



# Section 08 Greenspace and Ecosystem Health



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### Why Greenspace and Ecosystem Health Are Important

Human activities coupled with natural variations in the carbon cycle, have resulted in a significant increase in the concentration of carbon dioxide (CO<sub>2</sub>) and other “greenhouse gases” in the atmosphere, thus causing measurable global warming. Controlling atmospheric CO<sub>2</sub> requires deliberate action that combines reducing emissions and increasing storage, while planning for adaptation to the changes that result. Part of this Climate Action Plan addresses ways that greenspace protection and enhancement is one of Bloomington’s most important avenues for lowering our environmental footprint.

Greenspace, plays a central role in supporting community health, improving air, soil, and water quality, reducing energy use in buildings, and supporting climate-change mitigation. An urban greenspace includes any permeable vegetated surface, public or private, set apart for recreational, aesthetic, or ecosystem services in an otherwise urban environment. It is space set aside for providing life-essential benefits people and other living things obtain from properly-functioning ecosystems. The key benefits and services greenspaces provide include:

- **Carbon sequestration:** Within a greenspace carbon sequestration is sometimes referred to as biological or terrestrial sequestration. Plants convert carbon dioxide into biomass (leaves, stems, etc.) through photosynthesis and with a greater amount of greenspace, the more CO<sub>2</sub> will be removed from the atmosphere.
- **Stormwater infiltration and flood mitigation:** Greenspace helps protect from flash flooding by absorbing water through roots and slowing down rainwater run off. Native plants have deep roots that can also mitigate erosion and can filter the water through phytofiltration.
- **Reduce the urban heat island effect:** The more vegetated greenspace in Bloomington, the better the cooling effects. High levels of impervious surfaces (a surface that does not allow water to infiltrate such as pavement and buildings) results in an increased urban heat island effect, which elevates the temperature of the near-surface air, buildings, and pavement higher than the surrounding areas. Ideally, a greenspace would contain the vertical architecture, or levels of a natural forest (canopy, understory, and shrub, herbaceous, and ground layers). Bloomington’s Urban Tree Canopy Assessment Summary Report suggests the community needs and has space for additional canopy cover.
- **Purify and humidify the air:** Plants purify the air when the plants absorb light, carbon dioxide, and water to manufacture sugar. That chemical process, known as photosynthesis, creates fresh oxygen, which in turn purifies for humans and other animals.
- **Support pollinators:** Animal species that pollinate plants, termed pollinators, carry pollen, either accidentally or intentionally, from the male part of a flower to the female part of the same or another flower. This pollen transfer must occur for the plant to be fertilized and produce seeds, fruits, or young plants. These pollinators are needed to pollinate 90% of flowering plants and one third of our food crops and they also contribute to the intricate web that supports the biological diversity in natural ecosystems.
- **Enhance soil biology:** Soil is a vital living ecosystem teeming with microorganisms (bacteria, protozoa, fungi) and macroorganisms (worms, beetles, bees) that work symbiotically to break down carbon-rich organic matter and release nutrient-rich waste into the soil (carbon, phosphorus, nitrogen). In fact, it is estimated that soil is home to about one third of all Earth’s living organisms! Additionally, just as importantly, soil can absorb and hold rainwater and filter potential pollutants, and the biomass (organic matter) within the soil can sequester CO<sub>2</sub>.



## Greenspace and Ecosystem Health

Human health -In addition to the countless ecosystem services greenspace provides, it is also good for humans. Actions as ordinary as going outside, looking out a window, or simply looking at one tree can increase our mood and reduce stress. In fact, recently, our understanding of the human value of greenspace has been expanded to include mental and physical health benefits, such that some doctors have even started prescribing parks as a remedy to patients’ health issues.

### Bloomington’s Tree Canopy

The City’s average existing Tree Canopy coverage of 38% is above the national average, however, there are likely portions of the City which could benefit from increased tree canopy. According to the 2019 Bloomington Urban Tree Canopy Assessment Report

The City of Bloomington’s existing tree canopy is 38%; the possible tree canopy is 27%; and the preferred plantable area (possible tree canopy area that takes into consideration the current or future planned land use) is 22%, making the maximum tree canopy attainable under current development conditions at 62% (Figure 10). Reaching the projected tree canopy potential of 62% will require the City of Bloomington to preserve all existing tree canopy while expanding the urban forest in designated preferred plantable areas.

