RINARD ORCHID GREENHOUSE

Sustainability 400
Ball State University
2019
Prof. Martha Hunt
Foundational values and overarching goals:

► Developing framework for programming and assessment of sustainable design. For the greenhouse this including its context, education, outreach, and systems.

► Sustainability (triple bottom line)

► Universal Education (access)

► Resulting aesthetic reflects use/fit with Ball State
Scale and Scope

Building

Site, including Christy Woods

Greater Muncie Community
Principle Considerations

Educational  
Sustainability  
Botanical  
Community & Cultural
Measurable Success

**LEED**

LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN
GREEN BUILDING LEADERSHIP IS LEED

- Sustainable Sites
- Water Efficiency
- Indoor Environmental Quality
- Materials & Resources
- Energy & Atmosphere
- Innovation & Design
- Awareness & Education

**WELL**

THE WELL BUILDING STANDARD™
SEVEN CONCEPTS FOR HEALTHIER BUILDINGS

- AIR
- WATER
- NOURISHMENT
- LIGHT
- FITNESS
- COMFORT
- MIND

**SITES**

SUSTAINABLE SITES INITIATIVE
CREATING SUSTAINABLE AND RESILIENT LANDSCAPES

- Open spaces
  - Local, state and national parks
  - Botanic gardens
  - Arboreta
- Commercial
  - Retail and office areas
  - Corporate campuses
- Residential
  - Neighborhoods or individual yards
- Educational/Institutional
  - Public and private campuses
  - Museums
  - Hospitals

- Streetscapes and plazas
Primary Visitors

- Ball State students
- Researchers
- Professors
- Muncie Public schools
- Indiana Masters Naturalist
- Orchid Enthusiast

* Majority of users come from Delaware and surrounding counties.
Christy Woods Visitation

“I use Christy Woods for the following purposes: To showcase soil science properties for woodland soils, prairie soils, soils with trails and recreational uses, and for wetland demonstrations... I use the woods for walks during my breaks at work to relax and de-stress... This space is invaluable to me.”

- Ball State University Professor

* Numbers reflect only Christy Woods visitors.
PROJECT VISION

- EDUCATION
- ACCESS
- SUSTAINABILITY
Education

Provide sustainable adaptive educational opportunities

- Human comfort zone
- Temperature, humidity, light, noise
- Universal accessibility, functionality
- Pathway materials
- Path, corridor width, turning radii
- Visibility, views
- Signage
- Seating, gathering spaces, entrances
- Classroom
- Office
- Outdoor spaces
Access

Ensure visual and physical access to facilities and site

- Multi-modal transit
- Parking availability
- Circulation- inside and outside
- Signage
- Visual access
- ADA compliance
Sustainability

Protect and enhance facilities and surrounding landscape

- Air circulation
- Light
- Water
- Facility/ building operations
- Ecology/ecosystem integrity
- Pathways (size, materials)
- Entrances, nodes
- Material care over time
- Reducing, reusing, recycling
DESIGN CONCEPTS
COMMUNITY DESIGN CONCEPTS

Goals

- Improve accessibility with Muncie community
- Connect educational resources
Environmental Learning Centers & Green Space

1. Christy Woods and Greenhouse
2. Minnetrista
3. Camp Adventure
4. Hughes Nature Preserve
5. John Craddock Wetland Nature Preserve
6. Ball Gymnasium
7. Ball State University Recreation & Wellness Center
8. White River Park
9. Westside Park
10. Riverbend Park
11. Riverside UMC Community Gardener
12. Tuhey Park
13. The Farm on Howard
14. Urban Light Community Garden
15. Maring Hunt Community Gardens
16. Boys and Girls Club Garden
17. North Street Urban Garden
18. Inside Out Community Garden
19. Buley Center
20. Motivate Our Minds Children’s Garden

* Christy Woods and Greenhouse is 1 of 3 environmental learning centers
* 9 parks or gardens
Rinard Orchid Greenhouse Educational and Environmental Contributions

► “The largest university-based orchid collection in the United States”
  ○ Attracts a variety of visitors outside of Muncie

► Variety of current educational programs
  ○ All About Pollinators
  ○ Tropical Edibles
  ○ Flowers, Ferns, and Dinosaurs

► Research Center and Genetic Repository
  ○ Designated plant rescue center
  ○ Emphasis on conservation
  ○ Potential for educational programs
Pedestrian Access

