.
- There is little diversity of choice for seating on the asphalt steps.
- Intended classroom/presentation areas are either too hot or too windy because there is no buffering from these extreme conditions.
+ With the intended addition to the south, there is the potential to create classroom and presentation space on the lower terraces which works.
+ Diversity could be made by simply introducing an overhead tree canopy.

Parking Lot:
- Present source of glare from autos and surfacing.
- Breaks up pedestrian flow.
- Poorly and illogically drained; runoff could be better used for irrigation.
+ Slated for removal, the parking lot area can then become an east-west pedestrian alee (one exists - but pedestrians have to move through the parking lot) with a transition/study zone between it and the CAP building.

Open Area:
- There is little visual or ecological diversity: turf, plenty of asphalt, and a few scattered trees.
- There is plenty of glare and heat.
+ Well-vented from the west and northwest (at times, too vented).
+ Can accommodate large university events.

Whittinger Business building balcony:
- No diversity of choice exists.
- No protection from sun and wind.
+ With a windbreak to the west, moveable furniture and carrels, users might be given better choice instead of just "high and blown dry."
North Side of Bracken Library:
- Entrance to the library is overpowering.
- Perpetual shade cools down cool winds even more as they whip around the building.
+ The architectonic beds might be more thickly planted to shelter the fire escape pads, which could then double as classroom areas.
+ The scale of the beds to either side of the entrance could be reduced in order to make the entrance more inviting.

McKinley Avenue:
- Little differentiation between pedestrian and vehicular traffic except for an eight-inch curb.
+ A tree allee would act as a campus spine and improve the pedestrian experience.
CHAPTER 5

Program and Phasing

Having been a student at Ball State for four and a half years, I had a good idea as to the shortcomings and opportunities of the the library quad - via my own observations and of those around me. I felt confident to assume the role of the client, Ball State University. I looked at the space as becoming an academic quadrangle. Surrounded by academic building, in particular the library, I see the quad first responding to academically-oriented activities: studying, learning, graduation ceremonies and educational events such as UniverCity. This does not mean that the quad could not accommodate non-academic activities, but the spaces would be designed with the concept of an academic quadrangle or academic grove in mind.

I created a rough site program based on what I saw as a "climax" design - the final product after all of the pieces have fallen into place. I took the components, the zones of this climax design and placed them in relative order of urgency to be realized, made usable. This suggested phasing of the components is detailed below:

1. Removal of parking lot and replacement of present pedestrian asphalt pathways with unit pavers.
   The removal of the parking lot allows the space to be more fully redesigned as a pedestrian quadrangle and campus core.

2. Creation of pedestrian allee on axis to the Ball and Bell buildings on the west side of McKinley Avenue
   The creation of the pedestrian allee has a sense of urgency to it. The allee would begin to create a diversity from open sun to a closed caropy. Already a heavily used corridor, the addition of a multi-species allee would improve the experience. Benches along the allee would allow for casual meetings, a resting place, and so on. Over time, study carrels would be added within the transition/study zone to the north to allow for studying, eating, socializing. with heavier use besides circulation, there will need to be the addition of waste receptacles and even one or two drinking fountains.

3. Amelioration of Whitinger Business balcony conditions
   The present mound along the west side of the building will be used to create a thick windbreak. The change in contour will help guide the wind up and over the balcony. As the height of the windbreak increases, so will its effectiveness: for every vertical foot of windbreak, ten
horizontal feet behind the windbreak are protected. The mound could also be cut into to create two quad-level classrooms.

4. Creation of tree allee along McKinley Avenue

This allee would visually act as a spine for the campus (it would continue north and south from the site) as well as functionally serving as a partial windbreak for the library quad and easing the pedestrian experience along McKinley Avenue.