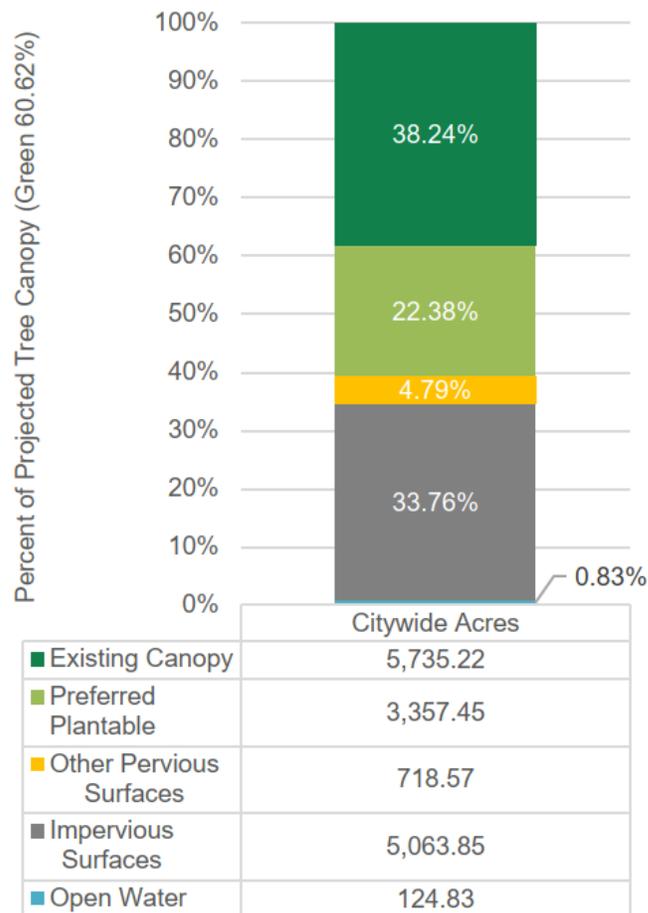


Figure 10. Projected tree canopy potential within the City of Bloomington, IN (2018)

Source: 2019 Bloomington Urban Tree Canopy Assessment Report

## Climate Change Considerations



### Climate Hazards

Projected climate change impacts may cause forests and urban trees to experience increased mortality and reduced productivity, more prevalent invasive species and disease all resulting in forest and tree loss, reduction in crop yield. Loss of greenspace, in turn, reduces carbon capture potential of green infrastructure.



### Opportunities

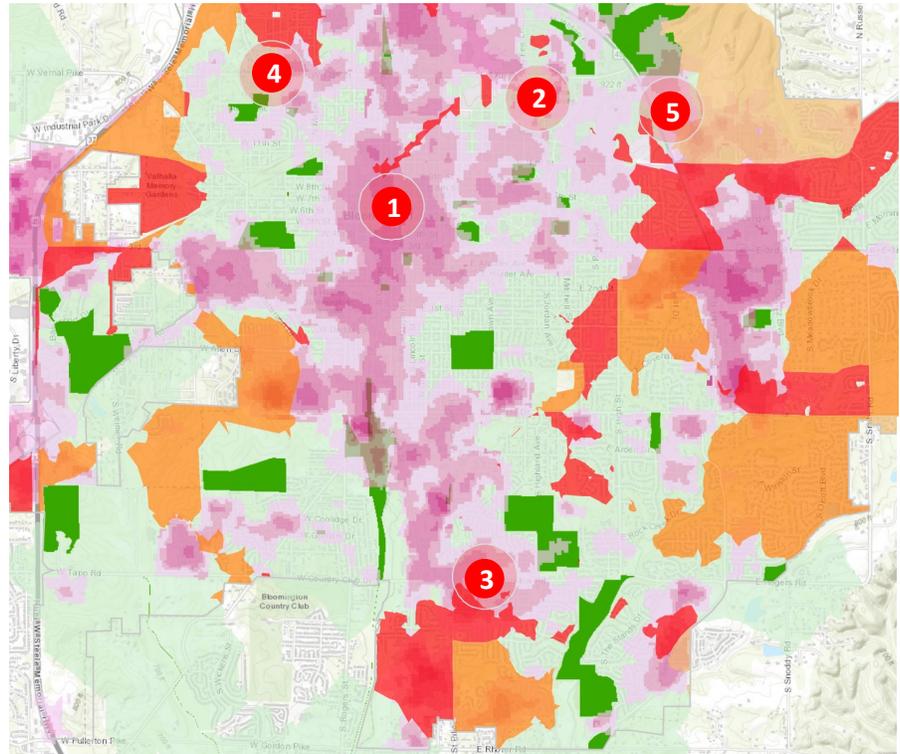
Many strategies within the Greenspace sector can advance community resilience and quality of life. Increased tree canopy, decreased impervious surfaces, and increased utilization of native grasses and plantings can reduce heat island experiences, energy consumption, storm-water runoff, and flood impacts.

