Section 3

Guiding Principles
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Design Standards

Guiding Principles

Trees provide a number of human and environmental benefits over the course of their lives when properly planned for, selected, and planted within urban conditions. Choosing the right tree for the right location is critical to the establishment of a healthy urban forest and a variety of approaches and planting layouts should be considered. Increased tree diversity and a reduction of monocultures along street corridors guided by proper tree selection and current design practices will help create a resilient urban forest that contributes to a strong quality of life for residents and expands the sense of identity of Saint Paul.

Diversity, Composition, and Design Implications

Diverse tree populations are better equipped to withstand environmental pressures so that urban canopy losses, as a percentage of total canopy cover, are minimized across the city. Like Dutch elm disease, the emerging emerald ash borer threat has shown that increasing species diversity is an important aspect of urban forestry management that the city will continue to promote in its forestry practices. When completed, the street tree inventory being developed by Forestry will provide tools to measure and track tree species diversity while informing the planning and design of street corridors.

- To accomplish the goal of increasing tree diversity and reducing the likelihood of large tree losses across the city a number of steps should be taken based on work done by the City of Saint Paul, recommendations made by the Tree Advisory Panel, and current best management practices.

- Species diversity will be considered on the city scale and coordinated between planting districts based on site conditions and selecting the right tree for the location. Establishing a goal limiting any single species to 10%-20% of the total tree inventory reinforces diversity planning and minimizes potential large scale losses of urban trees due to insect damage or disease.

- The 30-20-10 model (Santamour) provides a useful guide and suggests that the total tree inventory contains no more than 30% of a single family, 20% of a single genus, and 10% of a single species. Forestry recognizes this goal though urban site conditions and the number of species available for the Minnesota climate may limit the full implementation of this model.

- The maximum linear distance that a single species of trees is planted along a street corridor should be set at 1-3 blocks. Where visual continuity is required, lengths of 4-6 blocks of a single species will be considered.

- The development and use of sequencing, planting multiple tree species on the same block, provides a model to increase diversity on a block by block basis. Pairing species for aesthetic and maintenance concerns will vary based on need and can be changed to tailor the planting scheme to meet conditions present on the site.

- In park areas where growing conditions are appropriate the use of native trees should be considered. This will provide genetic variation within the urban canopy as well as habitat for birds and other wildlife.

- Maintaining urban trees is most efficient and cost effective when trees with similar growth rates and characteristics are planted together. This reduces travel and setup time and allows city crews to work with minimal interruptions to the maintenance process. Refer to the appendix for more information on city tree maintenance.

- Planning for ecological, functional, and structural diversity will increase the overall benefits the urban forest provides to residents and the urban environment.

Sequencing

The development and use of sequencing provides a model to increase species diversity at the city block level by planting two or more tree species in a designed pattern along street corridors and adjacent cross streets. This planting pattern reduces the risks associated with monocultures while maintaining visual cohesion and unity within the streetscape.

Pairing species for aesthetic, horticultural, and maintenance concerns will vary according to design goals and site conditions and can be arranged to tailor the planting scheme to meet planning priorities. Species selection should be based on design principles and the compatibility of tree characteristics including size, form, texture, color, and seasonal interest. Primary species selection should favor trees that are well suited to the growing conditions found on site with secondary trees selected for aesthetic, site, and functional compatibility. Consideration of repetition, balance, and scale will strengthen visual unity and can be used to guide the attention of pedestrians and motorists or highlight significant landmarks or roadways.

Sequenced planting patterns, species selection, and tree location on planting boulevards shall be determined by Forestry with additional consultation from Design when parks, parkways, or historic districts are being planted.

The following examples provide options that can be expanded upon when using sequencing in boulevard planting. Site conditions and existing infrastructure may require the alteration or adjustment of these patterns to meet planting goals.