- Limited sidewalks
- Conditions are either good or excellent
- No accessible paths through site
Vehicular Access

- Near MITS Route
- Stop is in IU/Ball Memorial Hospital parking
- No direct route to site from hospital bus stop
- Vehicular access off main transit routes
Community Connections

**Strengths**
- Network of Educational Resources
- Opportunities for Education/Outreach

**Weaknesses**
- Limited Access (visually, physically)
- Limited Connectivity (visually, physically, socially)
- Lack of Resource Awareness
SITE DESIGN CONCEPTS

Goals:

- Improve accessibility
- Enhance educational resources
- Apply sustainable practices
Site

- Residential area north of site
  - Need for connection
- Visual transit gateway along Tillotson
  - Potential for gateway signage at University and Riverside
- Proximity to hospital
  - Potential health/ wellness connection

- 98% of site is landscape vs 2% building
- High potential for water management and air quality
Site Condition Analysis – Access

- Parking lot spaces
- Front building access requires a walk through parking lot
- Paths/sidewalks/signage/entrances
- Pathways can be confusing
- Non ADA compliant
Site Condition Analysis – Environmental

- Help mitigate flooding in adjacent Muncie community
- Potential to sequester carbon
- Enhance educational areas at ecosystem intersections

* 468 trees in Christy Woods
* Little elevation change
Existing Condition Analysis – Signage

- Signage visibility and condition
- Minimal gateways visibility
- Inadequate bicycle parking
Education and Ecology

- Used by Biology, NREM, and other departments
  - Research and environmental observation
  - Experiment design
  - Data collection

- Important Habitat Island
  - Migratory bird habitat
  - Small mammal populations
  - Native insect populations, pollinators
Value of Christy Woods’ 468 Trees

- Enough oxygen produced for 4,680 people
- 83 metric tons of carbon dioxide sequestered annually
- Absorb up to 234,000 gallons of water per rainfall event
Measurable Success– Site Design

Create Regenerative Systems and Foster Resiliency

► Protect and restore natural resources such as soil, water, and vegetation.
► Encourage biodiversity.
► Enhance landscapes to provide multiple ecosystem services such as cleaning air and water, providing habitat, and storing carbon.
► Plan for monitoring and adaptive management.
Proposed Plan

University Ave.

Pathway

Fire Station

Glass Center

Teaching Greenhouse

Classroom/Office

Chilling Plant

Heat Plant

Tillotson Vehicle Access

Signage  Open Lawn  New Trees
Proposed Gateway Concept
Native Plant Palette

Flowering Dogwood
Viburnum
Dutchman's pipe
Butterfly Weed
Milkweed
Cherry Truffle Stonecrop
Proposed Materials

- Material Selection
  - Criteria
    - Locally sourced
    - Recycled material
    - Permeability
    - Meet ADA standards

- Concrete Grass Paver
- Permeable Recycled Glass Paver
- Permeable Brick
- Decomposed Granite
BUILDING DESIGN CONCEPTS

Goals

- Improve building and educational access
- Integrate building addition
- Apply sustainable practices
Building Inventory and Spatial Analysis
Patterns of Biophilia

3 Types of Patterns
► Nature in Space
► Nature of Space
► Natural Analogues

Patterns in Design
► Visual Connection with Nature
► Material Connection with Nature
► Refuge
► Dynamic and Diffuse Light
► Connection with Natural Systems
► Presence of Water

14 Patterns of Biophilic Design

Nature in the Space Patterns
1. Visual Connection with Nature
2. Non-Visual Connection with Nature
3. Non-Rhythmic Sensory Stimuli
4. Thermal & Airflow Variability
5. Presence of Water
6. Dynamic & Diffuse Light
7. Connection with Natural Systems

Natural Analogues Patterns
8. Biomorphic Forms & Patterns
9. Material Connection with Nature
10. Complexity & Order

