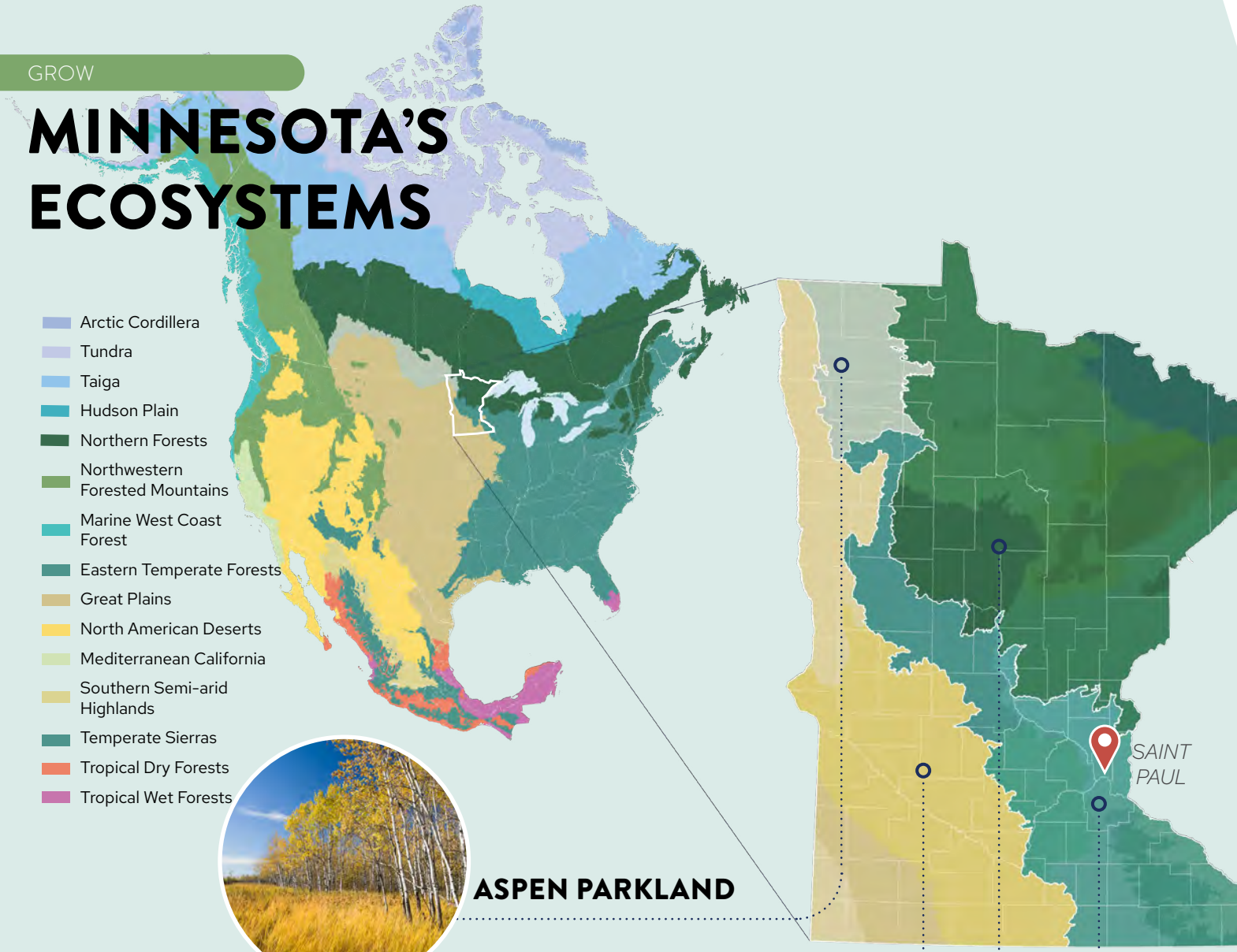
GROW

- Minnesota's Ecosystems
- Sits on the Mississippi Flyway
- Ecosystem Heritage
- Landscape Typologies
- Capitol Area Tree Canopy
- Thermal Comfort
- Stormwater Systems
- Existing Campus Maintenance
- Opportunities and Challenges

The Capitol Mall will steward its landscape with sustainable maintenance practices. The cultivation of a diverse and resilient ecosystem will enable this important area of Saint Paul to adapt to a changing climate while preserving cultural heritage.

MINNESOTA'S ECOSYSTEMS



ASPEN PARKLAND

PRAIRIE GRASSLAND

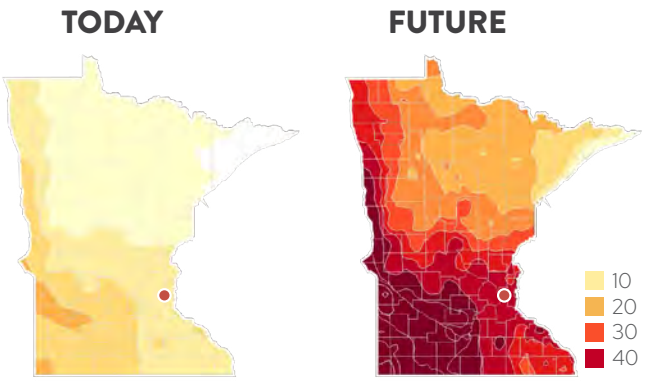
Minnesota is fortunate to lie at the center of four major North American ecological regions or biomes: aspen parkland, prairie grassland, deciduous forest, and coniferous forest.

CONIFEROUS FOREST

DECIDUOUS FOREST

Figure 319: Minnesota's Ecosystems

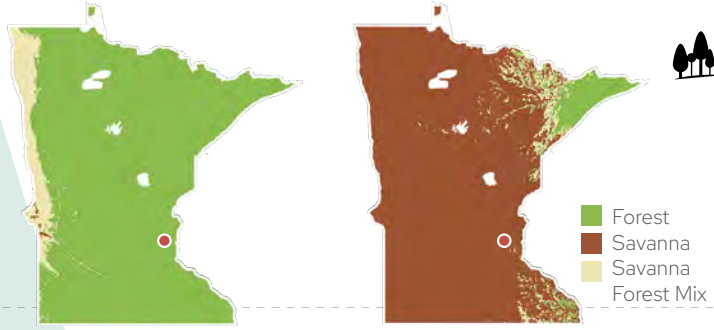
Source: Climate Adaptation Partnership. "Minnesota CliMAT - Climate Mapping and Analysis Tool (CMIP6)"



Days / year warmer than 90 °F C
Comparison between today and 2080

RISING TEMPERATURES

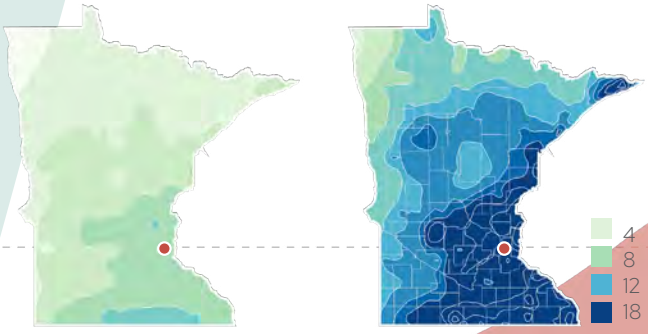
Minnesota will have warmer winters and nights, along with increased summer heat and longer dry spells. The warming temperatures will alter ecosystem productivity, exacerbating the spread of invasive species and changing how species interact with each other and with their environment. These changes are reconfiguring ecosystems in unprecedented ways.



Current Biome zones *Biome zones in 2070*

SHIFTING LANDSCAPES

Today, Minnesota's climate supports forests and trees. In 50 years, climate change could turn most of it to oak savannas, dominated not by trees, but grasslands. In fact, over 70% of the northern tree species have already shifted further northward.



