

I.U. tree canopy goal: it takes a plan and land to move the needle

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Purpose

- Current tree canopy: 20%
- Desired tree canopy: 40%
- Case study: Arboretum
- Tree management plan
 - Methods
 - Timeline
 - Budget
- Potential threats



Figure 1: high traffic area in potential tree planting zones

SWOT

Strengths	Weaknesses
Specific area of focus	Current TC past peak maturity
Determined TC goal (40%)	Lacks detail (time, funds, planting)
Office of landscape architecture	Accountability
Existing Arboretum	Lacks intermediate goals
Upholds aesthetic values	No current urban forester
Quantified tree benefits	Undetermined potential tree canopy
Opportunities	Threats
Develop community spaces	Funding
Increase species diversity	Mortality
Research	Tree removal
Education	Lack of Implementation
Ecological enhancement	Landuse
Tree inventory	Invasive species

Figure 2: Opportunities and challenges relating to the IU tree canopy (TC) goal of 40% based on the IU master plan (2010)

Method

Number of trees total (40% canopy)

$$t_1 = (424 * 0.9906) / 0.00938$$

$$t_1 = 44,777$$

Figure 3: Number of total trees needed to meet goal, based on TC case study in arboretum to reach 40% TC

Number of Saplings (x= trees)

80% survivability of newly planted trees (m_1)

$$x = \frac{(22389)0.965^{30}}{1 + \sum_{i=0}^{28} (0.8)(0.965)^i}$$

$$x = 1282$$

90% survivability of newly planted trees (m_1)

$$x = \frac{(22389)0.965^{30}}{1 + \sum_{i=0}^{28} (0.9)(0.965)^i}$$

$$x = 1139$$

Figure 4: Annual saplings needed to meet 40% TC goal in 30 years. Includes sapling mortality (up to three years) and existing TC mortality.

Timeline



Figure 5: 30-year timeline of potential tree canopy growth.

Budget

Annual Cost

80% survivability of newly planted trees

$$x = 1282(250) + 61,323 + 701,778$$

$$x = \$1,083,601$$

90% survivability of newly planted trees

$$x = 1139(250) + 61,323 + 701,778$$

$$x = \$1,047,851$$

Total Cost

80% survivability of newly planted trees

$$x = 1083601 * 30$$

$$x = \$32,508,120$$

90% survivability of newly planted trees

$$x = 1047851 * 30$$

$$x = \$31,435,530$$

Figure 6: projected annual and total budget based on costs of tree saplings and maintenance, urban forester salary, and the average cost of tree removal. Modified based on survivability rates.

Recommendation

- Hire urban forester
- Increased accountability
- Knowledgeable management
- Follow planting regiment proposed
- Allow for a one million budget annually
- Maintain a reactive SWOT
 - Adaptable to address new threats

