City of Wheat Ridge

Streetscape Design Manual

Adopted March 28, 2011

City of Wheat Ridge

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January 2014 revision: Due to the presence of the Emerald Ash Borer in Colorado, Appendix B is updated to remove all ash species from the list of Recommended Street Trees.

CHAPTER 1 - INTRODUCTION

The Wheat Ridge Streetscape Design Manual establishes design standards for important corridors throughout the City. This manual is intended to promote high-quality streets that encourage pedestrian use and enhance the public realm.

Figure 1.1 - The Wheat Ridge float in a 1914 parade along an early Denver streetscape

1.1 Historical Context

Wheat Ridge had its origins in the silver and gold rush days of Colorado in the late 1800's. Miners traveled back and forth between Golden, Blackhawk and Central City through what is now the City of Wheat Ridge to Denver. Eventually, farmers settled Wheat Ridge and the routes between Denver and points west became established as the main thoroughfares we know today. Wheat Ridge became an incorporated City in 1969.

Wheat Ridge, like many satellite suburban communities, does not have an historical main street or town center. Residential development radiated out from Denver and the commercial activity developed along the main thoroughfares. Today these thoroughfares remain as Wheat Ridge's main commercial corridors: W. 38th Avenue, W. 44th Avenue, Sheridan Boulevard, Wadsworth Boulevard, Kipling Street and Youngfield Street.

The City's suburban development pattern has created a diverse and eclectic character in the community. On the east side of Wheat Ridge development followed the traditional Denver urban grid pattern. The development pattern east of Wadsworth Boulevard is more dense and compact and the structures are older. As development moved west of Wadsworth, the pattern became more suburban with curved streets, cul-de-sacs and lower density development. Farther to the west, lower-density residential and agricultural uses remain.

Figure 1.2 - The first Wheat Ridge post office, now preserved in the Wheat Ridge Historical Park

Historically, many of the City's commercial corridors were pleasant, tree-lined country lanes with smaller scale neighborhood-oriented retail shops. The proliferation of automobile travel as the main mode of transportation was at odds with creating pedestrian-friendly and pedestrian-oriented developments. The suburban development pattern moved buildings from the street edge and placed large parking lots between the building and street. Streets once characterized by small-scale buildings with intimate settings became disorganized streetscapes dominated by parking lots, over-scaled signs and under-utilized or non-existent sidewalks.

Wheat Ridge's commercial corridors provide many benefits to the City and surrounding neighborhoods. These corridors serve as gateways into the City and establish the image of the City. They provide service, shopping, dining, cultural and entertainment opportunities for residents of the adjacent neighborhood, the city and the region. Business activity along these

Figure 1.3 - Existing commercial streetscape on Wheat Ridge's W. 38th Avenue

corridors provides a significant tax base for the City. Commercial corridors should help connect neighborhoods and add to a sense of community pride.

This manual is intended to improve the design and appearance of major corridors within the City. Quality streetscapes are a vital component to a thriving community. The standards in this manual support the City's goals for transforming its commercial corridors into more pedestrian-friendly, lively streets lined with mixed-use development.

1.2 Purpose

The purpose of the Wheat Ridge Streetscape Design Manual is to:

- Promote high-quality streetscapes that contribute to the overall character and identity of the City
- Promote multi-modal streets that encourage pedestrian use, enhance the public realm, and complement compact, mixed- use development patterns
- Encourage the use of draught-tolerant, low-water plants that promote water conservation
- Establish standards and guidelines for the streetscape design of all collector and arterial streets within the City of Wheat Ridge, with a particular focus on priority corridors identified in Chapter 2
- Create design standards and guidelines that are consistent with:
    1. The City of Wheat Ridge Bicycle and Pedestrian Master Plan
    2. The City of Wheat Ridge Comprehensive Plan, *Envision Wheat Ridge*
    3. The zoning rules and regulations of the City of Wheat Ridge
    4. The City of Wheat Ridge Parks and Recreation Master Plan

Many of the design guidelines within this manual are based on the City's former *Streetscape and Architectural Design Manual*, adopted in 2001. This updated Streetscape Design Manual was developed to provide consistency with the updated Comprehensive Plan, adopted in 2009, and the Bicycle and Pedestrian Master Plan, adopted in 2010.

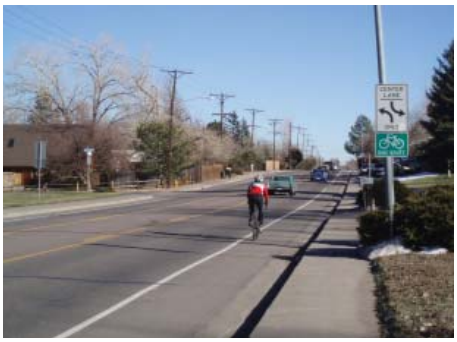


Figure 1.4 - The Streetscape Design Manual is intended to promote multi-modal streets that encourage use by pedestrians and bikers, as well as cars (W. 32nd Avenue in Wheat Ridge)

1.3 Applicability

The standards and guidelines in this manual apply to:

- Any new development along collector and arterial streets, identified in the Roadway Classification Map (Figure 1.14). This includes new development, redevelopment, and additions over 50 percent of the existing floor area.
- Improvements to existing collectors and arterials.
- The new construction of collectors, arterials, or any local street serving mixed use or commercial development.
- Any City-funded street improvement project.

This manual only applies to arterial and collector streets, as well as local streets serving mixed use or commercial development. It does not include any standards for semi-urban street typologies, which feature roadside

ditches and often lack sidewalks. There are few existing semi-urban arterial or collector streets in the city, and the City intends to transition existing semi-urban cross- sections into urban cross-sections, which include curb, gutter and sidewalk.

Where there is inadequate street right-of-way to construct the improvements required in this manual, the City shall have the right to obtain additional right-of-way or easements on private property to accommodate the improvements.

Figure 1.5 - Example of a hardscaped amenity zone, or the buffer between the sidewalk and roadway (Old South Gaylord Street in Denver)

1.4 Procedures

All new development or redevelopment meeting the criteria above in Section 1.3 Applicability shall submit a complete streetscape plan to the City for review. The streetscape plan shall be included with the application for either (1) Site Plan Review or (2) Building Permit Review, whichever occurs first. The streetscape plan shall include all necessary information to show compliance with the standards and guidelines within this document, including but not limited to:

- Landscape plan showing all plantings in the streetscape area, with dimensions and spacing labeled.
- Location plan showing all street furnishings, with dimensions and spacing labeled.
- Lighting plan showing all existing and proposed lights, with dimensions and spacing labeled.
- Utility plan, showing the location of all existing and proposed utilities in the streetscape.
- Details and section drawings for any proposed tree vaults.
- Cut sheets for all proposed lighting fixtures and street furnishings.

As part of the Site Plan or Building Permit review, City staff will review all streetscape drawings for compliance with this document. The drawings will also be referred to utility companies for review and approval.

Approval of the streetscape plan will be required prior to the final approval of the Site Plan or Building Permit application.

The following items will also be required for submittal to the Public Works Department prior to the construction of any streetscape improvements:

- For private improvements, a signed Development Covenant and maintenance agreement guaranteeing construction and perpetual maintenance, in a format approved by the Public Works Director.
- For public improvements, a signed public improvement agreement or subdivision improvement agreement including a cash bond or letter of credit, in an amount approved by the Public Works Director and deemed by him/her to be sufficient to guarantee such construction. The subdivision improvement agreement and letter of credit shall be administered in the same manner as provided by the Code of Laws Section 26-110 and cross references therein.