Days / 100 years when daily rainfall exceeds 4 inches
Comparison between today and projections for 2080

MORE DAMAGING RAINS

Heavy rains are now more common in Minnesota and more intense than any recorded rain on record, and climate projections indicate extreme events—like flooding, drought and heat waves—will likely become more frequent and more intense.

Without action, climate change will threaten the rich variety of plants in Minnesota. The Capitol Mall has the responsibility and opportunity to showcase the diverse natural heritage of Minnesota, and ensure that it can adapt to the changing climate.

SITUATED ON THE MISSISSIPPI FLYWAY

Figure 320: Mississippi Flyway Context
Source: *Audobon Minnesota*. https://mn.audubon.org/.

ECOSYSTEM HERITAGE

Where the Capitol sits now was once a deciduous forest with prairie openings. Traces of bluffs, wetlands and creeks were found on locations of parking lots and buildings. Prior to colonization, Dakota people were living and using this site and its native plants for centuries.

Figure 321: EcosystemHeritage

Source: *Minnesota Department of Natural Resources*. www.dnr.state.mn.us/.

Source: *Historic Context Report for the Minnesota State Capitol Planning & Context Development Project*. 106 Group, June 2022.

Source: Tester, John R., et al. *Minnesota's Natural Heritage*. 2021.

FAUNA

Fox squirrel
Sciurus niger

White-tailed deer
Odocoileus virginianus

Indigo bunting
Passerina cyanea

Eastern screech owl
Megascops asio

Rusty patched bumblebee
Bombus affinis

Grey fox
Geothlypis trichas

Western/Boreal chorus frog
Pseudacris maculata

Ruffed grouse
Bonasa umbellus

Painted lady
Vanessa cardui

Red-bellied woodpecker
Melanerpes carolinus

FLORA

Bur oak
Quercus macrocarpa

Quaking aspen
Populus tremuloides

Big bluestem
Andropogon gerardii

Prairie Phlox
Phlox pilosa

Stiff sunflower
Helianthus pauciflorus

American elm
Ulmus americana

Eastern Cottonwood
Populus deltoides

Hackberry
Celtis occidentalis

Prairie Rose
Rosa arkansana

White Sage
Salvia apiana

Redosier dogwood
Cornus sericea

Chokecherry
Prunus virginiana

Black Raspberry
Rubus occidentalis

Selected species mentioned in **DAKOTA ETHNOBOTANY**

OAK - ASPEN FOREST

OAK SAVANNA / MESIC PRAIRIE

WETLAND / LOWLAND HARDWOOD

LANDSCAPE TYPOLOGIES

LANDSCAPE OWNERSHIP

- State owned park and ROW
- City owned park and ROW
- County owned ROW
- Privately-owned public park
- Commercial / institutional landscape
- Private Residential Landscape

LAWN

- Formal lawn
- Commercial and civic lawn
- Streetscape lawn
- Residential lawn

NATURAL LANDSCAPE

- Meadow along steep slopes
- Vegetation in the vacant lot
- Meadow along highway - "the Green River"

PROGRAMMED LANDSCAPE

- Monumental landscape
- Other programmed landscape including pocket parks, sport fields and community gardens
- Tree Canopy

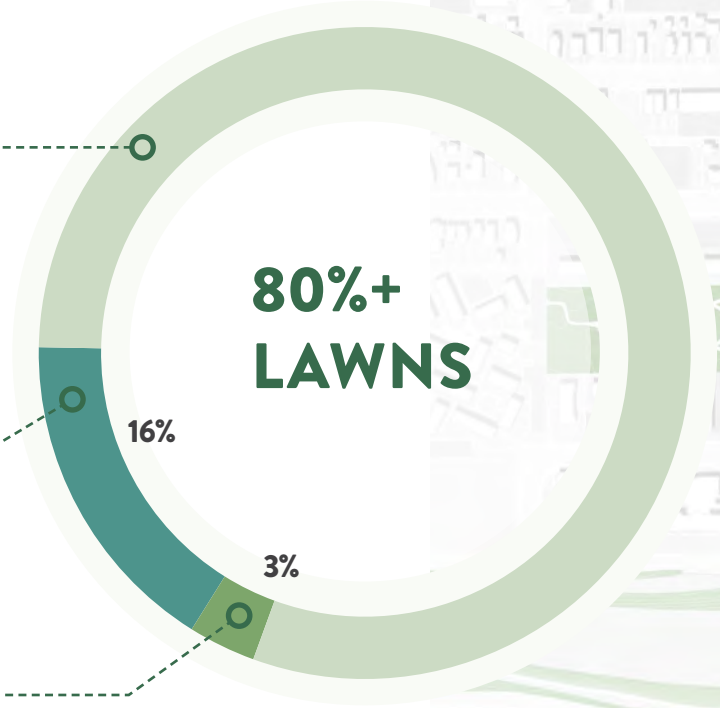


Figure 322: Landscape Typologies

Source: *Saint Paul for All 2040 Comprehensive Plan*. City of Saint Paul, Nov 2020.

N 0' 125' 250' 500'

As Minnesota's Front Lawn, the Capitol Campus's dominating landscape type is lawn with specimen trees, with some meadows and programmed landscape. The maintenance effort for public space and ROW is divided by landscape ownership.

CAPITOL AREA TREE CANOPY

More than 55 native species of trees are documented by CAAPB, including Basswood (Tilia americana), Norway maple (Acer platanoides), Hackberry (Celtis occidentalis) and other trees that play significant roles in the Saint Paul Baldwin Plains and Moraines Ecoregion. The central business district has an existing canopy cover of 9.4%, significantly lower than the city average of 32.5%. Increasing tree canopy while preserving important view corridors will be critical.

CANOPY COVER CLASSIFIED BY PARCEL

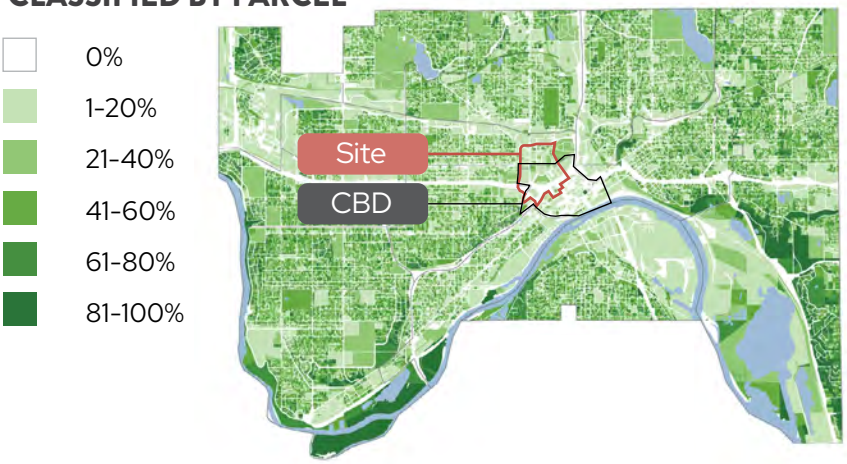


Figure 323: Metro Area Tree Canopy Cover
Source: *Saint Paul for All 2040 Comprehensive Plan*. City of Saint Paul, Nov 2020.
Source: *Minnesota Geospatial Commons*. gisdata.mn.gov/dataset.
Source: *Ramsey County Map Ramsey.* maps.co.ramsey.mn.us/mapramsey/.
Source: *Ramsey County Maps and Surveys.* www.ramseycounty.us/residents/property/
Source: *Saint Paul Minnesota.* information. stpaul.gov/search.