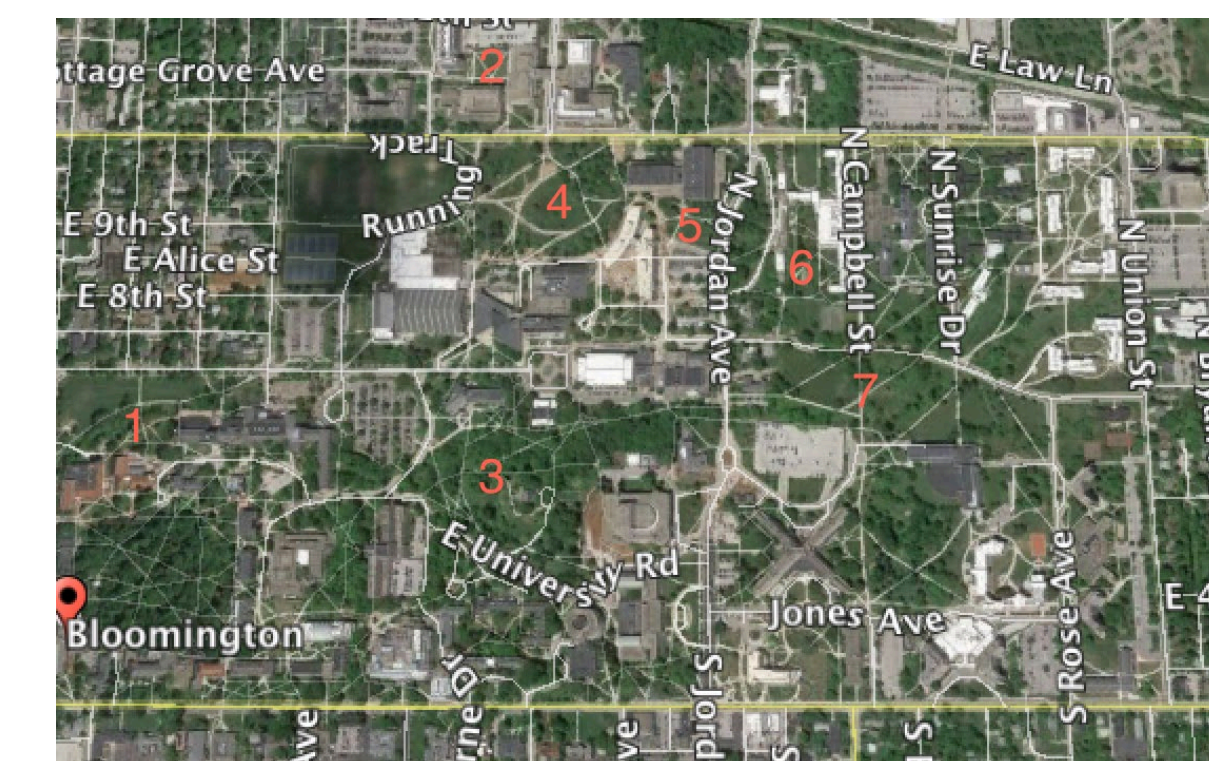


Figure 7: Recommended tree planting sites

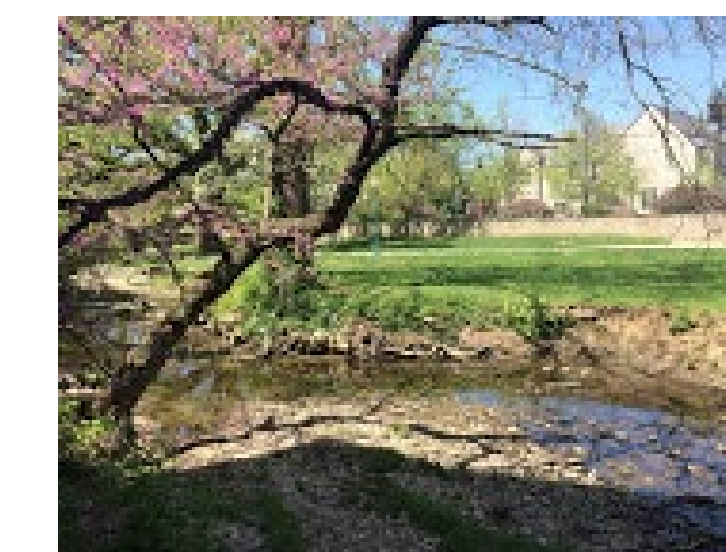


Figure 8: Site 1

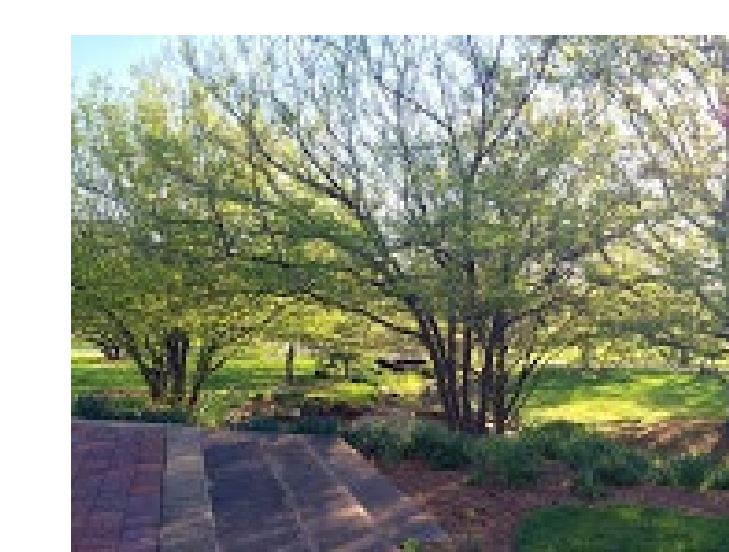


Figure 9: Site 4

Tree Type	Scientific Name	Price	Mature Height (ft)	Mature Spread (ft)	Growth Rate	Soil Type	Notes
Eastern Redbud	Cercis	\$29.98	20-30	15-30	Rapid	Moist	Can tolerate permanently wet soils
Pin Oak	Quercus palustris	\$79.98	60-70	30-40	Rapid	Moist, well-drained	Can withstand flooding
River Birch	Betula nigra	\$79.98	40-60	25-35	Rapid	Moist to damp	Can withstand flooding
Bur Oak	Quercus macrocarpa	\$21.98	70-80	70-80	Moderate	Widely adaptable	Good urban tree species
Linden	Tilia americana	\$42.98	80	40	Moderate	Moist, well-drained	Highly adaptable to urban setting
Honey Locust	Gleditsia inaequalis	\$79.98	45-60	40-60	Rapid	Widely adaptable	Grows well in spite of salt, heat, drought and compacted soil

Figure 10: Recommended tree species to plant

Threats

Exogenous Threats	Endogenous Threats
Poor tree care	Tree removal
Lack of accountability	Tree mortality
Faulty/ambitious planning	Invasive species
Landuse	Current TC at peak maturity
High traffic areas	Extreme weather

Figure 11: Table of exogenous and endogenous threats to campus tree canopy goal



Figure 12: example of an exogenous threat

Conclusions

- Thirty-year timeframe recommended
- Allocate \$31-32 million dollars total
- 1139-1282 samplings to be planted annually
- Statistically arboretum is insignificant to overall TC
- Increased ecological services
- Great opportunity to develop community spaces

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Acknowledgments

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For further information

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