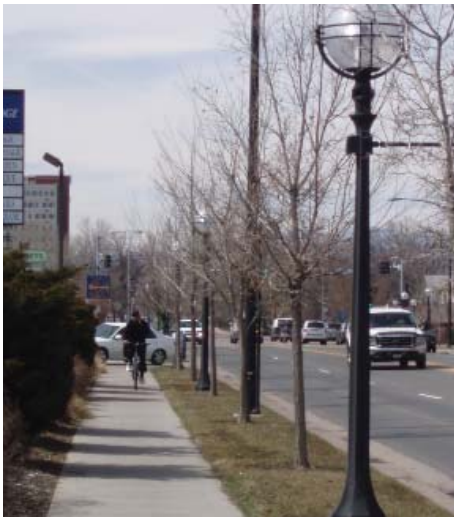


Figure 1.6 - Example of a landscaped amenity zone, or the buffer between the sidewalk and roadway, also called a tree lawn (W. 38th Ave in Wheat Ridge)

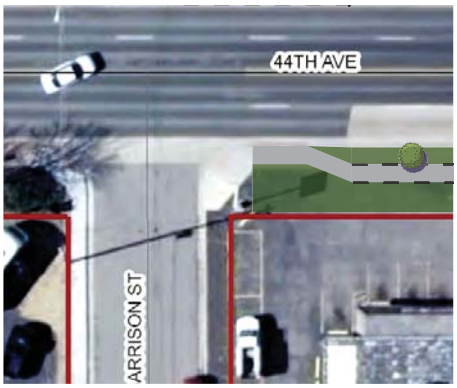


Figure 1.7 - In most cases, required streetscape improvements from this manual can be designed to align with abutting properties that do not have similar improvements, as shown in the image above.

Payment in Lieu of Construction of Improvements: in the event that the subject property is located such that the required streetscape improvements will not connect to a similar improvement on the same block, the applicant may request that the City accept payment of funds in lieu of constructions for all or portions of the streetscape improvements which would otherwise be required by this manual, which is authorized by Section 26-224 of the Code of Laws. Such request shall be submitted to the Public Works Director in writing. In the event that the Public Works Director approves such a request, in whole or part, the applicant shall deposit with the City certified funds in the amount agreed by the Public Works Director as sufficient to construct the improvement. Upon such deposit, the City shall assume responsibility for construction and maintenance of such improvements. The funds deposited in escrow shall be held by the City exclusively for construction and maintenance of the streetscape improvements, and shall be administered in the manner provided by Section 26-110 of the Code of Laws and the cross references contained therein.

The City may require right-of-way dedication and/or easements from within the development or re-development to accommodate future improvements.

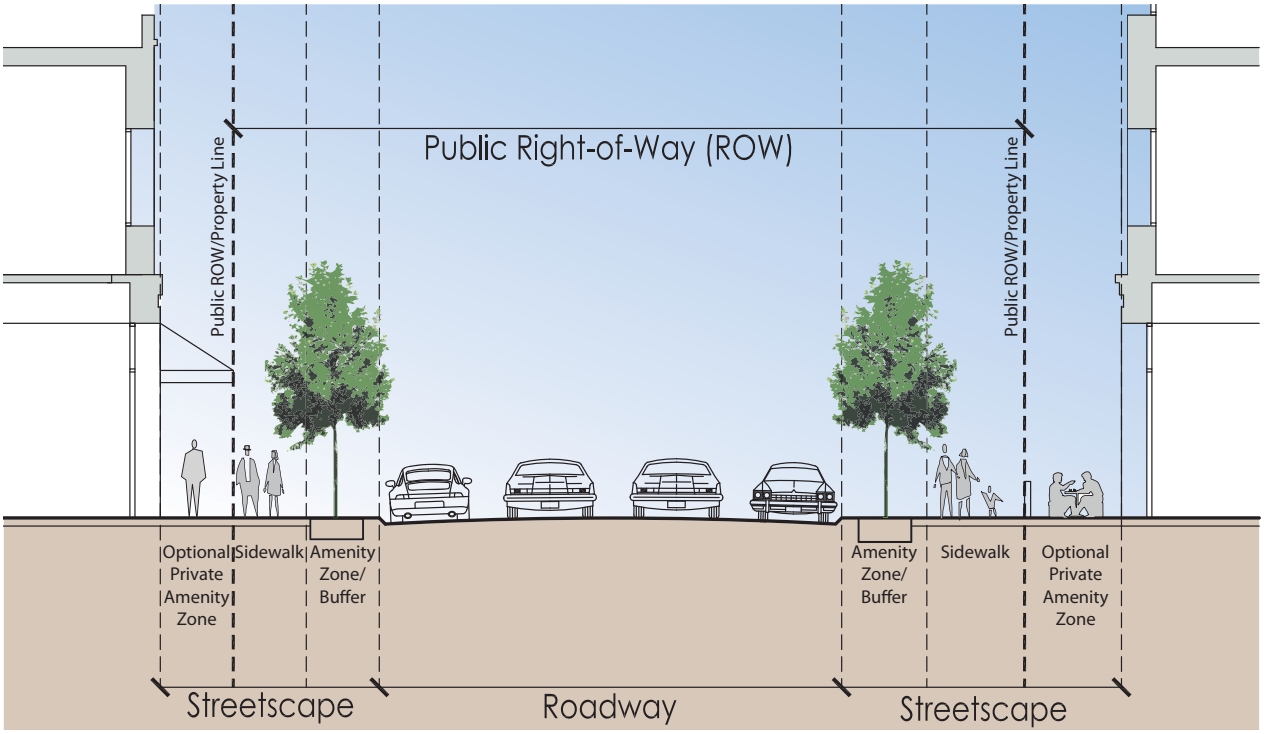


Figure 1.8 - Common components of the street.

1.5 Definitions

There are several terms used regularly in this document, which are defined below on the following pages.

Amenity Zone: the portion of the streetscape between the curb and the sidewalk, and also referred to as a "buffer." The amenity zone may be hardscaped or landscaped and provides a buffer between the sidewalk and parking or driving lanes on the street. Landscaped amenity zones may also be called "tree lawns." The amenity zone is the location for street lights, street trees, street amenities and furniture, bike racks, and utilities.

Figure 1.9 - West 44th Avenue in Wheat Ridge is an example of a minor arterial street with four lanes

Arterial Street: a roadway that serves high traffic volumes and provides access to regional destinations, economic centers, and freeway interchanges. Arterials typically have limited access points and are bordered by commercial land uses. Principal arterials serve high traffic volumes and provide access to regional destinations, economic centers, and highway interchanges. Examples of principal arterials in Wheat Ridge include Wadsworth Boulevard and Kipling Street. Minor arterials serve less traffic volume than principal arterials but still connect regional destinations. Examples of minor arterials in Wheat Ridge include Youngfield Street and W. 44th Avenue.

Building Facade: the face, or outside wall, of a building.

Collector Street: a roadway that serves moderate traffic volumes and primarily provides connections between neighborhoods and the arterial roadway system. Collectors may be bordered by commercial and/or residential land uses.

Figure 1.10 - Example of an entry walk

Entry Walk: a paved walkway which extends from the sidewalk or building face to the street, providing a pedestrian route to on-street parking areas through a landscaped amenity zone.

Hardscape: exterior surface areas covered with concrete, pavers, brick, stone, or a similar surface and not intended for vehicular use.

Local Street: a roadway that serves low traffic volumes and is primarily used to gain access to the property bordering it.

Figure 1.11 - Example of a "semi-urban" street, with no curb, gutter or sidewalk (W. 29th Ave in Wheat Ridge)

Private Amenity Zone: the portion of the streetscape between the sidewalk and the building face. This is an optional portion of the streetscape that is common in retail areas. The private amenity zone contains elements such as outdoor seating, planters, and cafe tables.

Right-of-Way: the land area owned by the City that forms the public street. The right-of-way typically contains road improvements, utilities, sidewalks, amenity zones, landscaping, lighting and street furniture.

Roadway: the portion of the street where vehicles, including cars and bicycles, travel.

Figure 1.12 - Example of an "urban" street, with curb, gutter, and sidewalk (Harlan Street in Wheat Ridge)

Semi-Urban Street: a street that does not have curb and gutter, but instead has a road-side ditch next to the roadway. This manual does not include standards or guidelines for semi-urban streets. For typical cross-sections of semi-urban street, see the Wheat Ridge Bicycle and Pedestrian Master Plan.

Sidewalk: a paved walkway between the amenity zone and the building face, or between the amenity zone and a private amenity zone.

Step-out Strips: also called landing walks, step-out strips are paved strips adjacent to the curb where landscaped amenity zones, or tree lawns, border on-street parallel parking. Step-out strips provide a way for people to enter and exit their car without damaging the landscaped area and are typically used in conjunction with entry walks.

Streetscape: the general area between the curb and building face where pedestrian activity is concentrated. The streetscape area includes the sidewalk, amenity zone (landscaped or hardscaped), and the optional private amenity zone.

Urban Street: a street that contains curb and gutter, rather than the semi-urban road-side ditch. All of the standards and guidelines in this manual apply to urban streets.