Nature of the Space Patterns
11. Prospect
12. Refuge
13. Mystery
14. Risk/Peril
<table>
<thead>
<tr>
<th>14 Patterns</th>
<th>Stress Reduction</th>
<th>Cognitive Performance</th>
<th>Emotion, Mood, &amp; Preference</th>
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<tbody>
<tr>
<td><strong>Visual Connection with Nature</strong></td>
<td>Lower blood pressure &amp; heart rate</td>
<td>Improve mental engagement/attentiveness</td>
<td>Positively impacted attitude &amp; overall happiness</td>
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<tr>
<td>Presence of Water</td>
<td>Reduced stress, increased feelings of tranquility, lower heart rate and blood pressure.</td>
<td>Improved concentration &amp; memory restoration</td>
<td>Observed preferences &amp; positive emotional responses</td>
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<tr>
<td>Dynamic &amp; Diffuse Lighting</td>
<td>Positively impacted circadian system functioning</td>
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<tr>
<td>Connection with Natural Systems</td>
<td>Increased visual comfort</td>
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<tr>
<td>Material Connection with Nature</td>
<td>Decreased diastolic blood pressure, improved cognitive performance</td>
<td></td>
<td>Improved comfort</td>
</tr>
<tr>
<td>Refuge</td>
<td>Improved concentration, attention, &amp; perception of safety</td>
<td></td>
<td></td>
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</table>
Proposed Building Footprint
Building Program

- Circulation through building
- Vestibule
- Fit to Ball State's aesthetic
- Connection to Christy woods
- Inviting entrance
- Loft space
- Thermal Comfort
- Multiple teaching areas
- Classroom to have 60 spaces for students
Building Floor Plan

Spaces

► Vestibule
► Pergola
► Classroom
► Loft
► Deck

Classroom

► Simple circulation through building
► UL Greenguard Desks
► Desk Orientation

38’

60’
Section Perspective

- Solar Panels
- Potential for a Rainwater Catchment System
- Proposed Structure System
Interior Render

- Skylights
- Access to loft
- Refuge
- Dynamic and diffused light
- Visual connection to nature
Proposed Materials

► Material Selection
  ► Criteria
    ► Locally sourced
    ► Recycled material
    ► Low Carbon
    ► Meet ADA standards

Black Locust Wood

Cellulose Acoustic Panels

Cork Flooring

Bird Safe Glass
### LEED v4 for BD+C: New Construction and Major Renovation

#### Project Checklist

<table>
<thead>
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<th>Credit</th>
<th>Description</th>
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<td><strong>Location and Transportation</strong>  16</td>
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<td>Access to quality transit</td>
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<td>Sensitive Land Protection</td>
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<td>Bike Facility</td>
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<td>Reduced Parking</td>
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<td>Outdoor Water Use</td>
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<td>Rainwater Management</td>
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<td>Tobacco Free ( campus )</td>
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<td>Locally and Sustainably Sourced Materials</td>
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<td><strong>Sustainable Sites</strong></td>
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<td>Construction Activity Pollution Prevention</td>
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<td>Site Assessment</td>
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<td>Site Development - Protect or Restore Habitat</td>
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#### Materials and Resources

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#### Indoor Environmental Quality

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#### Innovation

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#### Regional Priority

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<td>Regional Priority: Specific Credit</td>
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### Totals

- **Possible Points:** 110
- **Certified:** 40 to 49 points
- **Silver:** 50 to 59 points
- **Gold:** 60 to 79 points
- **Platinum:** 80 to 110
NEXT STEPS
Community Scale

- Design and implementations of transit connections
- Connect Christy Woods to proposed trails
- Work with community groups to support educational goals
Potential Collaborators for Education

► Ball State University (NREM, Biology, CAP, Art, etc.)
► Local Schools (Burris, Indiana Academy, Muncie Community Schools, etc.)
► Neighborhood Associations (e.g. Westridge, Downtown, Kenmore, Westside, Riverside, etc.)
► NextMuncie (trails and future transportation paths)
► Minnetrista
► Ball Brothers Foundation
► Community Foundation of Muncie and Delaware County
► IU Health Ball Memorial Hospital
Site Scale

- Develop grading plan
- Create pathway construction details
- Create wayfinding / signage plan and details
- Implement SITES guidelines
Building Scale

- Attach to district geothermal system
- Design and implement HVAC system
- Design rainwater catchment system
- Develop cost estimate
- Apply for WELL building certification
Students: Guillermo Rodriguez, Mia Baker, Michael Terronez, Noah Smith, Sarah Fox, Hannah Hubble, Abigail Bates, Ashley Kincaid, Christian Schmoll, Kenzie Hughes, Samantha Kubiak, TC Wolf