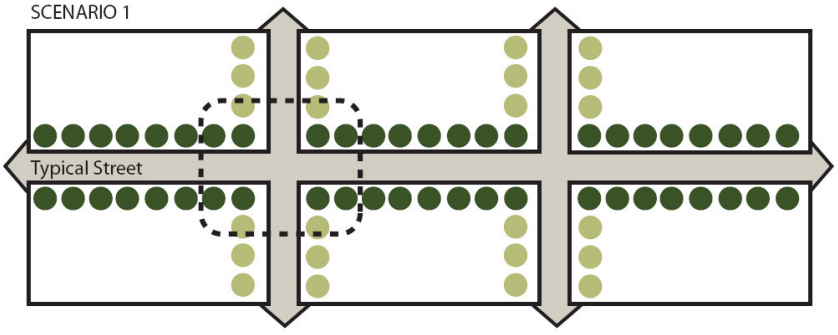

Figure 3.1:
A typical single tree species monoculture planting promotes visual uniformity and continuity but reduces canopy diversity. This type of planting pattern should be limited to no more than 1-3 sequential blocks, 4-6 blocks in special circumstances, and coordinated across districts to provide city-wide diversity.

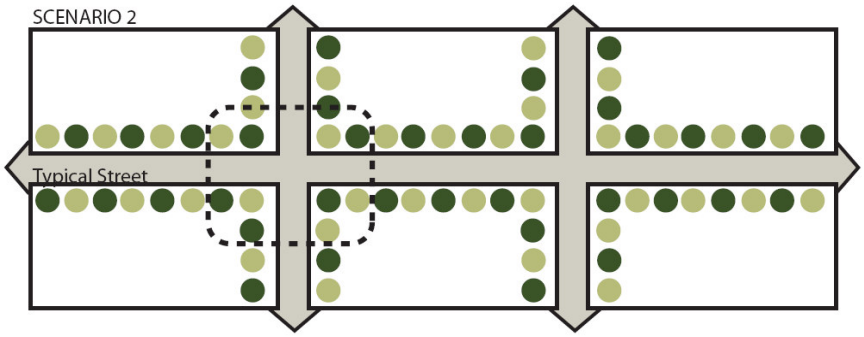

Figure 3.2:
Simple sequence planting creates a pattern of alternating tree species by combining two different tree types that are aesthetically and horticulturally compatible. This planting pattern increases species diversity at the block level reducing the potential impacts of disease or insect damage.

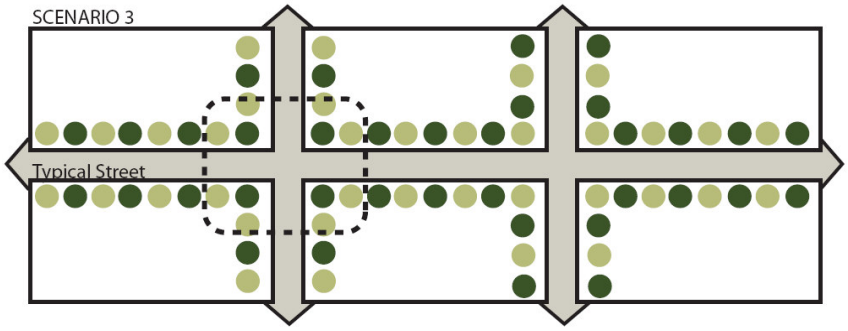

Figure 3.3:
Visual continuity and neighborhood identity can be increased by planting the same tree species at street intersections or other important landmarks.

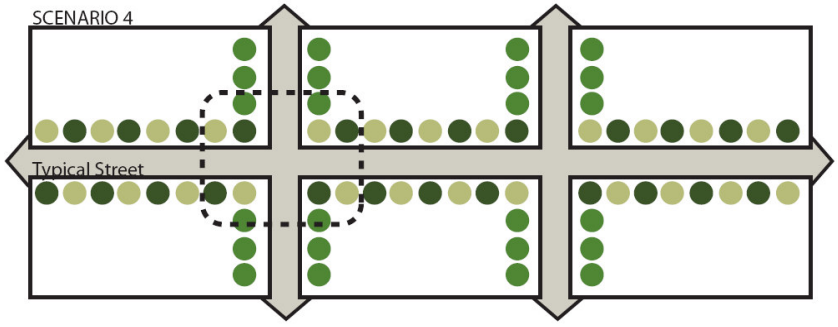

Figure 3.4:
Planting a third tree species on intersecting cross streets increases overall diversity. Tree selection based on size, form, and seasonal interest can influence the character and identity of different streets types.