Xeriscape: landscaping that utilizes low-water plants to promote water conservation.

1.6 Street Types

Arterial Streets

Figure 1.13 - Example of a step-out strip

Arterial streets serve high traffic volumes, provide access to regional destinations, have limited access points, and are typically lined with commercial land uses. Principal arterials have the highest traffic volumes, while minor arterials serve lower volumes. The arterial streets in Wheat Ridge, as illustrated in the Roadway Classification Map (Figure 1.14), are:

- Wadsworth Boulevard
- Kipling Street
- Ward Road
- Sheridan Boulevard
- Youngfield Street (minor arterial)
- W. 38th Avenue (minor arterial west of Kipling Street)
- W. 44th Avenue (minor arterial)
- W. 32nd Avenue (minor arterial)
- W. 26th Avenue (minor arterial)

Arterial streets may have as many as five to six traffic lanes, including a center turn lane and/or center median.

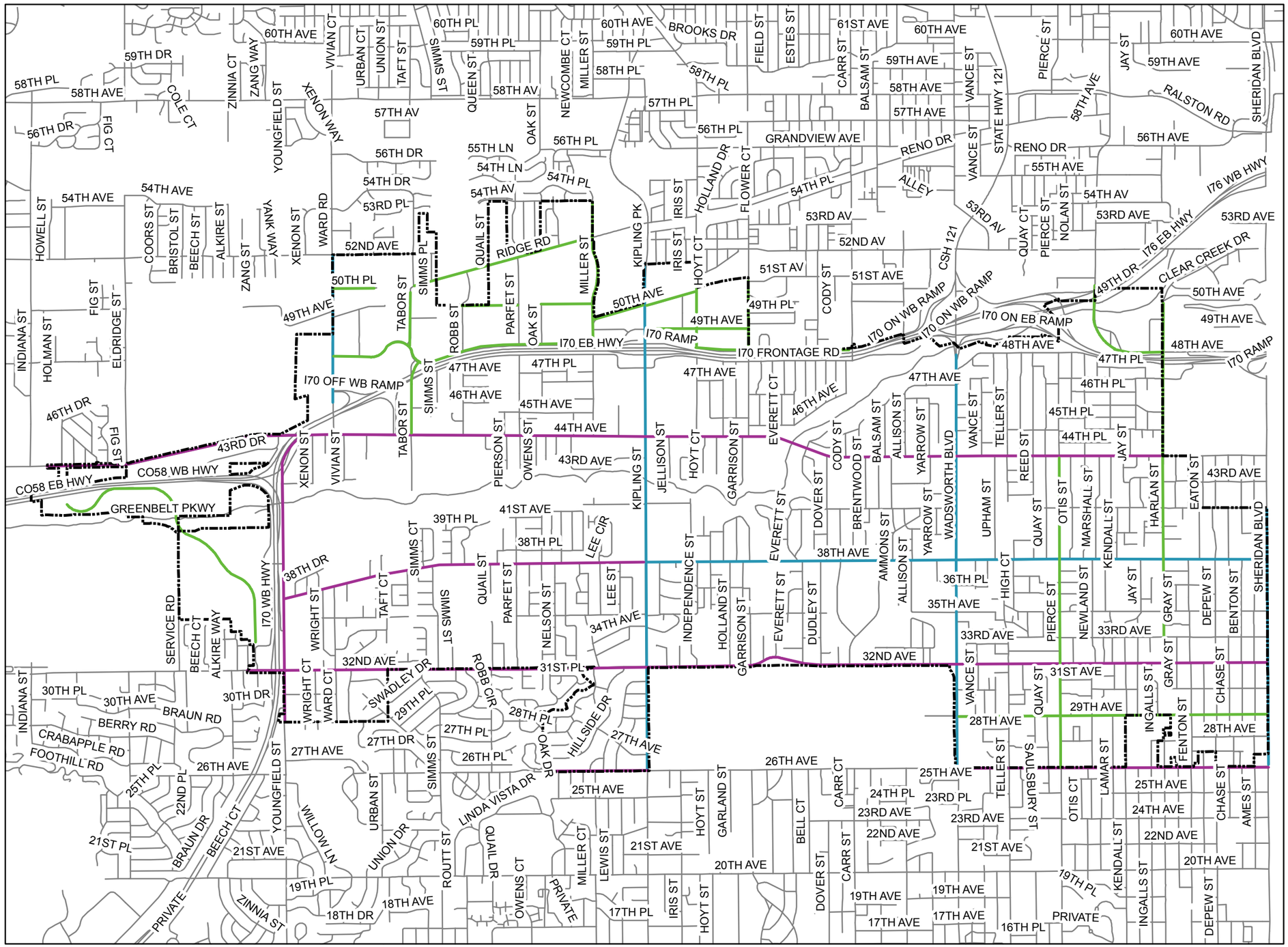


Figure 1.14
City of Wheat Ridge Roadway Classifications

LEGEND

- Collector
- Minor Arterial
- Principal Arterial
- City of Wheat Ridge Boundary

N

2,000 0 2,000 4,000 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD83

DISCLAIMER NOTICE:

This is a pictorial representation of geographic and demographic information. Reliance upon the accuracy, reliability and authority of this information is solely requestor's responsibility. The City of Wheat Ridge, in Jefferson County, Colorado - a political subdivision of the State of Colorado, has compiled for its use certain computerized information. This information is available to assist in identifying general areas of concern only. The computerized information provided should only be relied upon with corroboration of the methods, assumptions, and results by a qualified independent source. The user of this information shall indemnify and hold free the City of Wheat Ridge from any and all liabilities, damages, lawsuits, and causes of action that result as a consequence of his reliance on information provided herein.

City of Wheat Ridge

DATE: 09/09/2010

Collector Streets

Collector streets serve moderate traffic volumes and primarily provide connections between neighborhoods and the arterial roadway system. The collector streets in Wheat Ridge, as illustrated in the Roadway Classification Map (Figure 1.14), are:

- Tabor Street (north of W. 44th Ave)
- Ridge Road
- Miller Street (north of W. 48th Ave)
- Independence Street (north of W. 48th Ave)
- Garrison Street (north of W. 48th Ave)
- Pierce Street (south of W. 44th Ave)
- Harlan Street (north of W. 32nd Ave)
- Marshall Street (between I-76 and Lamar Street)
- Cabela Drive
- W. 50th Avenue (between Ward Road and Independence)
- W. 49th Avenue (between Kipling and Garrison)
- W. 48th Avenue (between Lamar and Harlan)
- W. 29th Avenue (between Wadsworth and Sheridan)

Collector streets typically have two to three traffic lanes, including a center turn lane and/or center median.

Figure 1.15 - Wadsworth Boulevard is an example of a five-lane principal arterial street in Wheat Ridge

Local Streets

Local streets serve low traffic volumes and typically have two lanes. Existing local streets in the City provide access to residential land uses and are not subject to the standards or guidelines in this manual. However, where new local streets are constructed to serve mixed use or commercial development, the requirements in this manual shall apply.

Figure 1.16 - Harlan Street is an example of a three-lane collector street in Wheat Ridge

CHAPTER 2 - PRIORITY CORRIDORS

The purpose of this chapter is to establish design goals, standards, and guidelines for key corridors in Wheat Ridge. Chapter 3 outlines design standards and guidelines that apply generally to all streets. This chapter supplements Chapter 3 by creating additional goals for the most important streets in the City. These streets, identified in the Priority Corridor Map (Figure 2.1), represent those corridors where mixed use and commercial development is most likely to occur based on the City's adopted plans.

Priority corridors deserve well-designed streetscape improvements that exceed the minimum standards established in Chapter 3. Applicants should first refer to this chapter in order to understand the vision and requirements for specific corridors, and then to the general standards and guidelines in Chapter 3. The priority corridors are consistent with the corridors identified in the Comprehensive Plan, *Envision Wheat Ridge*, and include the following streets:

- W. 38th Avenue between Sheridan and Wadsworth
- Wadsworth Boulevard between W. 32nd Ave and I-70, with a mixed use town center between W. 38th Ave and W. 44th Ave
- Kipling Street between W. 35th Ave and W. 51st Place
- W. 44th Avenue between Harlan and Wadsworth and between Everett and I-70
- Youngfield Street between W. 32nd Ave and Highway 58
- Streets with the future Transit-Oriented Development (TOD) at Ward Road Station

Please note that Harlan Street, north of 38th Avenue, is also a priority commercial corridor for Wheat Ridge. However, this street already contains cohesive streetscape improvements, installed by the City in 2001, and thus it is not included in this chapter.