5. Implementation of the College of Architecture and Planning Alumni Terrace

This already-planned project would add a sense of history to the building’s south entrance and ameliorate the glare and heat conditions of the present terrace. Cutting into the buffer zone (actually, a gap within the wooded site) would be a space large enough for the CAP graduation ceremonies. With careful placement of older trees, this area could then later be blended into the rest of the climax canopy, or remain a gap on the edge of the wooded quad.

6. Addition to the College of Architecture and Planning building

Still in the conceptual stage, this addition would allow the creation of lower terrace classrooms. To buffer from winds careening down off the building’s roofline, the concept of a wooded ravine will be explored, thus providing an overhead buffer.

7. Scale reduction of the Bracken Library entrance and the creation of 3-4 classroom areas

Within the first and second years, the outline of the architectonic beds would be modified (as will be seen in the Concept Generation). The two beds flanking the library’s north entrance will be redesigned as groved terraces with seating for studying, eating, and so on. These would be at the level of the library’s doors and the out-moded stairs and handicap ramp would be replaced with a gentle slope to accommodate all levels of physical ability. The raised terraces would then be accessed from the library door level.

The present fire escape pads, to be better buffered from the wind, would be enlarged and would then double as classroom space. Chairs could be brought out for classroom use, and should there be a fire alarm (which is clearly audible outside), the class would then be advised to act quickly and stack the chairs away from the door. This would simply require an explanation beforehand of how to act - much like people are advised how to exit a building upon sounding of a fire alarm.
8. Creation of the open gathering space
   Given the eventual canopy closure over the quad, this centrally located space would perform several functions:
   - First, it would, upon closure, act as a gap within the canopy and provide a choice between sun and shade.
   - Second, it would provide an open space for lectures, concerts, readings, and so on.
   - Third, given the revision of the quad's contours, this one-foot sunken area would become the drainage basin of all excess run-off not absorbed by the woods or pavers. After especially heavy rains, this area, with a sandy base underneath the field vegetation, would perhaps remain flooded for one to two days. This would offer an ephemeral diversity to the quad and act as an educational tool as well.

9. Creation of the transition/study zone
   A mixture of canopy and understory, and gaps, the transition zone would provide a variety of open and closed spaces for studying, eating, and meeting casually. Precautions will have to be taken to maintain setbacks and provide ample lighting for nighttime safety.

10. Creation/succession of a shaded amphitheatre
    Mildly contoured to accommodate large crowds for UniverCity lectures and other large university events, the amphitheatre will have a high canopy to provide a feeling of spaciousness.
CHAPTER 6

Zoning

After drafting the program and its phases, the site was broken down into functional zones which roughly paralleled the program elements. These zones were then analyzed for the spatial qualities necessary to fulfill the functional role of each zone. Then, by having an understanding of the spatial qualities of the successional stages and of the stages of the management schemes reviewed in the Background section, I began to place each zone along the successional continuum. The spatial qualities of the successional stages became evident as I formulated the successional plant palette.

1. College of Architecture and Planning classrooms
   This zone would be conceptually planted as a wooded ravine with trees planted amidst the stepped seating. Selective understory and shrub placement would further buffer the outdoor classroom and presentation spaces from passers-by and wind. The zone, given the partial shade from the addition and eventual shade from the transition/study zone to the south, would be best started in the intermediate wood stage. The site would be relatively cooler and moister than to the south. By planting with intermediates, there would only need to be one underplanting of climax species - and removal of the intermediates as they are crowded out. This could be difficult otherwise, given the proximity to the building and the change in grade.

2. College of Architecture and Planning Alumni Terrace
   This raised area is more open to the sun and wind than the lower terraces, resulting with a drier microclimate. However, due to the need to create an overhead canopy, this zone would best begin at the pioneer woods stage.