Grouped Sequencing:

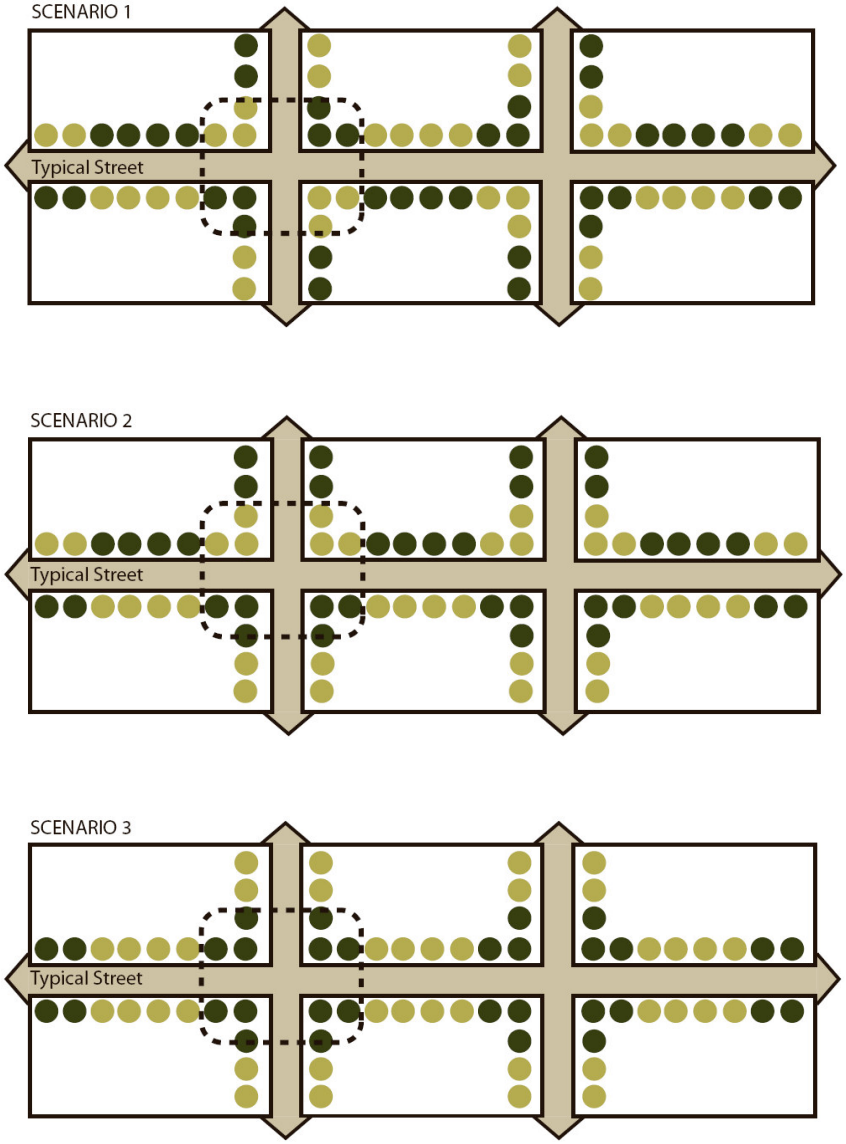

Figure 3.5, 3.6, and 3.7:
Three examples of grouped sequencing: Grouping tree species together increases the visual continuity and species diversity at the individual block level. The number and type of trees planted in each group influences the general aesthetic and experiential quality of the street corridor and may calm vehicular traffic. Alternating tree patterns can be designed to emphasize important intersections (figure 7) or landmarks.