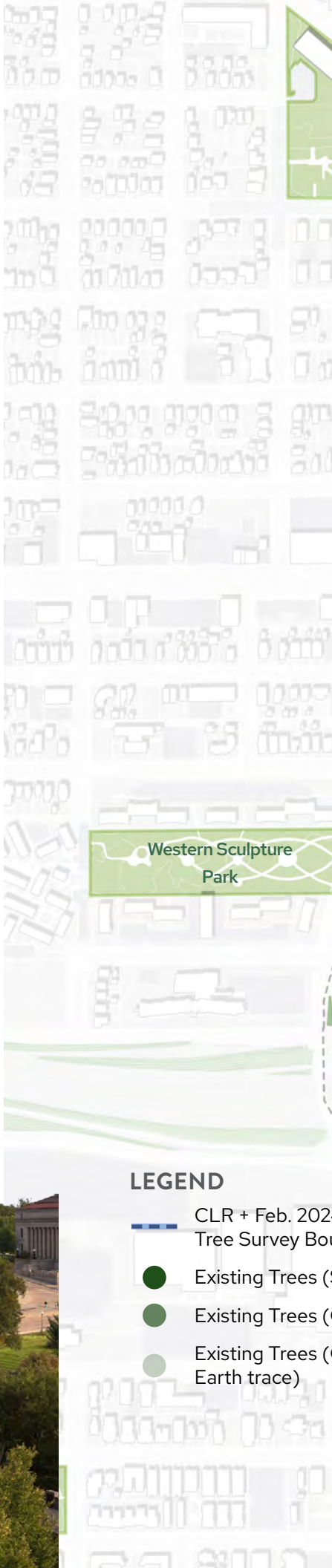
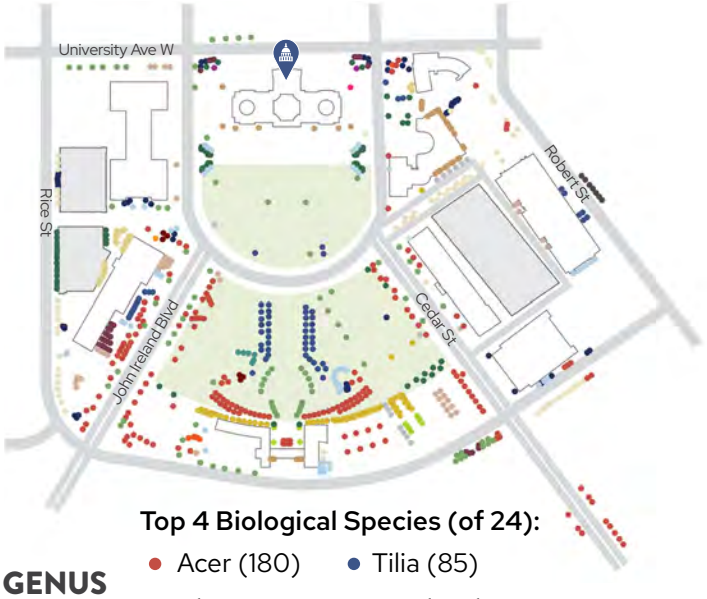


Figure 324: Capitol Area Tree Canopy

TREE CANOPY

TREE SURVEY



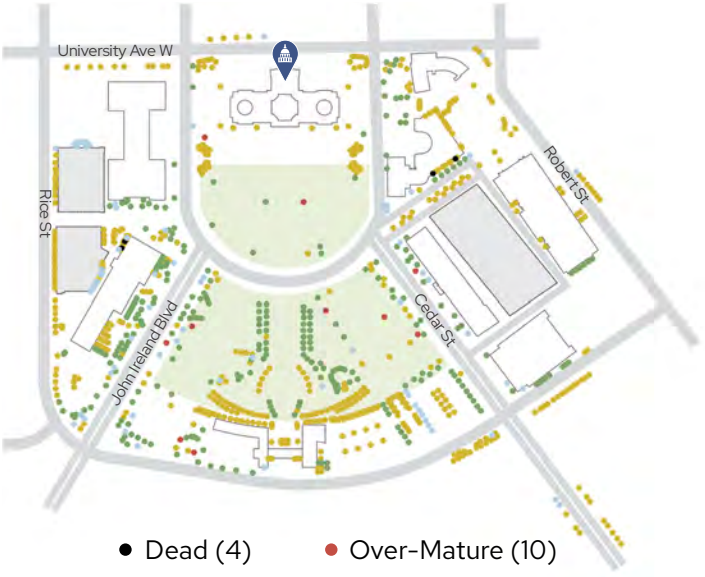
GENUS

Top 4 Biological Species (of 24):

- Acer (180)
- Tilia (85)
- Ulmus (85)
- Amelanchier (67)

CONDITION

- Dead (4)
- Good (217)
- Poor (11)
- unknown / stump (85)
- Fair (618)



AGE

- Dead (4)
- Over-Mature (10)
- Young (551)
- unknown/stump (85)
- Mature (285)

CROWN

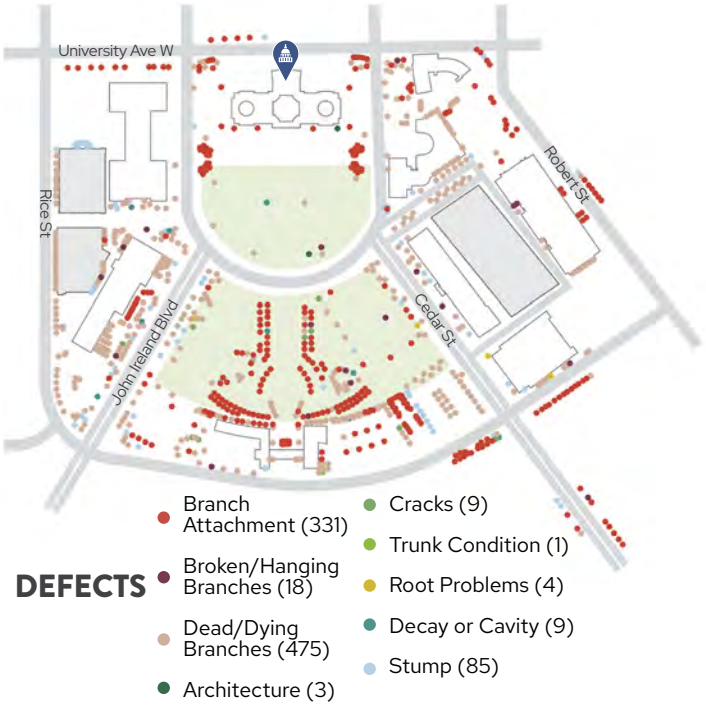
1' ⟶ 50'+

HEIGHT

- 1-10ft
- 31-40ft
- 11-20ft
- 41-50ft
- 21-30ft
- 50'+

METHODOLOGY

Condition includes 1) Good: A good tree shows no significant problems; 2) Fair: A fair tree has minor problems that may be corrected with time or corrective action; 3) Poor: A poor tree has significant problems that are irrecoverable; and 4) Dead: A dead tree shows no sign of life. **Age** is determined as 1) Young: Have achieved one-third of their mature height; 2) Mature: Have achieved one-third to two-thirds of their mature height; 3) Overmature: Have achieved their full potential of height based on species and conditions; and 4) Dead- No signs of life. **Crown** diameter is estimated within ten feet. **Defects** document only the most significant



DEFECTS

- Branch Attachment (331)
- Broken/Hanging Branches (18)
- Dead/Dying Branches (475)
- Architecture (3)
- Cracks (9)
- Trunk Condition (1)
- Root Problems (4)
- Decay or Cavity (9)
- Stump (85)

RISK

- Low (836)
- None (99)

MAINTENANCE

- Prune (622)
- Train (214)
- Stump Removal (80)
- Remove (14)

PRIORITY

- Very Low (150)
- Medium (345)
- Low (355)

conditions and limit the conditions to those outlined above. **Risk** is assigned based on an assessment of the failure mode (i.e., branch, whole tree, codominant stem) with the most significant risk. The specified period for the risk assessment is one year. **Maintenance** includes 1) Remove: Trees recommended for removal have defects that cannot be practically or cost-effectively treated. Most trees in this category have a sizable percentage of dead crown; 2) Prune: Removal of one or more limbs to reduce risk, provide clearance, and restore the tree; and 3) Train: Pruning of young or medium-aged trees to improve tree and branch architecture. **Priority** is determined via defects, risk, and recommended maintenance.