**Equity Considerations**

- Lower income neighborhoods and neighborhoods with higher proportions of people of color regularly have lower tree canopy coverage, and the environmental, economic, and quality of life benefits trees support than more affluent neighborhoods.
- “Heat islands” and “micro heat islands” are built up areas that are hotter than other nearby areas. This is caused by lack of adequate greenspace and healthy tree canopy coverage combined with too many hard surfaces like roads, parking lots, and hard building surfaces. Frequently neighborhoods with higher vulnerable populations have the highest heat island impacts.

The map to the right from the Trust for Public Land’s ParkScore tool shows current and recommended park space throughout Bloomington represented by the red circles (numbers representing priority). The green portions of the map illustrate existing parks with public access while areas with very high need for parks are shown in dark orange and areas with high or moderate need for parks are shown in tan.

Pink sections of the map indicate areas with calculated heat island or micro heat island impacts (darker colors represent higher heat island impacts). The numbered red circles indicate locations ideal for new parks which would serve populations without public park access within a 10 minute walk that are also in an area with higher urban heat island impacts.



**Sector Goals**

Sector goals are established to both support the City’s Climate Action Plan in creating a climate resilient community and to reduce city-wide GHG emissions 25% below 2018 levels by 2030.

Sector goals related to GHG emissions reductions are designed to balance reduction across all sectors and achieve the overall emissions goals set forth for the community. The goals seek to strike a balance between achievability while also reaching -for improvement beyond business-as-usual.

As indicated in the introduction, the Climate Action Plan is intended to be a 10 year plan to be updated at the completion of that time. Consequently, the goals and strategies outlined in this section are intended to be achieved by 2030 unless otherwise noted.

Implementation of actions are anticipated to be initiated over 3 phases: phase 1 within 1-3 years, phase 2 within 2-5 years, and phase 3 within 4-8 years of CAP approval.

**Goal G 1**

Increase quantity and quality of greenspace within the community.

**Goal G 2**

Increase quantity and quality of climate adaptive native habitats.

**Goal G 3**

Increase citywide tree canopy coverage by 3% of 2018 values.

**Goal G 4**

Reduce stormwater and micro heat island impacts.



## Goal G 1 Increase quantity and quality of greenspace within the community.

### Strategy G 1-A:

#### Establish city greenspace plans integrating findings and goals of Climate Action Plan.

Create community plans that integrate climate change impacts with recognition of the populations and neighborhoods most vulnerable to them. Use these plans to guide greenspace preservation and development, and ground cover conversion efforts, to capture the beneficial climate adaptation and mitigation potential of community-wide greenspace.