Functional + Ecological Principles

Urban forests provide important ecosystem services which reduce the economic costs of mitigating the environmental impacts of urban landscapes. Identifying and implementing current best management practices (BMP) in street corridor planning can maximize the benefits provided by urban trees.

- Reducing stormwater runoff
- Mitigating the urban heat island effect
- Reducing heating and cooling costs
- Reducing the wear on pavements
- Filtering air pollution
- Sequestering carbon
- Providing habitat and connectivity
- Providing sound breaks and buffers

Urban Design Principles

The design principles of balance, repetition, sequence, and scale should be followed when planning tree layouts. This is especially true when increasing diversity of the urban tree canopy in order to maintain the unified experiential qualities of the street corridor. Planting multiple species in a sequence requires the selection of similar or complimentary species based on a tree's size, form, texture, color, and seasonal interest. Selected groups of species can be planted in an alternating pattern to increase diversity, preserve and enhance connectivity, and provide visual unity to the urban canopy.

Image courtesy of Teresa Boardman

Trees need to be well proportioned to their site and should consider the architectural styles and sizes of adjacent buildings. Potential damage to buildings and the surrounding infrastructure can be minimized through proper tree selection and observations of the site conditions. Proper consideration of the site conditions where street trees are planted can improve their long term sustainability and increase the environmental and economic benefits they provide.

The following street sections highlight some of the considerations that should be made when planting trees on city boulevards. Variations in street and boulevard width as well as site conditions will all influence tree selection.

Street Sections

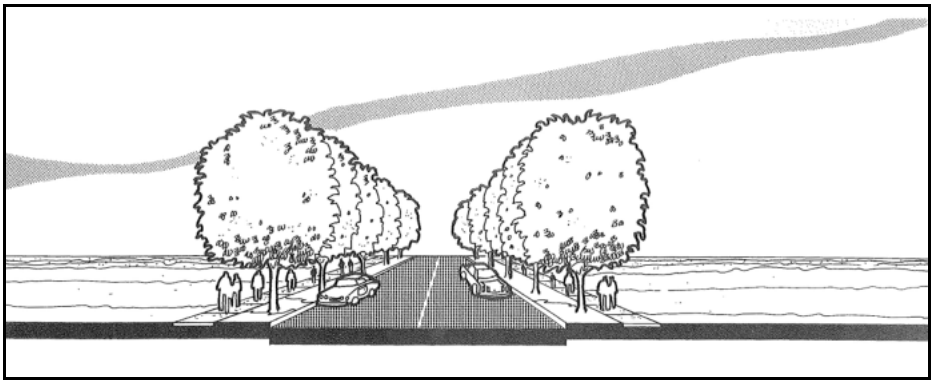

Figure 3.8: Streetscape

Standard street section of the public right of way showing the relationship between the planting boulevards, road way, sidewalks and adjacent private property.