For each priority corridor, design goals outline the vision for the character and quality of the streetscape design. The goals are followed by design standards and guidelines that help to ensure the vision is met. ***Design Standards*** are objective criteria that require compliance. Standards often utilize the term "shall" and must be followed unless there is a unique condition or hardship that prevents their application. Design standards are <u>underlined</u>. ***Design Guidelines*** are criteria that are strongly recommended, and should be followed wherever feasible. Guidelines often use the terms "should" or "encouraged."

For any priority corridor, where bus stop benches are required, bus shelters may be permitted as an alternative, given appropriate ridership levels and approval by the Department of Public Works.

Priority Corridors:

- West 38th Avenue between Sheridan and Wadsworth
- Wadsworth Boulevard between W. 32nd Ave and I-70
- Kipling Street between W. 35th Ave and W. 51st Place
- West 44th Avenue between Harlan and Wadsworth
- Youngfield Street between W. 32nd Ave and Highway 58
- Streets within the future TOD area

Figure 2.2 - Existing streetscape improvements on W. 38th Ave between Sheridan and Harlan

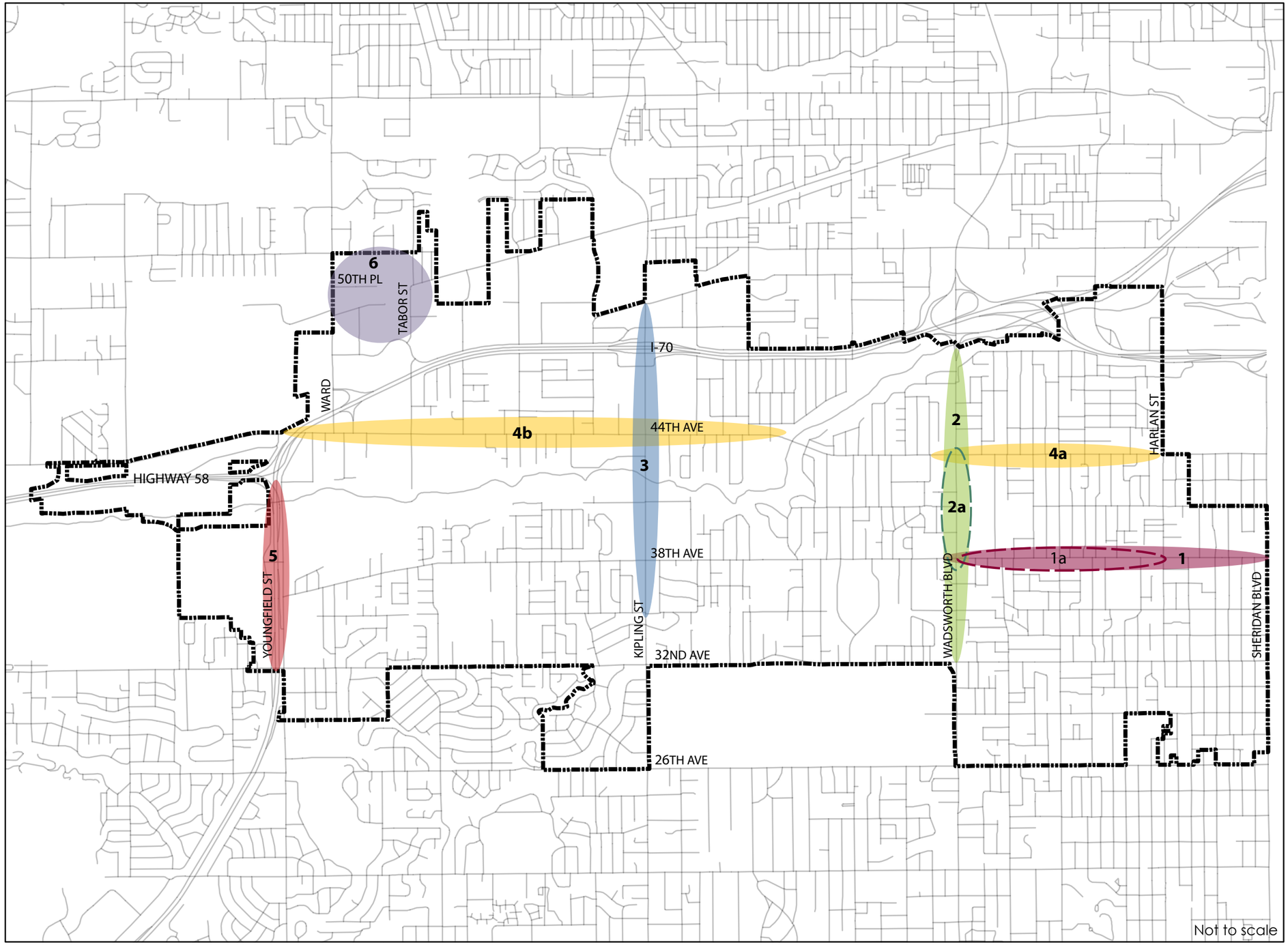


Figure 2.1
Streetscape Design Manual
Priority Corridors

1 W. 38th Ave between Sheridan and Wadsworth

1a W. 38th Ave: future streetscape improvement area (west of Harlan)

2 Wadsworth between W. 32nd Ave and I-70

2a Wadsworth between W. 38th Ave and W. 44th Ave (mixed use town center)

3 Kipling between W. 35th Ave and W. 51st Place

4a W. 44th Ave between Harlan and Ammons

4b W. 44th Ave between Everett and I-70

5 Youngfield between W. 32nd Ave and Highway 58

6 Future Transit-Oriented Development (TOD)

Note: numbers are for labelinig purposes only and do not indicate rankings or priority levels

City of Wheat Ridge

Figure 2.3 - Example of the sidewalk on W. 38th Ave west of Harlan, where there are no streetscape enhancements

Figure 2.4 - This streetscape in Old Town Arvada represents the type of high-quality, pedestrian-friendly atmosphere that is envisioned for W. 38th Ave

Figure 2.5 - The standard metal bench and trash can to be utilized on W. 38th Avenue, including at bus stops

2.1 West 38th Avenue

W. 38th Avenue between Sheridan and Wadsworth is envisioned as a vibrant, pedestrian-friendly street lined with a mix of uses. Its history, central location, and unique mix of businesses make it a special destination. *Envision Wheat Ridge* designates the street as a main street corridor, calling for neighborhood-oriented retail and mixed-use development along the street. The Bicycle-Pedestrian Master Plan recommends a full sidewalk and amenity zone for the corridor as well as a shared on-street bicycle facility. The City will begin a Corridor Plan for W. 38th Avenue in 2011. Recommendations within the completed plan for roadway and streetscape improvements will guide future amendments to the requirements for W. 38th Avenue in this manual.

The City completed significant streetscape improvements to W. 38th Avenue, between Sheridan and Harlan, in 2002. However, there are large portions of the street west of Harlan that lack adequate sidewalks or amenity zones. The following goals, standards, and guidelines shall apply to any new streetscape improvements on W. 38th Avenue between Wadsworth and Harlan (the area labeled 1.a on Figure 2.1).

Design Goals

- Establish a high-quality streetscape that complements the vision for W. 38th Avenue to become a primary destination within the City.
- Create a vibrant streetscape environment that prioritizes the pedestrian and forms a cohesive image for the corridor.
- Establish high-quality sidewalks with enhanced paving patterns and materials.
- Provide a public amenity zone with enhanced streetscape amenities including street trees, plantings, and benches that are compatible with the character of the existing streetscape amenities on W. 38th Avenue between Harlan and Sheridan.

Design Standards and Guidelines

A. **Sidewalk width**: the streetscape on W. 38th Avenue shall include a sidewalk at least 8 feet wide.

B. **Public amenity zone width**: the streetscape on W. 38th Avenue shall include a public amenity zone at least 6 feet wide between the sidewalk and roadway.

C. **Public amenity zone design**: the public amenity zone shall be landscaped, except where adjacent to on-street parking, where hardscape amenity zones are encouraged. Landscaping may include ornamental grasses and/or groundcover and should incorporate low-water use plants. Any hardscaped amenity zone shall be distinguished from the sidewalk through the use of textures, integral color, or scoring patterns. Pavers or flagstone should be used in combination with the concrete to provide interesting patterns and to enhance the amenity zone's design.