#### How We'll Measure Progress:

Status of integration of climate action plan findings and goals into community greenspace plans

#### Co-Benefits of Strategy:

Protected / Enhanced Ecosystems

Improved Community Equity



Actions	Implementation Phase
G1-A-1 Complete a Land Conversion Opportunity Study. Analyze public and private property for unused turf and impervious areas, and create a Ground Cover Conversion Implementation plan by census tract to convert identified areas to native grasslands, wetlands, shrub, and forested areas. Identify incentive opportunities and establish an outreach campaign.	1
G1-A-2 Conduct a greenspace and preservation equity assessment to evaluate greenspace citywide and determine potential needs for expansion, purchase and preservation of greenspace based on quantified equity, environmental, economic benefits, and Return on Investment based on life cycle costs of greenspace property ownership. Coordinate assessment with findings of the Citywide Ground Cover and Heat Island Assessment and Urban Forest Management Plan.	2
G1-A-3 Develop an incentive and assistance program to support the conversion unused turf and impervious areas in the city to sustainable green space as outlined in the City's Land Conversion Opportunity Study.	2

### Strategy G 1-B:

#### Improve the connectivity and functionality of greenspaces within the city.

Integration of climate change impacts and a recognition of the populations and neighborhoods most vulnerable to them into community plans which guide greenspace preservation and development and ground cover conversion efforts to capture the beneficial climate adaptation and mitigation potential of community wide greenspace is a critical requirement to effectively reducing climate change impacts.

#### How We'll Measure Progress:

Status of pollinator and wildlife "corridors;" percentage of residents within a 10 minute walk of park; implementation of climate best practices at City parks

#### Co-Benefits of Strategy:

Protected / Enhanced Ecosystems

Improved Quality of Life



	Actions	Implementation Phase
G1-B-1	Enhance the connectivity of greenbelt and habitat corridors across the community, including identification and improvement of "pollinator corridors" and "wildlife corridors." See Bloomington Environmental Commission documentation on pollinator and wildlife corridors.	1
G1-B-2	Expand and connect green spaces so they are welcoming and within 10 minute walking distance of all residents, especially in underserved communities where there is a high level of impervious surfaces.	2
G1-B-3	Improve the ecological functionality of and resiliency of parks and open space through green infrastructure, best practices for stormwater management, and increased plant diversity and pollinator-friendly habitat. <a href="https://www.cnt.org/publications/green-values-strategy-guide-linking-green-infrastructure-benefits-to-community">https://www.cnt.org/publications/green-values-strategy-guide-linking-green-infrastructure-benefits-to-community</a>	3

## Goal G 2 Increase quantity and quality of climate adaptive native habitats.

### Strategy G 2-A: Create and expand native habitat policies and infrastructure.

Aligning City policies guiding use and maintenance of public facilities, parks, and rights of way with the goals of the climate action has immediate positive impacts advancing citywide goals, and serves as examples and case studies to illustrate effective approaches for residents and businesses throughout the community.

#### How We'll Measure Progress:

Status of policy development

#### Co-Benefits of Strategy:

Protected / Enhanced Ecosystems

Improved Community Resilience



	Actions	Implementation Phase
G2-A-1	Create a policy requiring the use of native plants in landscaping at City-owned properties unless a data-driven case can be made that such use is not appropriate.	1
G2-A-3	Establish and effectively manage native-habitat corridors along trails (Parks) and utility easement areas to restore and maintain landscape connectivity.	2
G2-A-4	Support seed banks to address shifts in habitats, microclimates, bioclimatic envelopes.	3

### Strategy G 2-B: Increase the use of native species and pollinator restoration areas.

Native plant and tree species tend to be more drought resistant, increase development of soil organic material and health, help reduce air pollution, and support biodiversity and pollinator health.

#### How We'll Measure Progress:

Percentage of native species and pollinator friendly ground cover citywide

#### Co-Benefits of Strategy:

Protected / Enhanced Ecosystems

Improved Community Resilience



Actions	Implementation Phase
G2-B-1 Install roadside climate-adaptive native vegetation that creates effective barriers to prevent drifting of air pollutants to adjacent schools, residences, and parks. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6060415/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6060415/</a>	1
G2-B-2 Increase use and promotion of "no mow areas" with plantings of appropriate heights to ensure safety and visibility along roads and parking lots.	2
G2-B-3 Promote "landscaping for absorption" practices for water prone residential and commercial landscapes. Strategies include native moisture tolerant perennial plantings and shrubs.	3

