NKU Loch Norse Commons

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This investigation was conducted as part of the Landscape Architecture Foundation's 2015 Case Study Investigation (CSI) program. CSI matches faculty-student research teams with design practitioners to document the benefits of exemplary high-performing landscape projects. Teams develop methods to quantify environmental, economic and social benefits and produce Case Study Briefs for LAF's Landscape Performance Series.

Landscape Performance Benefits

Environmental

1. ***Improved ecological integrity along the northern lakeshore by creating a native plant area with an average Coefficient of Conservativism of 4.71, a moderate score.***

Increases habitat for micro-invertebrates, fish, and waterfowl by using native plant material with an average Coefficient of Conservatism of 4.71. Loch Norse was once a typical water impoundment used for flood control measures and to hold water in the uplands. After the design of the new Loch Norse by CARMAN, the lake experienced an improvement in performance. Habitat for different trophic levels of biota was increased due to the use of native plant material along the northern edge of Loch Norse. Also, varied water depths alter habitat distribution throughout the lake that also increased the habitat quality and biodiversity from previous conditions. Habitat increase was measured by size and depth of new pond structure. Table 1 illustrates the plant palette for the native area of vegetation on the northern edge.

Plant Palette for NKU Loch Norse Native Plantings

Perennials		CoC
Chelone lyoii	Pink Turtlehead	7
Eupatorium coelstinum	Mistflower	3
Hibiscus moscheutos	Rose Mallow	3
Iris pseudocorus	Yellow Flag Iris	0
Iris versicolor	Blue Flag Iris	0
Lobelia cardinalis	Cardinal Flower	5
Lobelia siphilitica	Blue Lobelia	4
Grasses		
Carex frankii	Frank's Sedge	3
Chasmanthim latifolium	River Oats	4
Panicum virgatum	Switchgrass	5
Sorghastrum nutans	Indian Grass	4
Groundcovers		
Caltha palustris	Marsh Marigold	10
Chrysogonum virginianum	Green and Gold	10
Shrubs		
Amorpha fruticosa	Indigo Bush	5
Cephalanthus occidentalis	Buttonbush	3
Cornus ammomum	Silky Dogwood	6
Itea virginica	Virginia Sweetspire	8

Table 1. Plant list for the native planting area northern edge of Loch Norse, Northern Kentucky University. CoC is the Coefficient of Conservatism, the higher the number the more specific habitat requirements for that species. The CoC for the Commonwealth of Kentucky was accessed through Dropseed native Plant Nursery.

Assignment of Coefficients
0-3: Plants exhibiting a high range of habitat tolerance, considered generalist or pioneer species.
4-6; Plants exhibiting a moderate range of habitat tolerance, more specialized than generalist but still adaptable.
7-8: Plants exhibiting a poor tolerance range and require specific habitat. Generally associated with advanced successional stages.
9-10: Plants exhibiting a narrow tolerance range and requiring a pristine habitat.

The previous edge consisted of mowed grass abutting the water's edge. Today, the northeast edge (Figure 1) is heavily planted with native vegetation increasing the habitat value by approximately 8,250 sf.

Edge length of 365 linear ft x average width of 22.6 ft = 8,249 sf.