D. **Private amenity zones**: where sidewalks are adjacent to

buildings with restaurant or retail uses, private amenity zones with additional pedestrian amenities and outdoor seating areas are encouraged. Where sidewalks abut parking lots, landscaped private amenity zones are encouraged to help buffer the pedestrian realm from the parking area.

E. **Street trees:** street trees shall be planted in the public amenity zone at a minimum spacing of 35 feet on center. Variations in spacing may be allowed due to existing obstructions, special conditions, and the expected mature size of the tree.

F. **Benches**: metal benches, consistent with the design of the existing metal benches within the W. 38th Avenue streetscape (Figure 2.5), shall be provided at a minimum spacing of one bench per every 150 feet, per each side of the street. Where bus stops contain an existing vendor/ advertising bench, that bench shall be replaced with the standard metal bench (Figure 2.5). Except at bus stops, benches may be placed in the private amenity zone, subject to approval by the Community Development and Public Works Departments. Additional seating areas within the streetscape, especially near corners and areas with high pedestrian traffic, are encouraged.

G. **Trash receptacles**: next to each bench, including those at bus stops, a metal trash receptacle that is consistent with the design of the existing trash containers on W. 38th Avenue (Figure 2.5) shall be provided.

H. **Planters and pots**: planters and pots with flowers should be incorporated into the private or public amenity zone, especially near benches and within hardscaped public amenity zones.

I. **Gateway markers and banners**: banners and gateway markers that identify and brand the W. 38th Avenue corridor are encouraged. Pedestrian lights should include brackets that may be used to hang banners.

J. **Pedestrian lighting**: the existing acorn-style pedestrian lights on W. 38th Ave west of Harlan Street (Figure 2.7) shall be relocated or replaced so that they are regularly spaced at 65 feet on center within the public amenity zone. Variations in spacing may be allowed due to existing obstructions, utility boxes, or other constraints. Existing light fixtures should be replaced with an acorn fixture with shielding to prevent light pollution, subject to approval by Xcel and the Department of Public Works.

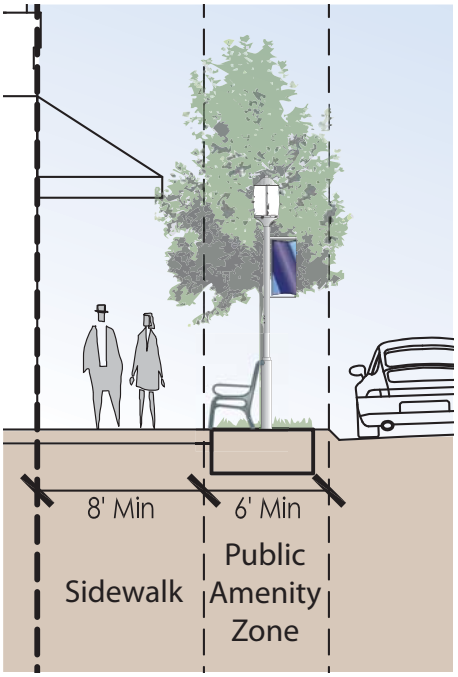


Figure 2.6 - Typical section for streetscape improvements on W. 38th Avenue between Harlan and Wadsworth

Figure 2.7 - Example of existing acorn pedestrian lights on W. 38th Avenue, between Harlan and Wadsworth

2.2 Wadsworth Boulevard

Wadsworth Boulevard is a primary commercial arterial that forms an important north-south connection within the City. The street carries high traffic volumes and is a state highway controlled by the Colorado

Figure 2.7 - Example of the existing streetscape environment on Wadsworth

Department of Transportation (CDOT). Today, the street lacks sidewalks in many locations and nearly the entire corridor lacks an amenity zone. *Envision Wheat Ridge* and the Wadsworth Corridor Subarea Plan (2007) create a vision for Wadsworth to be redeveloped into a mixed-use, multi-modal corridor with pedestrian and streetscape improvements. The portion of the corridor between W. 38th Ave and W. 44th Ave is intended to become a mixed use town center for Wheat Ridge.

The Wadsworth Corridor Subarea Plan proposes three alternate cross sections for Wadsworth between W. 26th Avenue and W. 48th Avenue that recognize CDOT's long-term plans to widen the street, potentially up to a total right-of-way width of 150 feet. The Bicycle and Pedestrian Master Plan identifies Wadsworth for pedestrian and bicycle improvements, off- and on-street bike facilities. The future design of Wadsworth has not been finalized. However, future streetscape improvements between on Wadsworth between W. 32nd Avenue and shall meet the following goals, standards, and guidelines.

Design Goals

- Create a streetscape with an attractive sidewalk and high-quality public amenity zone to buffer pedestrians from vehicular traffic.
- Incorporate street trees, plantings, pedestrian lights, seating, gateway markers, and other amenities into the public amenity zone that can help identify the corridor as well as distinguish the pedestrian environment from the roadway.
- Provide pedestrian connections to adjacent and intersecting local streets that serve the future mixed use town center.

Design Standards and Guidelines

A. **Sidewalk width**: the streetscape on Wadsworth shall include a sidewalk at least 10 feet wide.

B. **Public amenity zone width**: the streetscape on Wadsworth shall include a public amenity zone at least 6 feet wide between the sidewalk and roadway.

C. **Public amenity zone design**: the public amenity zone shall be landscaped. Landscaping may include ornamental grasses and/or groundcover and should incorporate low-water use plants.

D. **Private amenity zones**: where sidewalks are adjacent to buildings with restaurant or retail uses, private amenity zones with additional pedestrian amenities and outdoor seating areas are encouraged. Where sidewalks abut parking lots, landscaped private amenity zones are encouraged to help buffer the pedestrian realm from the parking area.

E. **Street trees:** street trees shall be planted at a minimum of 35 feet on center. Due to the planned widening of the Wadsworth right-of-way, street trees should be planted in the expected location of the future public amenity zone, based on a future right-of-way width of 150 feet.

Figure 2.8 - This street in Toronto demonstrates the wide sidewalk and quality public amenity zone that is envisioned for Wadsworth, especially in the Town Center Area

This location shall be approved by Department of Public Works. Variations in spacing may be allowed due to existing obstructions, special conditions, and the expected mature size of the tree.

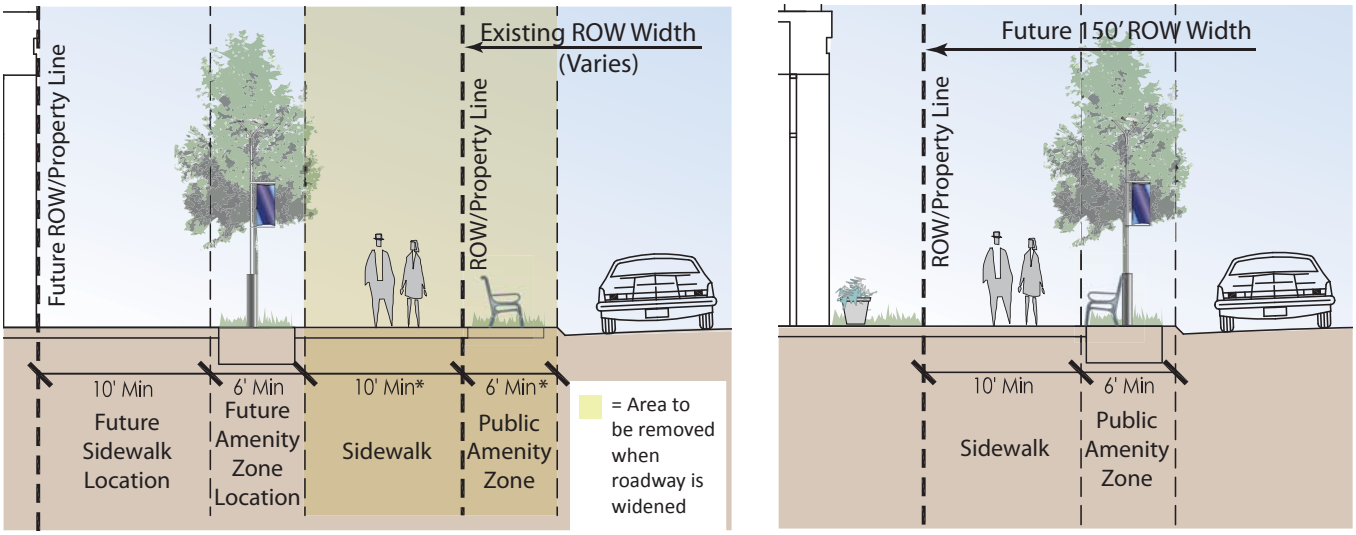
F. **Benches**: At least one bench shall be provided at each bus stop on Wadsworth. Where bus stops contain an existing vendor/advertising bench, that bench shall be replaced with the standard metal bench (Figure 2.5). Within the mixed use town center area, between W. 38th Ave and W. 44th Ave, additional benches shall be provided at a minimum spacing of one bench per every 300 feet, per each side of the street. Except at bus stops, benches may be located in the private amenity zone, subject to the approval of the Community Development and Public Works Departments.