## Goal G 3 Increase citywide tree canopy coverage by 3% of 2018 values.

### Strategy G 3-A:

#### Establish city plans and policies in support of tree canopy and ground cover goals.

Increased tree canopy coverage improves soil health, pollution absorption, air quality, and stormwater uptake, and decreases stormwater runoff and micro heat island impacts. Conversion of impervious surfaces to greenspaces using native species, pervious paver systems, and "green roofs" can significantly reduce extreme heat experiences for vulnerable populations. Establishing policies and plans in support of tree canopy goals and outlining planting targets to achieve the goals is an effective path towards achieving the climate action plan greenspace goals.

#### How We'll Measure Progress:

Status of policy and plan development and implementation

#### Co-Benefits of Strategy:



Actions	Implementation Phase
G3-A-1 Conduct a Citywide Ground Cover and Heat Island Assessment. Assessment should include tree canopy, light-colored impervious surface, dark-colored impervious surface, grassland, and water coverage by census tract. Study should include heat island impact study to identify areas of high heat island contribution and impact. Findings of tree coverage, benefits, heat island impacts, and opportunities should be overlapped with vulnerable population mapping from the City's Climate Vulnerability Assessment. See <a href="https://palebluedot.llc/tree-canopy-assessments">https://palebluedot.llc/tree-canopy-assessments</a>	1
G3-A-2 Develop an Urban Forest Management Plan to establish objectives and best management practices for the Municipality's urban forest and to identify appropriate canopy cover goals and establish an implementation plan to meet ground cover and tree canopy goals by neighborhood/census tract based on the Citywide Ground Cover and Heat Island Assessment and develop species diversity goals for the City. Recommended species should prioritize drought and flood resistant varieties and varieties likely to be resistant to changing climate and USDA Hardiness zones for City (see appendix 2 of City of Bloomington Climate Risk and Vulnerability Assessment). Species recommendation list to be distributed to and promote among residents, businesses, and contractors within the City.	2

Actions		Implementation Phase
G3-A-3	Continue to prioritize tree planting and maintenance on public property.	3
G3-A-4	Enhance street scape plantings and tree canopies, especially in areas of high traffic volumes.	3

## Strategy G 3-B:

### Support and empower community partners, businesses and residents in meeting tree canopy goals.

Aligning the landscaping and greenspace maintenance actions of property owners and businesses citywide is critical to achieving citywide greenspace goals, particularly in sections of the city with high shares of vulnerable populations.

#### How We'll Measure Progress:

Establishment and utilization of incentives; citywide ground cover characteristics and tree canopy coverage

#### Co-Benefits of Strategy:

Protected / Enhanced Ecosystems

Improved Community Resilience



Improved Community Equity

Improved Quality of Life



Actions		Implementation Phase
G3-B-1	Create additional incentives for tree planting, particularly in prioritized areas within the City as established by the Citywide Ground Cover and Heat Island Assessment.	1
G3-B-2	Develop educational and informational resources providing information on beneficial and climate adaptive tree species, "carbon gardening" strategies for ornamental gardens, and produce gardens, tree profile rebuilding, elimination of synthetic fertilizer and pesticide use, high mow deck settings, use of biochar amendments, polyculture lawn mixture and other beneficial greenspace practices included in this CAP.	2
G3-B-3	Create a communication campaign and educational content to increase opportunities for residents to learn about and take care of trees.	2
G3-B-4	Plant shade trees to limit the need for indoor cooling and reduce temperatures at parks, playgrounds, and other outdoor spaces. Collaborate with School District to include school properties.	3



## Goal G 4 Reduce stormwater and micro heat island impacts.

**Strategy G 4-A:**  
**Reduce impervious surfaces.**

Reduction of impervious surfaces, particularly in sections of the community with high existing impervious surface ground cover share, can significantly reduce stormwater runoff and micro heat island impacts. Consistently implementing green streets, green streets, or living streets, or complete street policies will advance replacement of impervious surface with greenspace and pervious surfaces. (Note, “green street” is a stormwater management approach that incorporates vegetation, soil, and engineered systems to slow, filter, and cleanse stormwater runoff from impervious surfaces; “complete street” is a design approach that requires streets to be designed to support safe, convenient and comfortable travel and access for users of all ages and abilities regardless of their mode of transportation; “living street” combines the concepts of complete streets and green streets while putting additional focus on quality of life aspects for City residents)