3. Transition/study zone
   Initially, this zone will be managed as an open field system until the addition to the CAP is completed. Then, managed secondary succession will be allowed to spread through the zone creating open pockets and gaps, thickets, and open wooded areas to provide a diversity of spaces for studying, socializing and the like.
4. Pedestrian allee

Immediate canopy is needed in order to create an amiable walkway through an otherwise open site. Having been begun from an open site and also being more accessible for service vehicles, the allee can be easily initiated from the pioneer woods stage. This would not be the traditional single-species allee, but rather a mixed-species one, allowing the trunks to act as a unifying vertical element. Underplanting might be geometrically spaced between the existing trees or offset to accentuate the process being encouraged.

5. Amphitheatre

This particular zone is in no hurry to reach its climax design, being as other spaces in the site can accommodate its functions, if necessary, via some landscape planning. This zone, initially a dry, open space, offers the opportunity to take succession form open field to climax forest, and would be a long-term educational tool and point of interest. The particular management scheme for this area is detailed in the Concept Generation section.

6. Having no special name, this zone would help accommodate the function of the amphitheatre zone during its patchy stages. Managed initially as open field, the zone would be reduced to a gap upon the initial canopy closure of the amphitheatre area.

7. Open gathering area

This zone is to be managed as an open field area and, then, a gap upon canopy closure around it. Due to its drainage function, there would be a need to use grasses (and some flora) adapted to moist and drought conditions; for example, buffalo grass.

8. Whitinger Business building balcony

Given the need for an immediate windbreak, the mound to the west would be thickly planted at the pioneer woodland stage using the techniques of Brian Clouston outlined in the Background chapter. This would result with a rich, multi-level windbreak as well as a screen for the classroom spaces incorporated into the mound.

9. Whitinger Business building west entrance

In order to provide a sense of semi-privacy to this "front porch" space, this zone would be initiated around the tenth year of secondary succession. At this point, a site is populated by many woody plants, and some pioneers stand out as solitary specimens.
10. **North side of Bracken Library**

   Given the perpetual shade of this zone, planting can begin with the late intermediate woods stage. There will still be some need to buffer from the wind to promote soil moisture retention. Those beds surrounding the fire escape/classroom pads, would be multi-level plantings, whereas the terraces to either side of the library would be simple grids of late intermediates.

11. **McKinley Avenue tree allee**

   Like the east-west pedestrian allee, this would be a multi-species allee initiated at the pioneer woodland stage.
CHAPTER 7

Concept Generation

Having laid out the zones spatially and successively, it was simple to generate the concept through time via overlays. Presently, the site retains its sculpted mounds and ten- to twenty-foot wide sidewalks from the 1960's. By neither massing the trees nor placing them where their shadows might shade the walkways, the site is very bland, very open. The horticultural layout is successful except in the spring when the rich green of the turf and the whites and pinks of the flowering crabapples are a delight to the eye after a long gray winter.
YEARS 1-2

Within even the first two years, the space has undergone a series of changes. The parking lot has been removed to make way for the transition/study zone and the pedestrian allee. The original circulation of the space has been maintained, but the surfacing has been replaced with unit pavers, a semi-pervious material which allows rainwater to return to the soils, not the gutter. The quad has been re-contoured, only the Whiting Building mound remains. There are now two drainage points: from the pedestrian allee to the south, drainage is guided to the open gathering area which doubles as an overflow basin, and within the transition/study zone, excess water is now collected to the east.

By transplanting masses of ten-foot trees, an immediate microclimatic change has been made and there is a definite choice between sun and shade. Additional masses of three-foot saplings begin to buffer the north side of Bracken Library and the WB balcony, as well as guide movement and sightlines within other parts of the quad. The larger trees of the allees and extensions into the quad will have about seven years of a freeze on growth. The sapling masses will generally show fast growth, and can better adapt to being transplanted - one good reason to use as young as material as possible. These young trees need to be masses, however, not left to the open elements: together they will compete, yet physiologically support, each other.

Little has been done near the CAP building given the pending addition in the tenth year of this plan. It is fruitless to begin a landscape only to tear it out. Open field vegetation will until then offer visual interest and tie this zone to the quadrangle's landscape.