G. **Trash receptacles**: next to each bench, including those at bus stops, a metal trash receptacle shall be provided.

H. **Gateway markers and banners**: banners and gateway markers that identify and brand the mixed use town center area between W. 38th Ave and W. 44th Ave are encouraged. New pedestrian lights should include brackets that may be used to hang banners.

I. **Pedestrian lighting**: pedestrian lights shall be provided at a spacing of 80 feet on center. Due to the planned widening of the Wadsworth right-of-way, pedestrian lights should be placed in the expected location of the future public amenity zone, based on a future right-of-way width of 150 feet. This location shall be approved by Department of Public Works. Variations in spacing may be allowed due to existing obstructions, utility boxes, or other constraints

Figure 2.9 (below) - The image on the left shows a typical cross section for how streetscape improvements may be made to the existing ROW width on Wadsworth so that the street trees and pedestrian lights are in the location of the future amenity zone. The image on the right depicts the desired streetscape section after the planned widening of the corridor.



* The sidewalk and public amenity zone should be a minimum of 10 feet and 6 feet respectively where possible. However, anticipating the future widening of Wadsworth, Public Works and Community Development may approve narrower widths so that the street trees and future amenity zone are located in the correct location based on the planned future width of the street.

Figure 2.10 - Existing bench and trash receptacle at a bus stop on Kipling. This is the standard metal bench and trash can that should be used at all bus stops

2.3 Kipling Street

Kipling is a primary commercial arterial located in the center of Wheat Ridge. It carries high traffic volumes and is a state highway controlled by the Colorado Department of Transportation (CDOT). Today, significant portions of the corridor do not have a sidewalk and there is no amenity zone along the street. *Envision Wheat Ridge* identifies this corridor as a priority area for commercial and mixed-use redevelopment. Recommendations include adding pedestrian improvements and a multi-use trail along the east side of the street. The Bicycle-Pedestrian Master Plan also recommends potential on-street bike facilities as part of future improvements to the corridor. Future streetscape improvements along Kipling between W. 35th Ave and W. 51st Place must comply with the below goals, standards, and guidelines.

Design Goals

- Create a streetscape with an attractive sidewalk and high-quality public amenity zone to buffer pedestrians from vehicular traffic.
- Incorporate street trees a pedestrian lighting within the public amenity zone to enhance the image of the street and to help separate the sidewalk from the roadway.
- Provide pedestrian connections to adjacent and intersecting local streets that serve future development.

Design Standards and Guidelines

A. **Sidewalk width**: the sidewalk on the west side of Kipling shall be at least 6 feet in width. The sidewalk on the east side of Kipling shall be at least 10 feet in width.

B. **Public amenity zone width**: the streetscape on Kipling shall include a public amenity zone at least 6 feet wide between the sidewalk and roadway.

C. **Public amenity zone design**: the public amenity zone shall be landscaped. Landscaping may include ornamental grasses and/or groundcover and should incorporate low-water use plants.

D. **Private amenity zones**: where sidewalks are adjacent to buildings with restaurant or retail uses, private amenity zones with additional pedestrian amenities and outdoor seating areas are encouraged. Where sidewalks abut parking lots, landscaped private amenity zones are encouraged to help buffer the pedestrian realm from the parking area.

E. **Street trees:** street trees shall be planted in the public amenity zone at a minimum spacing of 35 feet on center. Variations in spacing may be allowed due to existing obstructions, special conditions, and the expected mature size of the tree.

F. **Benches**: At least one bench shall be provided at each bus stop on Kipling. Where bus stops contain an existing vendor/ advertising bench, that bench shall be replaced with the standard metal bench (Figure 2.10).

Figure 2.11 - Existing acorn-style pedestrian lights on Kipling

G. **Trash receptacles**: next to each bench, a metal trash receptacle shall be provided.

H. **Pedestrian lighting**: pedestrian lights shall be provided at a spacing of 80 feet on center within the public amenity zone. Variations in spacing may be allowed due to existing obstructions, utility boxes, or other constraints. The existing acorn-style pedestrian lights on Kipling north of W. 44th Ave should be relocated or replaced within the landscaped public amenity zone. Existing light fixtures should be replaced with an acorn fixture with shielding to prevent light pollution, subject to approval by Xcel and the Department of Public Works.

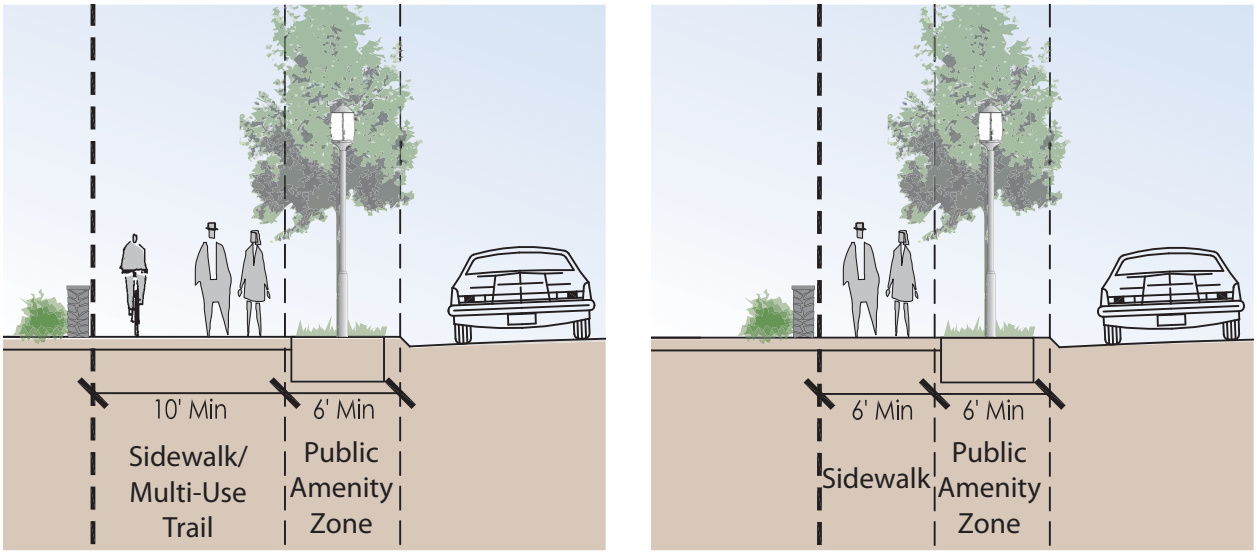


Figure 2.12 - The image on the left shows the typical streetscape section for Kipling on the east side of the street. The image on the right shows the typical section on the west side of the street.

2.4 West 44th Avenue

W. 44th Avenue is an important east-west route through Wheat Ridge. It is a minor arterial lined with commercial and residential uses. *Envision Wheat Ridge* identifies most of this corridor (between Harlan Street and Ammons Street and between Everett Street and I-70 on the west end of town) as a neighborhood commercial corridor that is appropriate for commercial and mixed-use redevelopment. The Bicycle-Pedestrian Master Plan calls for a bike lane along the street between Harlan and Kipling.