THERMAL COMFORT

EXISTING

METHODOLOGY + OUTCOMES

Thermal comfort is defined as a person's sensations in relation to the thermal environment, or the ability for a person to be outside and not feel too hot or too cold. Thermal comfort is determined by several factors, including air temperature, air velocity (wind), humidity, shade and so on. To ensure the final Design Framework maximizes thermal comfort, the planning team utilized a thermal comfort tool to better understand what areas in the Capitol Area are most comfortable and which are not. Unsurprisingly, areas with the most tree canopy were the most comfortable overall and had the most significant influence during the summer months. Winter was generally less comfortable, particularly in areas between buildings.

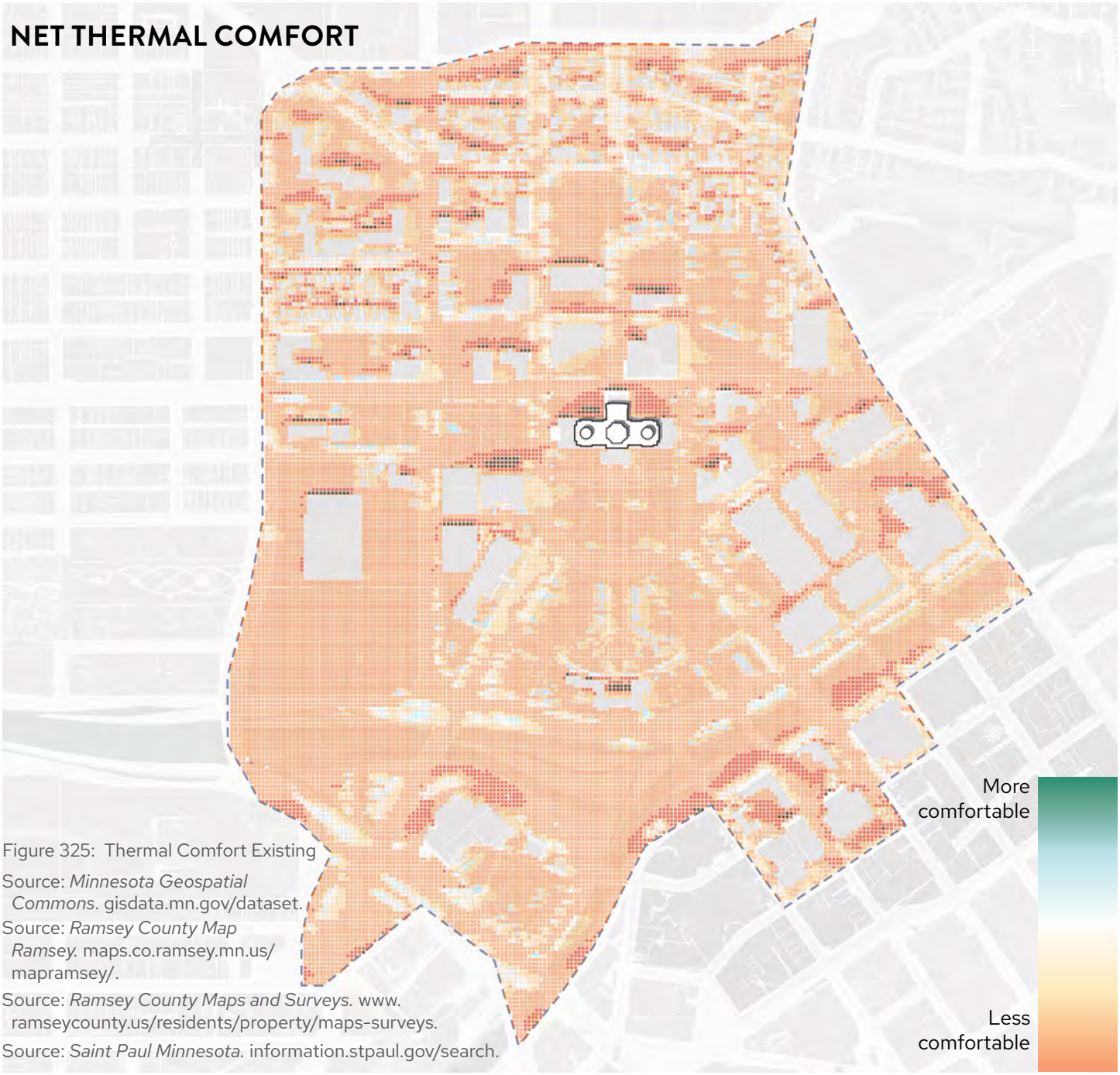


Figure 325: Thermal Comfort Existing

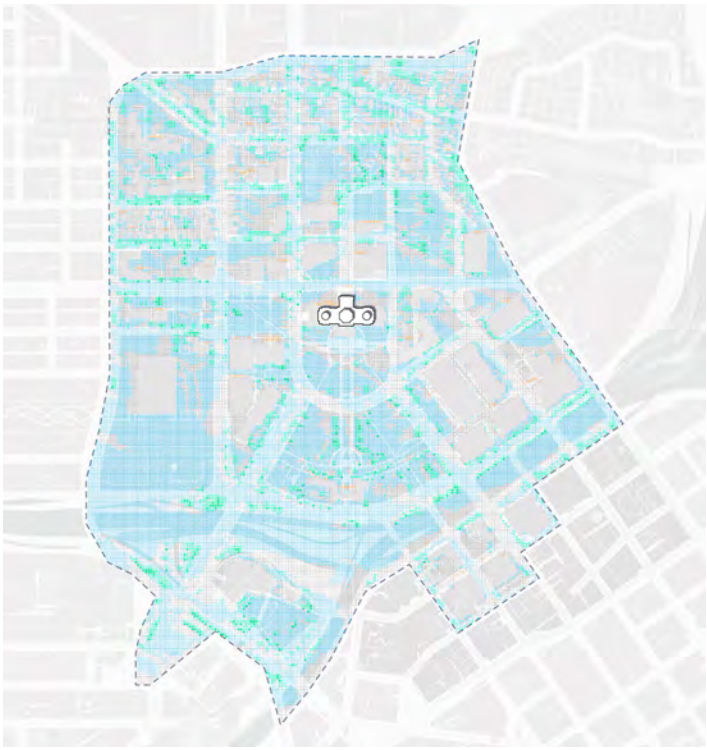
Source: *Minnesota Geospatial Commons*. gisdata.mn.gov/dataset.

Source: *Ramsey County Map Ramsey.* maps.co.ramsey.mn.us/mapramsey/.