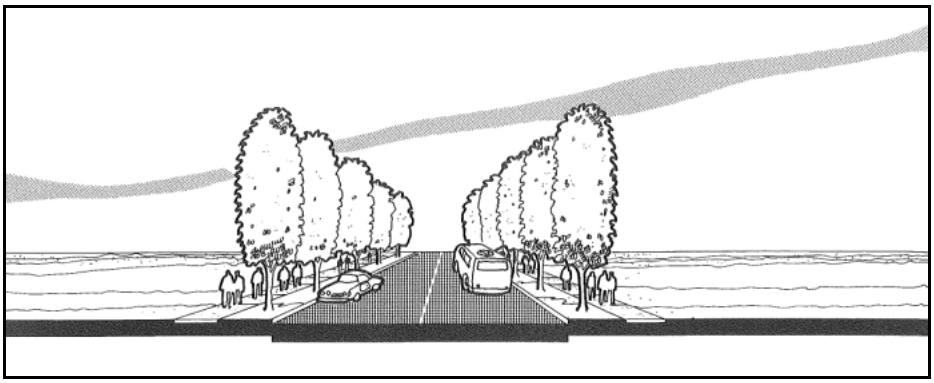

Figure 3.9: Heavy traffic with narrow boulevards

Street trees shall have a form and site tolerance compatible with the environmental conditions, pollution levels, and increased traffic loads associated with these roadways. Growth shall not block signals or street lights and shall not interfere with pedestrian and traffic movement. Planting street trees along these routes can calm traffic and form an important part of the city's green infrastructure.

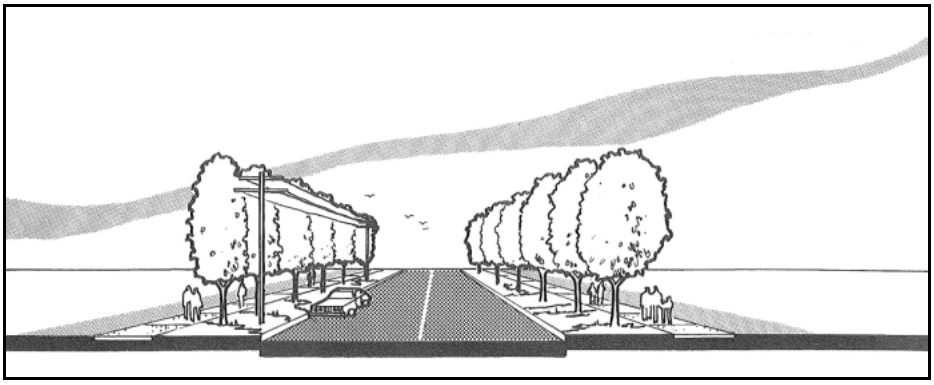

Figure 3.10: Utility lines in wide boulevards

Trees located near utility lines shall be selected to minimize potential conflicts by planting shorter species or offsetting the tree from the utility lines where boulevard widths allow. Columnar or upright trees provide an additional option in this situation and maximize the environmental benefits of street trees through increased canopy size.

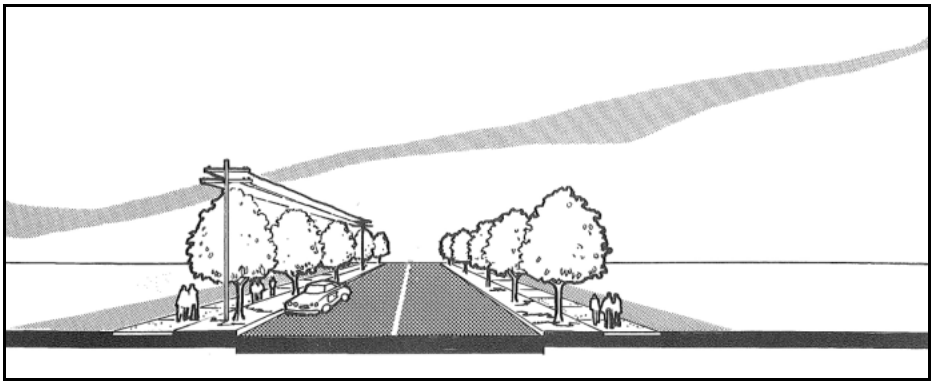

Figure 3.11: Utility lines in narrow boulevards

Trees located on narrow boulevards with utility lines shall be selected to minimize potential conflicts. Planting shorter species will reduce utility interference and maintenance requirements while increasing visual interest and city-wide species diversity. Boulevards opposite the utility lines can be planted with similar trees or larger species can be selected to provide increased environmental benefits.