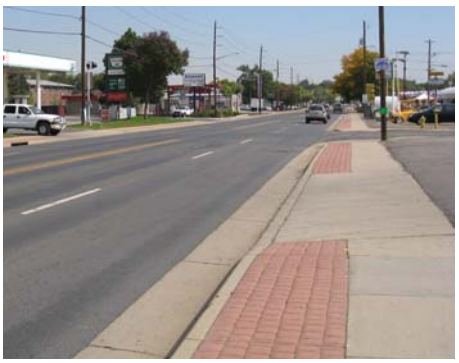


Figure 2.13 - Example of existing streetscape environment on W. 44th Avenue

The existing streetscape on W. 44th Avenue varies. In many locations the street has a 4 foot wide sidewalk with a narrow hardscape amenity zone (typically 3 to 4 feet wide) with no street trees or street furniture. Future improvements to the corridor between Harlan Street and Ammons Street and between Everett Street and I-70 must comply with the following goals, standards, and guidelines.

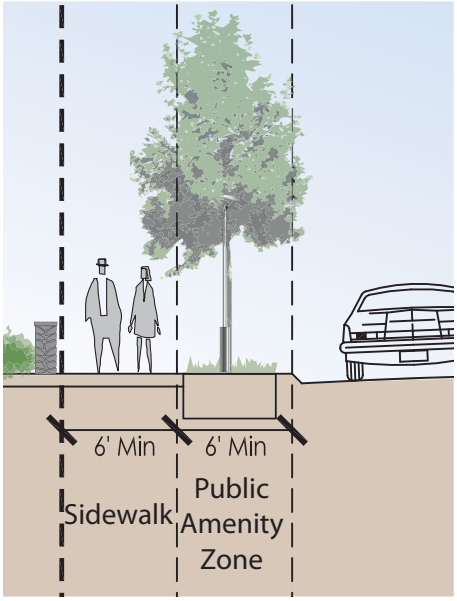


Figure 2.14 - Typical streetscape section for W. 44th Avenue

Design Goals

- Create a streetscape with an attractive sidewalk and high-quality public amenity zone to buffer pedestrians from vehicular traffic.
- Incorporate street trees and pedestrian lighting within the public amenity zone to enhance the image of the street and to help separate the sidewalk from the roadway.

Design Standards and Guidelines

A. **Sidewalk width**: the streetscape on W. 44th Avenue shall include a sidewalk at least 6 feet in width.

B. **Public amenity zone width**: the streetscape on W. 44th Avenue shall include a public amenity zone at least 6 feet wide.

C. **Public amenity zone design**: the public amenity zone shall be landscaped. Landscaping may include ornamental grasses and/or groundcover and should incorporate low-water use plants.

D. **Private amenity zones**: where sidewalks are adjacent to buildings with restaurant or retail uses, private amenity zones with additional pedestrian amenities and outdoor seating areas are encouraged. Where sidewalks abut parking lots, landscaped private amenity zones are encouraged to help buffer the pedestrian realm from the parking area.

E. **Street trees:** street trees shall be planted in the public amenity zone at a minimum spacing of 35 feet on center. Variations in spacing may be allowed due to existing obstructions, special conditions, and the expected mature size of the tree.

F. **Benches**: At least one bench shall be provided at each bus stop on W. 44th Ave. Where bus stops contain an existing vendor/advertising bench, that bench shall be replaced with the standard metal bench (Figure 2.10).

G. **Trash receptacles**: next to each bench, a metal trash receptacle shall be provided.

H. **Pedestrian lighting**: pedestrian lights shall be provided at a spacing of 80 feet on center within the public amenity zone. Variations in spacing may be allowed due to existing obstructions, utility boxes, or other constraints.

Figure 2.15 - Example of existing sidewalk with no amenity zone on the east side of Youngfield

2.5 Youngfield Street

Youngfield is a primary commercial arterial that runs along the western edge of Wheat Ridge. The street is bordered by an I-70 immediately to the west and provides access to a large commercial development on the east. Today, most of the street has a 4 foot wide sidewalk along the east side only with no amenity zone, street trees, or street furniture. *Envision Wheat Ridge* highlights Youngfield as a primary commercial corridor and recommends adding on-street bicycle facilities. The Bicycle-Pedestrian Master Plan also recommends an on-street bike facility and multi-use trail along the east side

of the street to connect with the Clear Creek Trail. Future improvements to the Youngfield streetscape, on the east side of the street only, must match the goals, standards, and guidelines outlined below. For the portion of Youngfield north of W. 42nd Ave, which will be realigned under CDOT's I-70 State Highway 58 Interchange project, the following requirements shall not apply until the realignment is complete.

Design Goals

- Create a streetscape with an attractive sidewalk and high-quality public amenity zone to buffer pedestrians from vehicular traffic.
- Incorporate street trees and pedestrian lighting within the public amenity zone to enhance the image of the street and to help separate the sidewalk from the roadway.

Design Standards and Guidelines

A. **Sidewalk width**: the streetscape on Youngfield shall include a sidewalk at least 10 feet in width.

B. **Public amenity zone width**: the streetscape on Youngfield shall include a public amenity zone at least 6 feet wide.

C. **Public amenity zone design**: the public amenity zone shall be landscaped. Landscaping may include ornamental grasses and/or groundcover and should incorporate low-water use plants.

D. **Private amenity zones**: where sidewalks are adjacent to buildings with restaurant or retail uses, private amenity zones with additional pedestrian amenities and outdoor seating areas are encouraged. Where sidewalks abut parking lots, landscaped private amenity zones are encouraged to help buffer the pedestrian realm from the parking area.

E. **Street trees:** street trees shall be planted in the public amenity zone at a minimum spacing of 35 feet on center. Variations in spacing may be allowed due to existing obstructions, special conditions, and the expected mature size of the tree.

F. **Benches**: At least one bench shall be provided at each bus stop on Youngfield Street. Where bus stops contain an existing vendor/advertising bench, that bench shall be replaced with the standard metal bench (Figure 2.11).

G. **Trash receptacles**: next to each bench, a metal trash receptacle shall be provided.

H. **Pedestrian lighting**: pedestrian lights shall be provided at a spacing of 80 feet on center within the public amenity zone. Variations in spacing may be allowed due to existing obstructions, utility boxes, or other constraints.

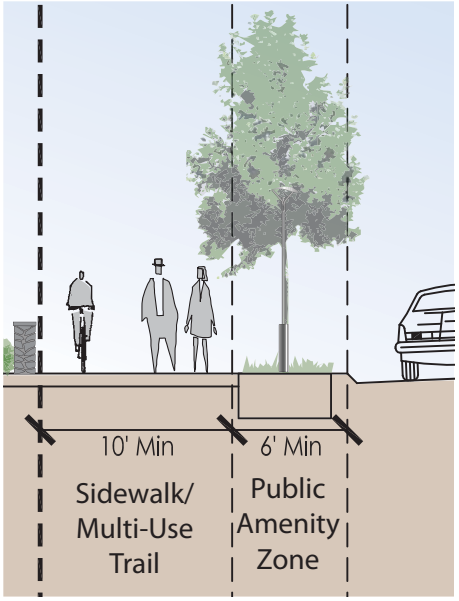


Figure 2.16 - Typical streetscape section for Youngfield Street

2.6 Transit-Oriented Development Area

This priority area encompasses a 1/4 mile radius around the future Ward Road commuter rail station at the end of the Regional Transportation

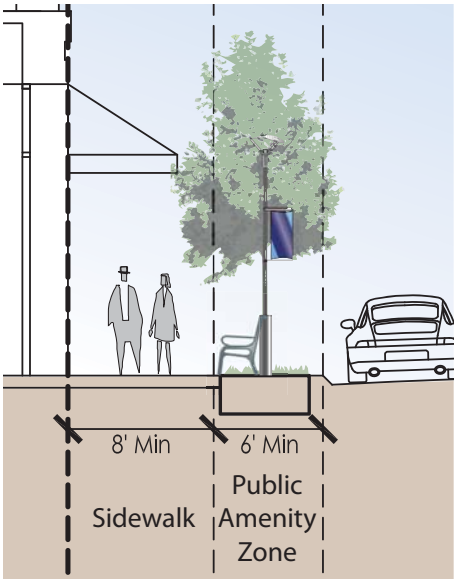


Figure 2.17 - A typical street section for commercial and mixed use streets in the planned TOD area

Districts (RTD's) Gold Line rail corridor. The station's proposed location near Ward Road and W. 50th Place is a largely industrial area where there are few improved streets. The City's plans for the area, including the Northwest Subarea Plan (2006) and *Envision Wheat Ridge*, call for transit-oriented development (TOD) that will support transit ridership, incorporate compact development with a mix of uses, and promote pedestrian and bicycle connectivity. Recommendations for future TOD include the construction of a new complete streets, as well as upgrades to existing streets such as W. 50th Place, so that the entire street network promotes a quality pedestrian environment.