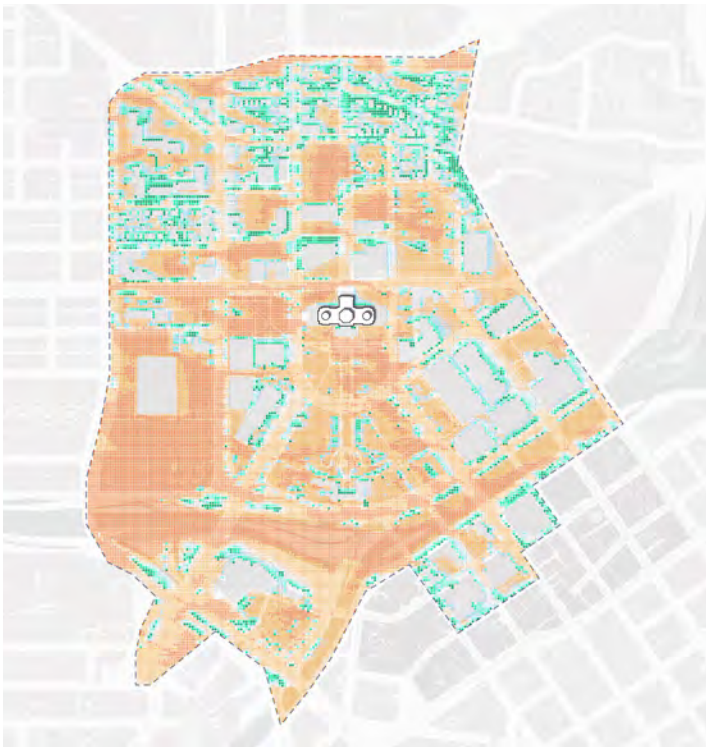
Source: *Ramsey County Maps and Surveys.* www.ramseycounty.us/residents/property/maps-surveys.

Source: *Saint Paul Minnesota.* information.stpaul.gov/search.

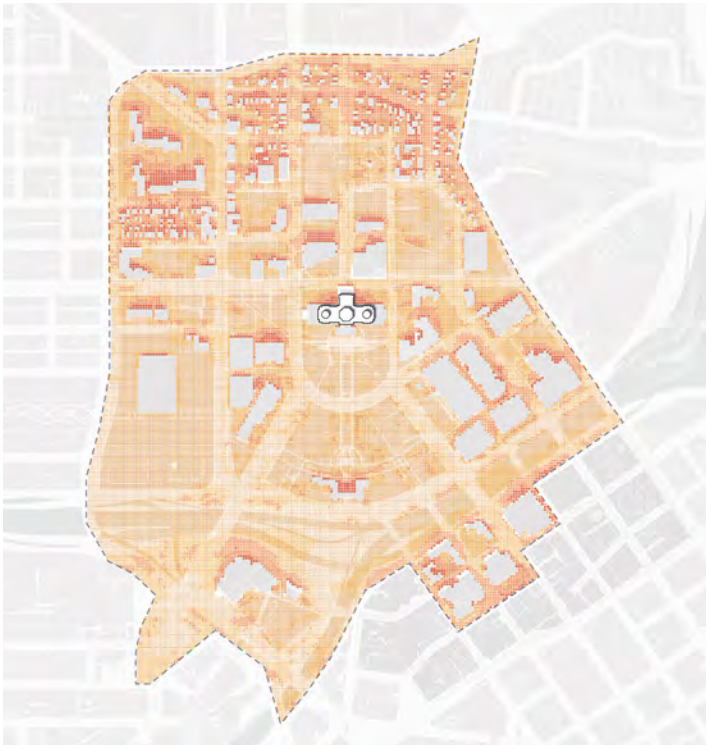
SPRING



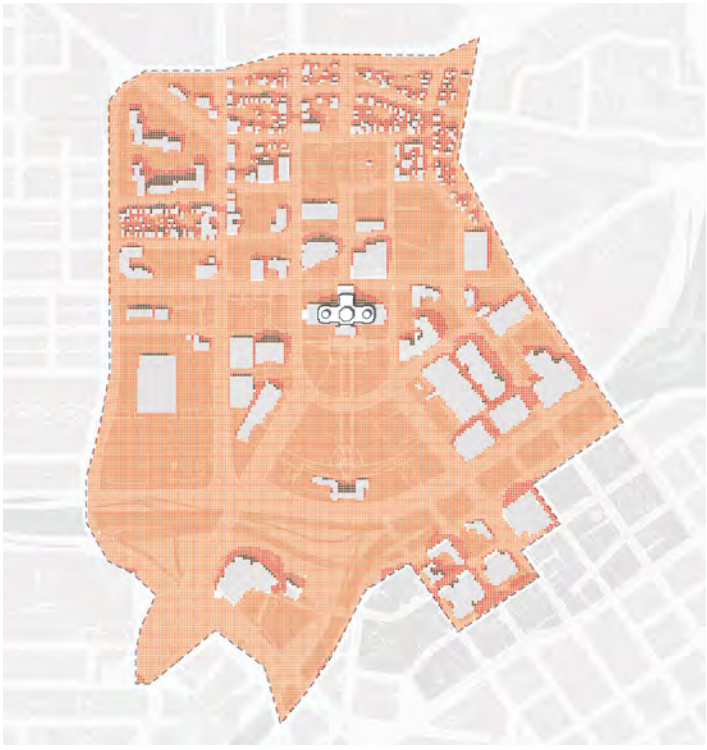
SUMMER



FALL



WINTER



THERMAL COMFORT

STRATEGY

SHADE VERSUS SUN

Locations requiring more shade versus more sun can be derived from the previous thermal comfort analysis. Both the Upper and Lower Malls require more shade via increased tree canopy to be comfortable year round. Additionally, all areas of extensive impervious cover (like the Sears Lot and Interstate bridges) are generally noted as needing more shade. Pockets of unshaded lawn provide moments of warmth and sunshine during winter months, so long as vegetated edges minimize wind. While increasing sun between existing buildings is difficult, new development should carefully consider solar orientation to support thermal comfort.