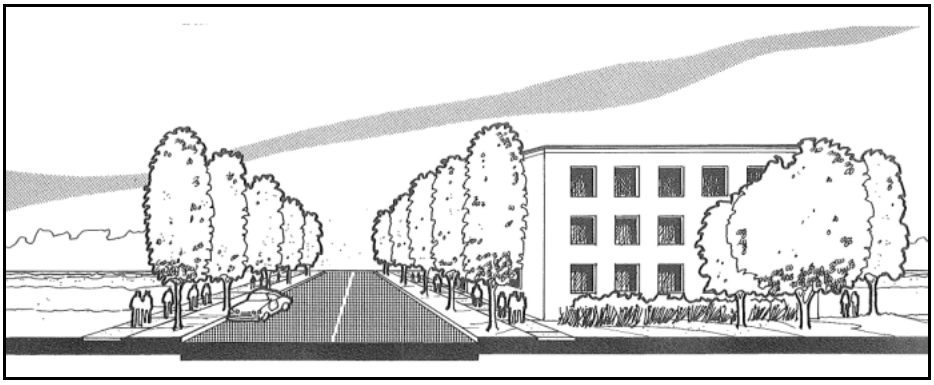

Figure 3.12: Restricted building setback

Boulevards with minimal building setbacks are typical of commercial and mixed use districts. Trees must be tolerant of restricted growing areas including reduced soil volumes, increased impervious surfaces, and urban environmental conditions. Species shall be selected to minimize potential conflicts between tree growth and built structures as well as pedestrian and traffic movement. Planting boulevards are often paved and the use of pervious pavers and structural soils, where appropriate, can increase the health and environmental benefits of these street trees.

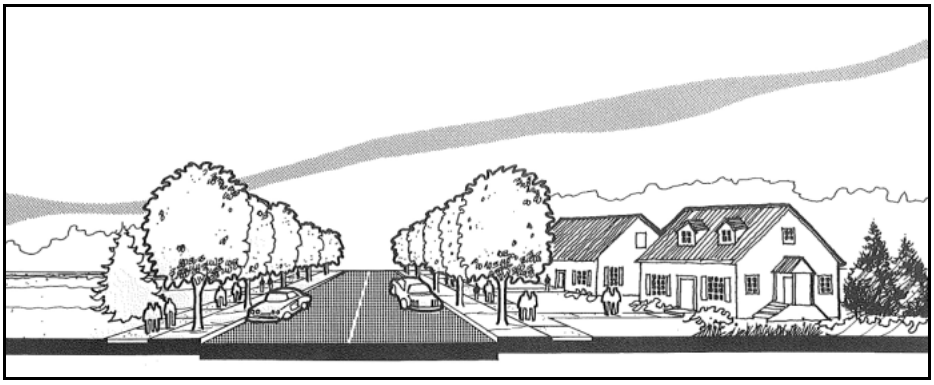

Figure 3.13: Low impact architectural element

Buildings are typically one to one and a half stories and consist of residential, commercial or industrial land uses and street trees shall be selected to match the surrounding architectural and land use context. Wide planting boulevards allow for the development of a large canopy to maximize the environmental benefits of street trees.

Figure 3.14: High impact architectural element

Buildings are typically two or more stories and consist of residential, commercial or industrial land uses and street trees shall be selected to match the surrounding architectural and land use context. Wide planting boulevards allow for the development of a large canopy to maximize the environmental benefits of street trees.