The existing trees have either been transplanted elsewhere, if they are natives, or used to create mulch. Given the introduction of three to four feet of foreign topsoil (to originally fill in the wetlands and create the former quad design, it had to be assumed that there was no seed bed and, therefore, most species will have to be introduced to the site and allowed to reproduce.
YEAR 5

Around this year, given favorable conditions, the larger transplanted trees (such as those along the allees) can be ready to resume growth. More trees have been added to extend the tree line inward, to surround the open gathering area. The masses of seedlings have now reached eight to ten feet in height and are much like thickets. These will be ready for thinning in year ten of the plan.

Little else has been done to the space except to begin the forestation of the amphitheatre area. The mature ash tree left from the original site design remains a focal point within the quad.
YEAR 10

A major change has been the addition to the CAP building. Now, the conceptual ravine has been begun: ten-foot trees have been used for instant impact. The transition/study zone is now allowed to fill in. Maintaining the space for the CAP graduation ceremony provides an open space within the intended wooded zone. Not shown, tensile-structure carrels would be placed in niches and gaps within the transition/study zone. Easily moved, these structures could accommodate changes in the boundaries of the vegetation. In this sense, structures which we so often egotistically design to be permanent marks upon the landscape now become secondary to a permanent landscape.

The allees and interior of the quad continue to reach canopy closure, and the amphitheatre area is allowed to further succeed, still keeping a sizeable portion open for university events. The McKinley Avenue allee has now been connected from north to south with the completion of the CAP addition.
YEAR 20

Canopy closure is nearing completion for much of the library quad. The amphitheatre's last open field area has been planted with ten-foot pioneer transplants. These have been placed to minimize the interference with sightlines to the stage/lectern. The sapling masses from years one and two have been lightly thinned in order to promote a high canopy and relatively high density of thin trunks. This provides a visual buffer but still allows for pedestrian passage through the area, if necessary.

The open field area to the south of the amphitheatre zone has been planted around its borders with masses of three-foot seedlings. These, in twenty years, will be thinned to give the same high, cathedral-like canopy described above.
YEAR 40

Ideally, canopy closure over a large portion of the quad has occurred. Underplanting with the next stage of woody species can occur. This continual cycle will occur again until the climax vegetation has been planted and has overtaken the canopy. Gaps may remain or naturally occur within the site (an ice storm, for example, might destroy several trees and create a gap), and the edges of these will, given the now-present seed bank, either naturally be filled with a larger diversity of intermediate or, even, pioneer species, or might be planted with more gap species in order to parallel the ecological framework. As in nature, these gaps might be made on an ephemeral or annual basis or just allowed to occur where nature sees fit. With the latter scenario, nature might be allowed to pass judgement on this human-created ecosystem. If a gap occurs, then perhaps that particular part of the site was not yet ready for that particular successional stage. Classes might study the dynamics of these gaps and other quad components over time.
CHAPTER 8
CONCLUSIONS

Successional design has exciting potential for landscape architecture. By traditional overlay methods, it can be a wasteful means of design. Computer software might be developed which can quickly and efficiently generate how a design might succeed through time according to specific inputs of desired spatial character, safety measure, functional need, and so on. Such a program would be extremely complex - but so is succession.

Succession needs to move past the stage of being a coined term, verbiage to be thrown out in order to impress a client or one's design peers. Successional design must embody education for the layperson if we are to expect our designs to be understood and their intentions managed. This education has already been begun for us: Catherine Boissett recently published her book *Gardening in Time*. This manual opens the layperson to the world of landscape management and succession, a world which can be as close as one's own backyard.

There is much which the profession can begin to explore in successional design: how plants interact over time; how the hardscape might be successional, safety and perception of the successional landscape; adapting the successional approach to formal planting layout; educating the public on succession...the opportunities are infinite, as are the design manifestations.

By rediscovering the ever-changing successional nature of our prime media, we can raise the landscape architecture profession to a higher ground. That is, if we are willing to take upon the challenge of the evolving landscape.
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