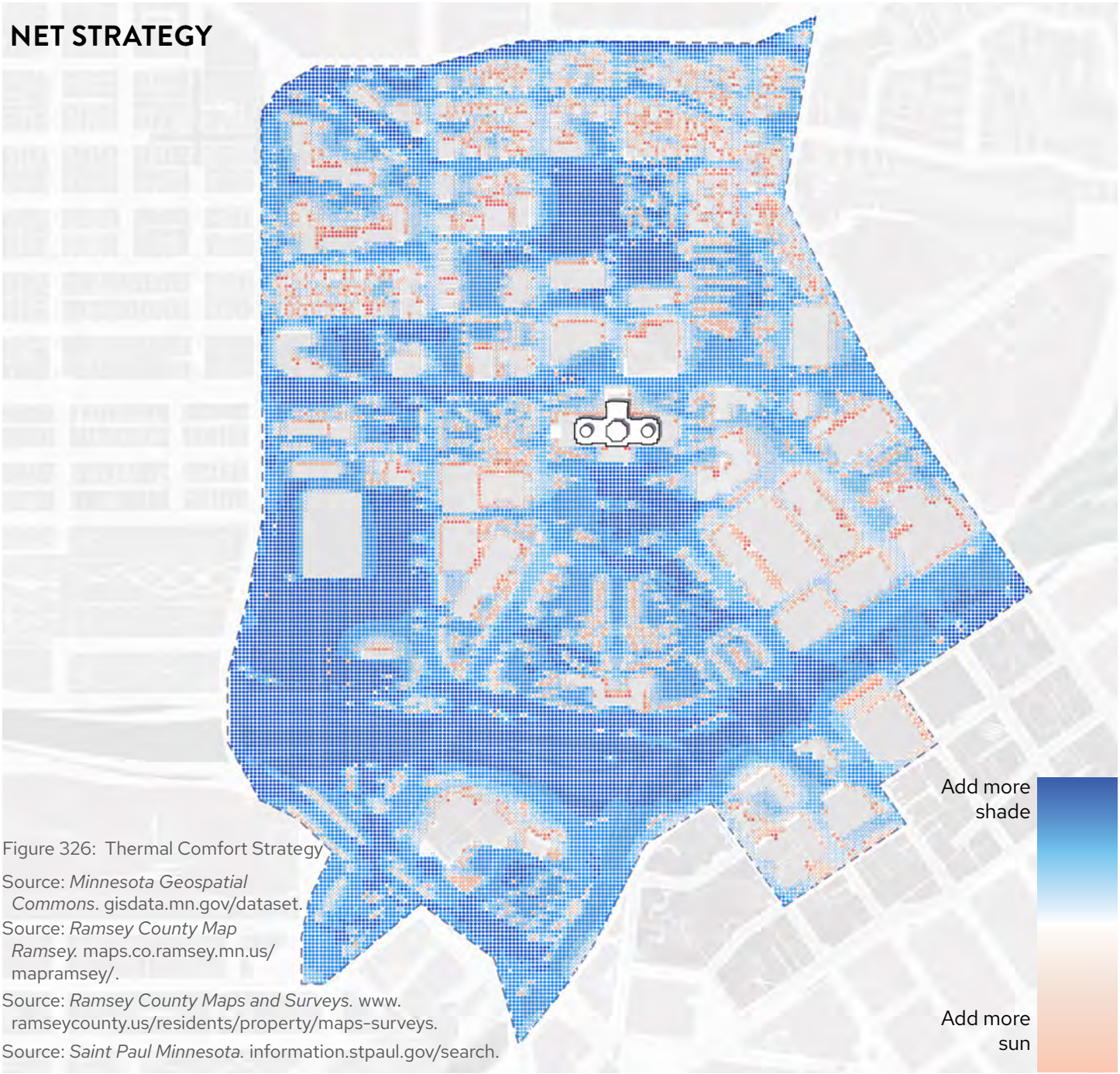


Figure 326: Thermal Comfort Strategy

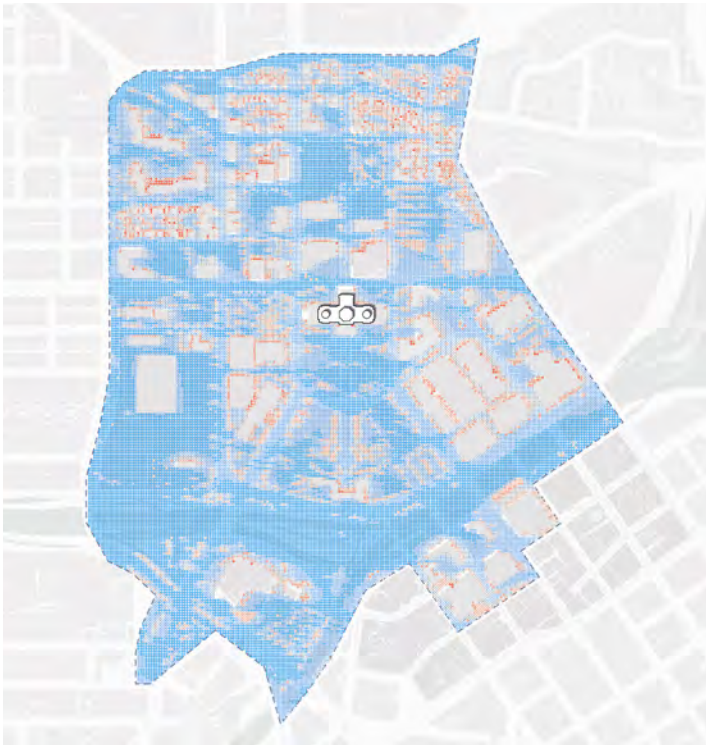
Source: *Minnesota Geospatial Commons*. gisdata.mn.gov/dataset.

Source: *Ramsey County Map Ramsey.* maps.co.ramsey.mn.us/mapramsey/.

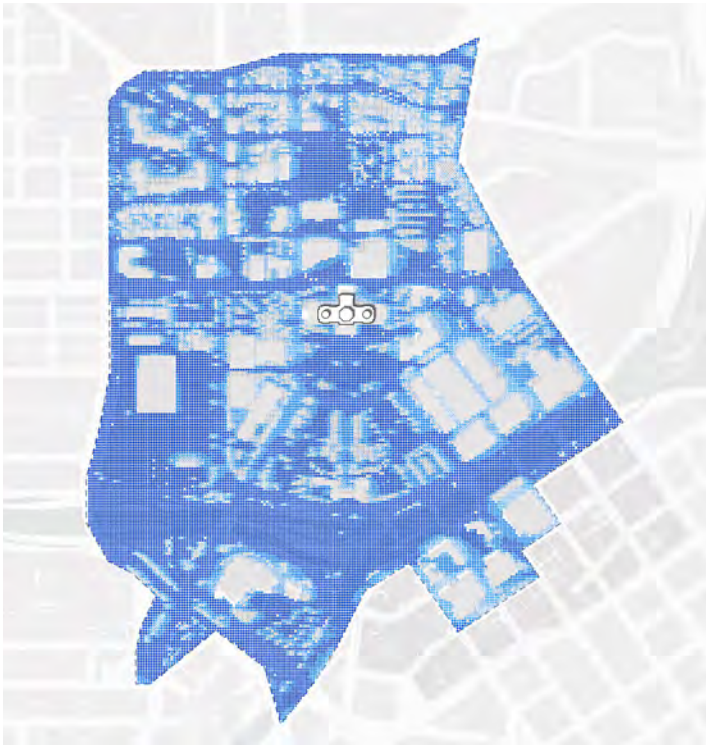
Source: *Ramsey County Maps and Surveys.* www.ramseycounty.us/residents/property/maps-surveys.

Source: *Saint Paul Minnesota.* information.stpaul.gov/search.