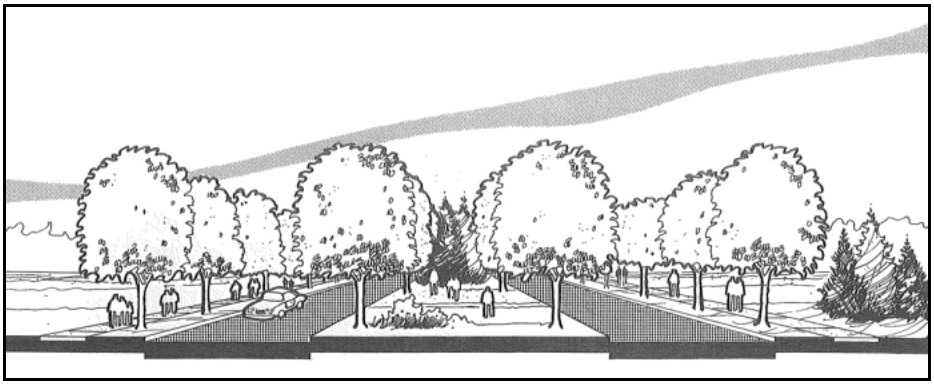

Figure 3.15: Parkway with center median

Street trees selected for planting along parkways shall promote visual and spatial interest while providing ecological benefits and serving as green corridors through Saint Paul. Planting boulevard trees in one to three block lengths and promoting the use of sequencing will increase canopy diversity while maintaining visual continuity. Median plantings reinforce the park like setting of parkways and shall include a diverse species pallet that includes native, conifer, flowering, nut, and fruit trees that add to the visual quality of the parkway system and compliment the architectural character of the surrounding neighborhoods.

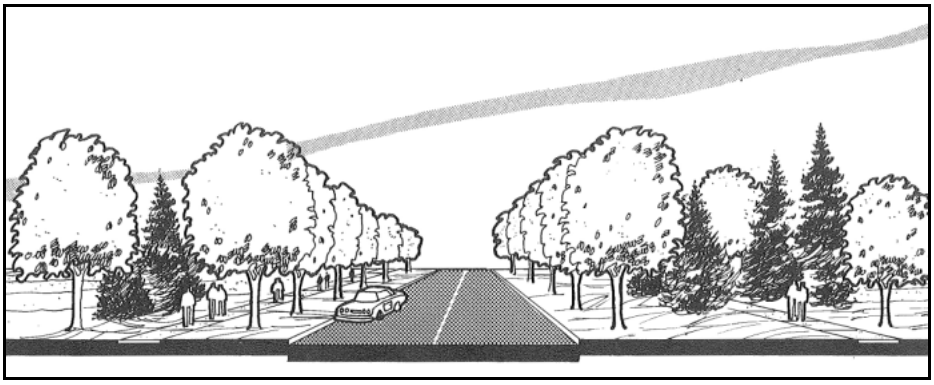

Figure 3.16: Parkway with wide public right of way

Street trees selected for planting along parkways shall promote visual and spatial interest while providing ecological benefits and serving as green corridors through Saint Paul. Planting boulevard trees in one to three block lengths and promoting the use of sequencing will increase canopy diversity while maintaining visual continuity. Trees planted within the right of way reinforce the park like setting of parkways and shall include a diverse species pallet that includes native, conifer, flowering, nut, and fruit trees that add to the visual quality of the parkway system and compliment the architectural character of the surrounding neighborhoods.

Use of New Planting Techniques

Growing trees in urban conditions is difficult and one of the most limiting factors is the soil conditions urban trees are planted in. Reduced volumes, compaction, poor infiltration rates, and low organic matter content all contribute to reduce the viability of street trees.

Innovative planting technologies including engineered soils and permeable paving are effective at increasing soil rooting volumes and reducing compaction while supporting pavements and active use of the streetscape in urban areas. These same technologies increase the infiltration of stormwater reducing the volume sent into traditional stormwater systems and improving water quality.

New planting technologies should be incorporated into projects when cost effective or where site conditions require additional infrastructure to support the growth of urban trees. Where cost prohibitive and soil conditions are suitable, planting success can be increased by selecting the right tree for the location. Additional soil preparation by amending or physically loosing compacted soils can improve soil strucuture and increase root growth and overall tree success.

Engineered soils reduce compaction and increase the available rooting volume of urban soils by using a porous base material composed of soil and coarse angular rock to support sidewalks, roads, or parking surfaces.

Greater soil volumes can be achieved using emerging modular technologies that create a structural armature to support walkways or parking surfaces over planting soils. These also increase on site stormwater infiltration volumes.