Lake edge habitat created 365 x 2 sides = 730 linear ft of edge condition

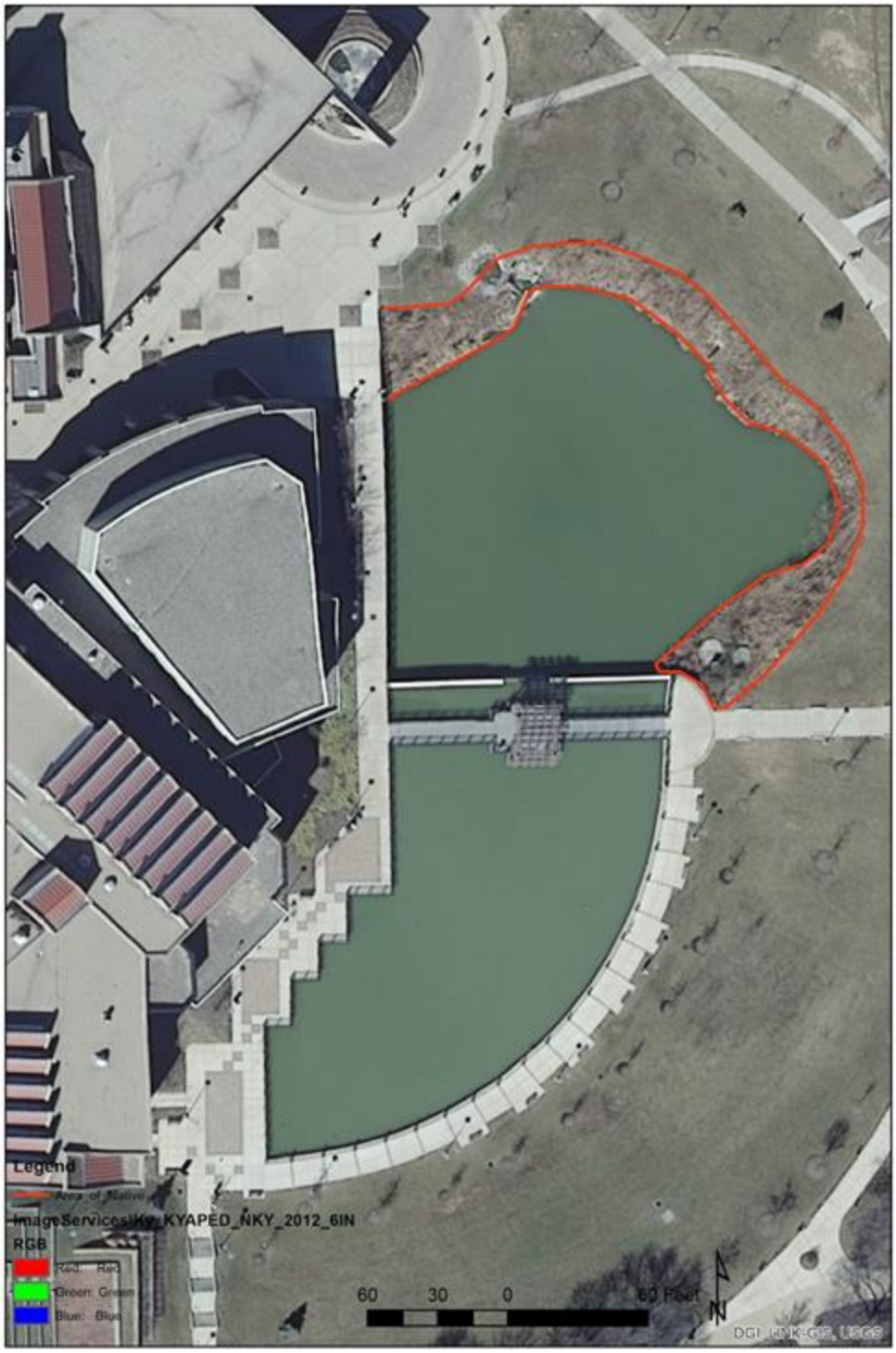

Figure 1. Loch Norse increase in native terrestrial and edge habitat. The area outlined in red was replanted as native plantings and species habitat for a variety of species including insects, rodents and birds.

Figure 2. Wading and water fowl using the non-native side of Loch Norse.

Figure 3. View looking southwest toward Loch Norse and main campus. Native vegetation in foreground (Sass 2015).

Social

1. ***Provides an outdoor learning laboratory on stormwater runoff and aquatic ecosystems for an estimated over 2,025 students.***

Students use this freshwater area as a learning laboratory. Approximate class size averages 23-students for each of the four lab sections. Students learn about the importance of stormwater quality, volumes and aquatic ecosystems through visual cues and classwork. Since the lake was finished in 2004, 22 semesters have occurred equating to approximately 2025 students have benefited educationally using the lake as a living laboratory. This calculation does not include high school visitors or those who pass by and generally observe the habitat.

Economic

1. ***Helped spur ongoing green development across campus, with $3.8 million in completed or planned renovations since the completion of Loch Norse.***

According to Mary Paula Schuh, Director of Campus and Space Planning, an increase in development across campus post-Loch Norse construction occurred. The campus began construction in 1968 on the site of existing farmland. By 1972, there were three buildings and three parking lots. By 1984, it had earned its nickname, the Concrete Jungle, adding many concrete buildings, wide walkways and parking lots. By 2011, many areas across campus became green space or artful plazas creating an inviting internal campus space. Post-construction of the Loch, the campus has seen $3.8 million in completed and planned renovations that continue even today. Director Schuh feels strongly that the Loch was the impetus for campus renovations (Schuh 2015).