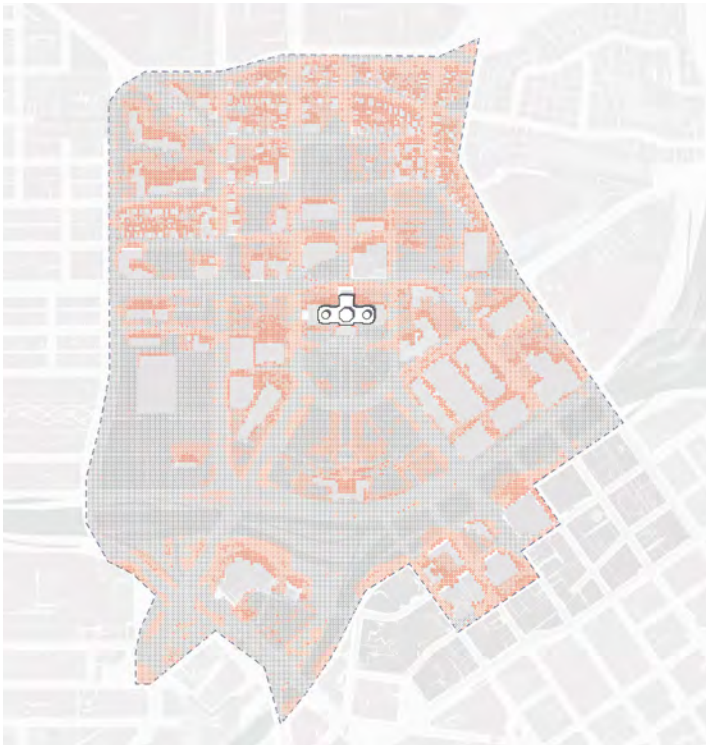
SPRING



SUMMER



FALL



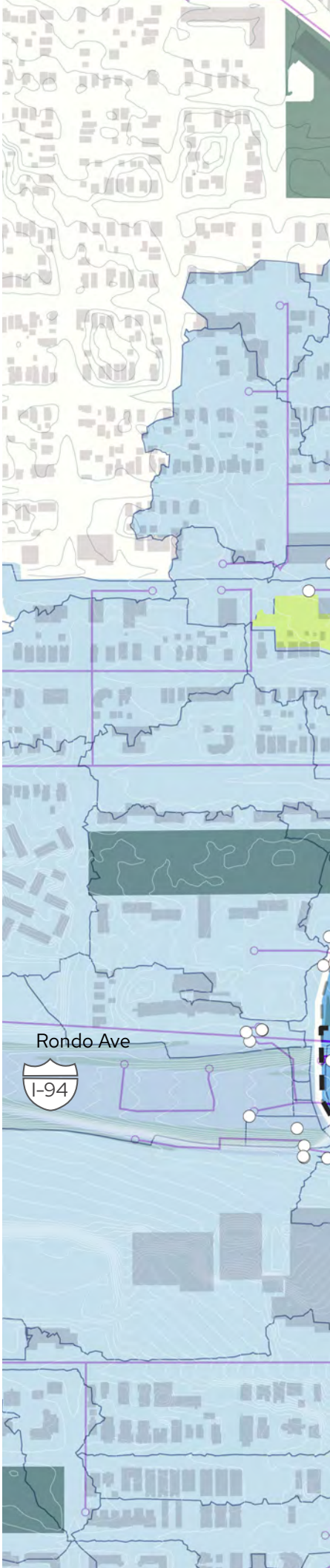
WINTER

STORMWATER SYSTEMS

RUNOFF WITHIN THE DISTRICT

The Capitol Mall is part of the larger Capitol Area, which encompasses 60 blocks and approximately 333 acres. Rainwater falling on the urban landscapes that comprise the Capitol Area runs off into the surrounding storm sewers, becoming stormwater that carries with it pollutants such as sediment and excess nutrients, and ultimately discharges into the nearby Mississippi River (Haháwakpa). Under current conditions, over 90% of the impervious surfaces within the Capitol Area receive no stormwater treatment to help manage and address this pollution before it flows to the river. These untreated landscapes include large portions of the Capitol Mall, the surrounding transportation network, and adjacent State Administration buildings (CRWD, Capitol Area Stormwater Management Study, 2024).

The Design Framework provides an opportunity to incorporate sustainable and resilient campus stormwater management systems and green stormwater infrastructure into several areas on and surrounding the Capitol Mall. Integrating these systems into the re-imagining of the Capitol Mall and its neighboring roadways allows for the capture, treatment, and reuse of stormwater runoff from this portion of the larger Capitol Area and for the State of Minnesota to be a leader in advancing and showcasing a more resilient approach to managing and protecting Minnesota's water resources.



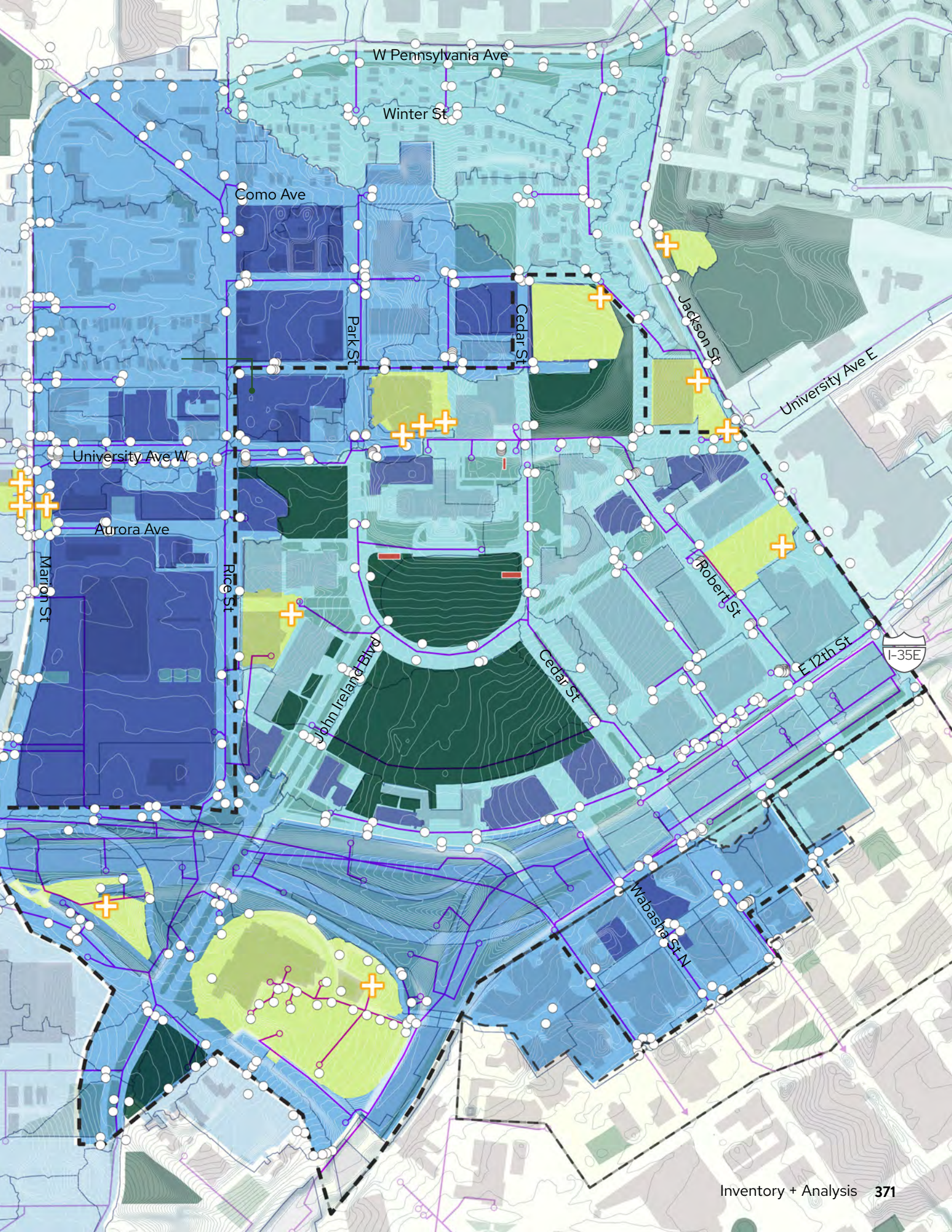
LEGEND

- Impervious Surfaces
- Treated Area
- Parks/Lawns
- Programmed/ Institutional Lawn
- Non-Trout Brooks Interceptor (TBI) Subwatersheds
- Trout Brooks Interceptor Subwatersheds
- BMPs
- Catch Basin
- Storm Sewer
- Underground Storm Chamber

N 0' 125' 250' 500'

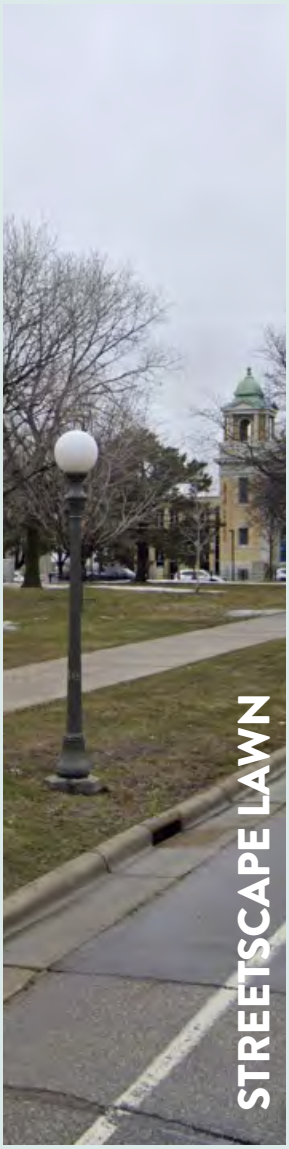
Figure 327: Stormwater Systems

Source: *Saint Paul for All 2040 Comprehensive Plan*. City of Saint Paul, Nov 2020.
Source: *Minnesota Geospatial Commons*. gisdata.mn.gov/dataset.
Source: *Ramsey County Map Ramsey.* maps.co.ramsey.mn.us/mapramsey/.
Source: *Ramsey County Maps and Surveys.* www.ramseycounty.us/residents/property/maps-surveys.
Source: *Saint Paul Minnesota.* information.stpaul.gov/search.