**How We'll Measure Progress:**  
Status of policy development and implementation

**Co-Benefits of Strategy:**

Safer Streets

Improved Community Resilience



Improved Community Equity

Improved Quality of Life



	<b>Actions</b>	<b>Implementation Phase</b>
G4-A-1	Create a "Living Streets" policy (Living Streets combines the concepts of complete streets and green streets, and also puts additional focus on quality of life aspects for City residents) to guide current and future street construction, reconstruction, and maintenance projects within the City.	1
G4-A-2	Use green infrastructure such as bioswales, permeable pavement, other pervious surfaces to reduce flood risk and minimize sediment entry into creeks from trails and roads.	2

**Strategy G 4-B:**  
**Increase water uptake capacity of greenspace.**

Increasing soil capacities for water uptake, particularly in sections of the city with high flood and flash flood risks, increases the capacity for stormwater management in place and reduces the risks or severity of flooding impacts. Use of best practices like biochar soil amendments and soil profile rebuilding at building and road construction sites can improve the capacity of greenspace.

**How We'll Measure Progress:**  
Status of policy development and implementation; greenspace and tree coverage

**Co-Benefits of Strategy:**



<b>Actions</b>		<b>Implementation Phase</b>
G4-B-1	Implement a policy requiring a biochar (a carbon-rich product resulting from the pyrolysis of organic residues) soil amendment for all City building and earth working construction sites. Encourage biochar soil amendment use for private sector construction and earth working construction sites. Biochar improves soil carbon sequestration and builds carbon content of topsoil, and improves water retention and permeability characteristics.	1
G4-B-2	Implement a policy to require soil profile rebuilding at new tree installations at all City building project sites or compacted soil conditions to reduce erosion and runoff contaminated with fertilizers, increase soil carbon stores and support long-term soil building. Encourage soil profile rebuilding for private sector building project sites or compacted soil conditions. ( <a href="https://www.urbanforestry.frec.vt.edu/SRES/">https://www.urbanforestry.frec.vt.edu/SRES/</a> )	1
G4-B-3	Explore revegetation, tree preservation planting and maintenance, depaving and porous pavement, and green infrastructure like bioswales ecoroofs and site development performance standards in support of the City's Citywide Ground Cover and Heat Island Assessment, Land Conversion Opportunity Study, and Urban Forest Management Plan.	2
G4-B-4	Keep natural resource areas, especially urban streams, cooler by increasing the width of vegetated areas along streams and wetlands and maintaining tree canopy.	2
G4-B-5	Transition maintenance of all city owned properties to Carbon Gardening practices including elimination of synthetic fertilizer and pesticide use, high mow deck settings, use of biochar amendments, and polyculture lawn mixture.	2



## What You Can Do

- Plant a rain garden with native plantings to absorb storm water and replenish our aquifers.
- Plant trees in your yard to provide shade and cooling in summer heat. Select trees suited for the changing climate of Bloomington. (see: <https://forestadaptation.org/learn/resource-finder/indiana-climate-change-projections-heat-hardiness-zones-and-tree-species>)
- Replace your lawn and landscape with drought-resistant, native or well-adapted, non-invasive plants.
- Make your backyard a Certified Wildlife Habitat with the National Wildlife Federation. [www.nwf.org/garden-for-wildlife/certify](http://www.nwf.org/garden-for-wildlife/certify)
- Remove pavement and increase permeable surfaces. De-pave areas wherever possible to encourage stormwater infiltration onsite.
- Install bioswales/rain gardens or rainwater diversion systems to reduce impact on the stormwater system.
- Install a Green Roof (living roof) to reduce your energy consumption. Decrease heat island impacts, and reduce stormwater runoff.