Cost Comparison

Decking

- ***1,820 sf of composite decking were used on the bridge. Composite decking materials cost about $7 per sf, 56% more than traditional wood decking, which costs about $4.50 per sf. For this project, the material cost of the composite decking was about $4,550 more than it would have been for traditional wood decking. However, the wood decking would cost an estimated $1,500 per year to maintain through cleaning and restaining. Therefore, the additional cost to maintain wood decking would surpass the additional cost of composite decking in just 3 years.***

Composite decking material saves money over time; however, initial investment tends to be higher. The estimated lifetime savings using composite decking for 1820 sf of decking material equates to about $25,000 over 20 years. The cost of not using harmful chemicals is difficult to quantify.

With treated pine at $8.27 per 2x6x12 board, and the deck being 1245 square feet, it would take 208 boards costing $1720.16. With composite decking at $26.97 per 2x6x12 board, 208 boards cost $5609.76. With a starting difference of $3889.60, the additional $500 per year to maintain the treated pine would surpass the price of composite decking in 7.78 years.

Estimated price of composite decking materials - $7 per sf
$7 per sf x 1820 sf of decking area = $12,740 in decking material

Estimated cost of traditional wood decking - $4.50 per sf
$4.50 per sf x 1820 sf = $8,190 in decking material

Estimated difference in initial composite investment = +$4,550

Maintenance is where the composite decking makes up in value and sustainability. No harmful chemicals are used to maintain its aesthetics or integrity.

Estimated cost of annual cleaning solutions:
$47.88 per gallon x 7.28 gallon/1,820 sf = $326

Estimated cost of annual re-staining wood decking:

$50.00 per gallon x 7.28 gallon/1,820 sf = $365

Estimated manual labor for 1,820 sf of decking annually:
$20 per hour per person x 40 hours = $800

Total estimated cost of annual maintenance:
$326 + $365 + $800 = $1,491 per year

Total saved over 20 years
$1,491.00 x 20 years – $4,550 = $25,270

Lighting

- ***There are 30 30-watt LED lighting fixtures in the plaza area. These cost about $150 per bulb, 140% more than traditional halogen bulbs, which costs $62.95 each. However, over their 13-year life, the LED bulbs will save an estimated $65,000 in energy and replacement costs compared to halogen bulbs.***

There are 30 30w LED lighting fixtures in the plaza area. Using LED lighting saves $10,629.64 for the year and $138,185.40 over the average lifetime of one LED bulb. The average US national cost of one KWh is $0.1001 and average time a bulb is in use in Highland Heights, KY is approximately 10 hours per night. The average life for LED bulbs is 50,000 hours while halogen bulbs last approximately 1,500 hours. Thus, it would take about 2.5 halogen bulbs per year, while the LED bulb lasts about 13 years. These calculations do not take into account disposal or any additional environmental cost that should be assessed.

30, 30w LED bulbs x $150 per bulb = $4,500 total investment
30, 75w halogen bulbs x $62.95 per bulb = $1,888.50
Total initial purchase savings if halogen was the choice bulb:
$4,500-$1,888.50 = $2,611.50

Halogen bulb cost over 13 years for all 30 fixtures:
(2.5 bulbs per year x 13 years) x $62.95/bulb x 30 fixtures = $61,376.25

Cost savings over 13 years for 30 fixtures:
$61,376.25 – $4,500 = $56,876.25

Energy cost savings between LED and halogen bulbs is well known. LED tends to operate at a much lower rate. For example, a 30w LED bulb uses approximately 65.7kWh per year while an equivalent halogen bulb (75w) uses approximately 273.75kWh per year (where $E_{(kWh)} = P_{(w)} \times t_{(hr)} / 1000$).

Cost to operate per fixture LED versus halogen bulbs:
LED: 65.7kWh per year x $0.1001/kWh = $6.57 per year
Halogen: 273.75kWh/yr x $0.1001/kWh = $27.40 per year

Total energy cost savings per fixture over one year:

$27.40 - $6.57 = $20.83

Total energy cost savings for 30 fixtures over one year:

$20.83/fixture x 30 fixtures = $624.97

Energy savings over life of LED bulb for 30 fixtures over 13 years:

$624.97 x 13 = $8,124.63

Total lifetime (13 years) savings using LED bulbs:

$56,876.25 + $8,124.63 = $65,000.88

Other Social:

1. ***Created 90% more active recreation and stage space for use during events, fairs and performances on the east side of campus, increasing the likelihood of social interaction during impromptu performances.***

In 2002, the only amenity located on the site was a medium-sized flood control structure. Very little programmed area was available for use. The plaza was informally used for fraternity and sorority socials, which could have proved dangerous due to the area's steep slopes and the presence of deep water.