W Pennsylvania Ave
Winter St
Como Ave
Park St
Cedar St
Jackson St
University Ave E
University Ave W
Aurora Ave
Marion St
Rice St
John Ireland Blvd
Cedar St
Robert St
E 12th St
I-35E
Wabasha St N

EXISTING CAMPUS MAINTENANCE

A NEED FOR CHANGING PRACTICES



THE LEVEL OF MAINTENANCE VARIES ACROSS THE CAPITOL CAMPUS. THE CURRENT STANDARD MAINTENANCE PRACTICE FOCUSES ON LAWNS. HOWEVER, CLIMATE CHANGE NECESSITATES MORE SUSTAINABLE MAINTENANCE PRACTICES FOR ALL LANDSCAPE TYPES MOVING FORWARD.

Figure 328: Landscape Maintenance Zones

Source: Doherty, Barrett. *Programmed Formal Lawn. 2021.* www.tclf.org/minnesota-state-capitol-mall.

Source: *Streetscape Lawn, Lawn on Parking Lot, Meadow on Slopes, The "Green River"*. www.google.com/maps/. Accessed Jan. 2024.

MAINTENANCE OVERVIEW

Current standard maintenance practices vary across the Capitol Campus, but primarily focus on lawns. Per extensive stakeholder engagement with government staff, specifically the Minnesota Department of Administration, maintenance is limited by insufficient budgets and staff power. Therefore, lawn dominates because it is perceived as the easiest and cheapest to maintain. While lawn is better than impervious cover when it comes to minimizing urban heat island effect and other climate challenges, it is much less effective than other native landscape typologies. Moreover, lawn actually requires more maintenance than some of these landscapes in the long term. The Design Framework incorporates more dynamic and resilient ecologies to address such issues and outlines sustainable maintenance practices moving forward.

OPPORTUNITIES AND CHALLENGES

OVERARCHING OPPORTUNITIES AND/OR CHALLENGES TO GUIDE PRINCIPLE DESIGN FRAMEWORK STRATEGIES MOVING FORWARD INCLUDE THE FOLLOWING:

- Human comfort challenges related to shade and wind patterns on site
- Disconnection from natural process and pre-settlement ecologies
- Investment in ongoing maintenance and operations
- Climate adaptability and resilience to extreme natural events

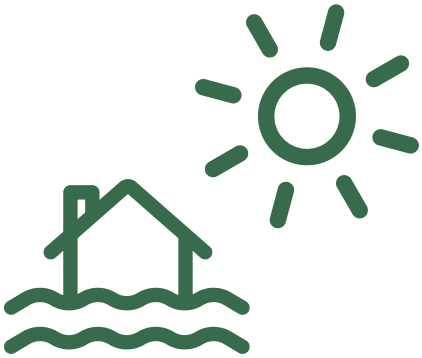
PRINCIPLE STRATEGIES

Moving forward from the 2040 Comprehensive Plan

INCREASE TREE CANOPY COVER AND EMBED HUMAN COMFORT IN PLACEMAKING

RECONNECT THE SITE'S NATURAL HERITAGE AND ALL CULTURES THROUGH PLANTING

DEVELOP AN EVOLUTIONARY MAINTENANCE REGIME THAT IS ECOLOGICAL AND SUSTAINABLE



CREATE A CLIMATE-READY LANDSCAPE THROUGH PLANTING AND STORMWATER MANAGEMENT

GROW PRINCIPLE STRATEGY

INCREASE TREE CANOPY COVER AND EMBED HUMAN COMFORT IN PLACEMAKING

STRATEGIES

- Strategically increase tree canopy and design plant communities for improved sightlines and microclimate effects in both parks and streetscapes
- Provide shading opportunities every two to four minutes of walking distance along park pathways and streets, and incorporate deciduous planting to balance thermal comfort during summer and winter
- Design with plant phenology in mind, and limit the use of plant that can be negatively affected by Minnesota's climate extremes
- Leverage and strategically preserve existing vegetation to enhance resilience and thermal comfort
- Create dynamic height differences to increase mixing of air and encourage more wind at human height.
- Consider shading structures and plantings that encourage summer wind flow and block winter wind flow

Figure 329: Pearl Street Mall

Source: Sasaki. *Pearl Street Mall, Sasaki,* https://www.sasaki.com/projects/bonnet-springs-park/.

GROW PRINCIPLE STRATEGY

RECONNECT THE SITE'S NATURAL HERITAGE AND ALL CULTURES THROUGH PLANTING

STRATEGIES

- Design planting patterns with Indigenous ethnobotany in mind
- Embed nature education opportunities in design
- Use native plant communities and landscape succession as a guide, and design with faunal associations in mind, prioritizing the use of native plant species that provide superior ecological benefits
- Utilize foundational plant species that support local habitat, such as sugar maple, basswood and bur oak
- Eliminate the use of invasive plant species and restrict the use of those that may become invasive in the future
- Create a pollinator-friendly landscape that supports butterflies, moths and pollen specialist bees, referring to resources like Keystone Plants by Ecoregion led by Dr. Doug Tallamy from University of Delaware and the Pollinator Station Program led by the City of Saint Paul

Figure 330: Bonnet Springs Park Birds Eye

Source: Sasaki. *Bonnet Springs Park Birds Eye, Sasaki,* https://www.sasaki.com/projects/bonnet-springs-park/.

GROW PRINCIPLE STRATEGY

DEVELOP AN EVOLUTIONARY MAINTENANCE REGIME THAT IS ECOLOGICAL AND SUSTAINABLE

- Facilitate application of resilience principles to ecosystem management through rich landscape settings at the human scale
- Promote a diversified native landscape pattern that sustains climate change and other anthropogenic stressors
- Design with plants that are less affected by common pathogens and pests and avoid those that may become a concern in the future
- Prioritize plants that are adapted to the current soil profile, and group plants together that share similar soil, irrigation and maintenance needs
- Promote green waste recycling, consider natural maintenance methods and reduce the use of chemicals and motorized equipment
- Maintain winter structure for planting and minimize salt damage on both parks and ROWs

Figure 331: Historic Fort Snelling at Bdote Revitalization

Source: FARM KID STUDIOS. Historic Fort Snelling at Bdote Revitalization. TEN X TEN Studio, www.tenxtenstudio.com/historic-fort-snelling-at-bdote-revitalization.

GROW PRINCIPLE STRATEGY

CREATE A CLIMATE-READY LANDSCAPE THROUGH PLANTING AND STORMWATER MANAGEMENT

- Use climate-ready species and refer to local planting sources (utilize the University of Minnesota Climate Adaptation resources such as climate-ready woodlands for more site specific planting suggestions)
- Design the landscape and hardscape to help with carbon draw down by selecting plants and materials that promote carbon sequestration and storage and creating a landscape that reduces operational carbon
- Maximize green infrastructure for stormwater treatment, and consider local habitat and species while designing the stormwater landscape
- Identify areas with high runoff potential and strategically size green infrastructure and the management requirements at those locations
- Design a landscape that promotes phosphorus and other pollutant removal

Figure 332: Ellinikon Park

Source: Sasaki. *Ellinikon Park, Sasaki,* https://www.sasaki.com/projects/the-ellinikon-park/.