In accordance with the Northwest Subarea Plan, the majority of the streets in the TOD area will include on-street parking, especially where adjacent to retail, commercial, and mixed-use development. In order to promote connections to the commuter rail station, the Bicycle-Pedestrian Master Plan calls for the addition of bicycle lanes on Tabor Street and Ridge Road, as well as an improved sidewalk and amenity zone on Ward Road.

The streets that are part of the TOD area (anywhere within 1/4 mile of the station) are divided into two types:

(1) **Commercial/mixed-use streets**: this category includes any street within the TOD area that serves commercial or mixed-use development

(2) **Residential streets**: this category includes any street within the TOD area that serves primarily residential development

Any new street and all streetscape improvements to existing streets within the TOD area must comply with the following design goals, standards, and guidelines.

Figure 2.18 - E. 29th Avenue in Denver demonstrates the character of streetscape envisioned for streets serving commercial and mixed use development at the future TOD area

Commercial/Mixed-Use Streets

Design Goals

- Create a vibrant streetscape environment that focuses on the pedestrian and complements the vision for a walkable, mixed-use transit village.
- Provide high-quality sidewalks with ample width and enhanced paving materials and patterns.
- Incorporate a public amenity zone with enhanced streetscape amenities including street trees, plantings, benches, and pedestrian lighting that form a cohesive image for the TOD area.

Design Standards and Guidelines

A. **Sidewalk width**: sidewalks shall be a minimum of 8 feet wide. On streets with significant retail development, a 10 foot minimum width is preferred.

B. **Public amenity zone width**: all streetscapes in the TOD area shall include a public amenity zone at least 6 feet wide between the sidewalk and roadway.

C. **Public amenity zone design**: the public amenity zone

may be landscaped or hardscaped. Landscaping may include ornamental grasses and/or groundcover and should incorporate low-water use plants. Where adjacent to on-street parking, hardscaped amenity zones are preferred. Any hardscaped amenity zone shall be distinguished from the sidewalk through the use of textures, integral color, or scoring patterns. Pavers or flagstone should be used in combination with the concrete to provide interesting patterns and to enhance the amenity zone's design.

D. **Private amenity zones**: private amenity zones that provide outdoor seating areas are encouraged. Where possible, private amenity zones should be utilized to provide additional pedestrian amenities, such as benches or planters.

E. **Street trees:** street trees shall be planted in the public amenity zone at a minimum spacing of 30 feet on center. Variations in spacing may be allowed due to existing obstructions, special conditions, and the expected mature size of the tree.

F. **Benches**: benches shall be provided at a minimum spacing of one bench per every 150 feet, per each side of the street. Except at bus stops, benches may be located in the private amenity zone subject to approval by the Community Development and Public Works Departments. Additional seating areas within the streetscape, especially near corners and areas with high pedestrian traffic, are encouraged.

G. **Trash receptacles**: next to each bench, a metal trash receptacle that is consistent with the design of the bench shall be provided.

H. **Planters and pots**: planters and pots with flowers should be incorporated into the private or public amenity zone, especially near benches and where hardscaped public amenity zones are provided.

I. **Gateway markers and banners**: banners and gateway markers that identify and brand the TOD area are encouraged. New pedestrian lights should include brackets that may be used to hang banners.

J. **Pedestrian lighting**: regularly-spaced pedestrian lights, generally placed 65 feet on center, shall be provided in the public amenity zone. Pedestrian light spacing may vary based on existing constraints and obstructions.

Figure 2.19 - An example of a public amenity zone that incorporates hardscape next to on-street parking, as well as landscaped areas for street trees

Residential Streets

Design Goals

- Create a quality streetscape environment that is oriented around the pedestrian and enhances the quality and character of the neighborhood.
- Incorporate a public amenity zone with streetscape amenities including street trees, plantings, and pedestrian lighting that contributes to a quality, cohesive image for the residential street.

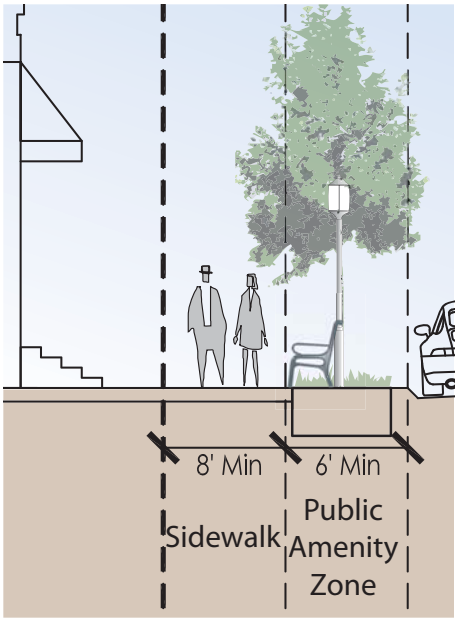


Figure 2.20 - A typical street section for residential streets in the planned TOD area

Figure 2.21 - example of a residential street with a landscaped public amenity zone that includes street trees and pedestrian lighting

Figure 2.22 - this landscaped public amenity zone incorporates low-water use plants, which is encouraged for the streets at the future

Design Standards and Guidelines

A. **Sidewalk width**: sidewalks shall be a minimum of 6 feet wide.

B. **Public amenity zone width**: all streetscapes in the TOD area shall include a public amenity zone at least 6 feet wide between the sidewalk and roadway.

C. **Public amenity zone design**: the public amenity zone shall be landscaped. Landscaping may include ornamental grasses and/or groundcover and should incorporate low-water use plants.

D. **Private amenity zones**: private amenity zones that provide outdoor seating areas are encouraged. Where possible, private amenity zones should be utilized to provide additional pedestrian amenities, such as benches or planters.

E. **Street trees:** street trees shall be planted in the public amenity zone at a minimum spacing of 35 feet on center. Variations in spacing may be allowed due to existing obstructions, special conditions, and the expected mature size of the tree.

F. **Benches**: benches shall be provided at a minimum spacing of one bench per every 200 feet, per each side of the street. Except at bus stops, benches may be located in the private amenity zone subject to approval by the Community Development and Public Works Departments.

G. **Trash receptacles**: next to each bench, a metal trash receptacle that is consistent with the design of the bench shall be provided.

J. **Pedestrian lighting**: regularly-spaced pedestrian lights, generally placed 80 feet on center, shall be provided in the public amenity zone. Pedestrian light spacing may vary based on existing constraints and obstructions.

CHAPTER 3 - DESIGN STANDARDS & GUIDELINES

This chapter establishes general design standards and guidelines for streetscape design elements. ***Design Standards*** are objective criteria that require compliance. Standards often utilize the term "shall" and must be followed unless there is a unique condition or hardship that prevents their application. Design standards are underlined. ***Design Guidelines*** are criteria that are strongly recommended, and should be followed wherever feasible. Guidelines often use the terms "should" or "encouraged."

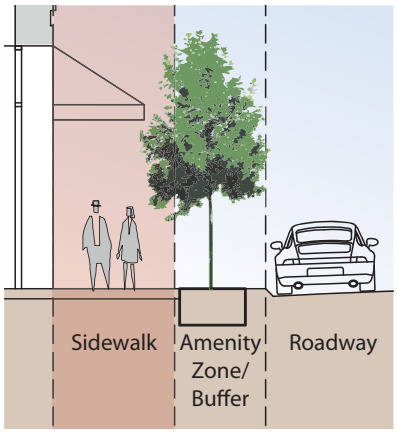


Figure 3.1 - The sidewalk is the paved walking path, typically located between the amenity zone/ buffer and the building

3.1 Sidewalks

Sidewalks are an essential element for providing safe pedestrian access along streets. Sidewalks are paved surfaces that provide a clear walking path for pedestrians.

Width

A. Sidewalks shall be at least 6 feet wide. Sidewalks less than the minimum required width may be allowed, subject to approval of the Public Works Department.
B. Where right-of-way width allows, sidewalks 8 to 10 feet in width may be required on streets with high levels of pedestrian activity.

Figure 3.2 - Example of a sidewalk with pavers

Paving

A. Sidewalks shall be paved. Concrete is the most common and appropriate paving system for sidewalks. Other appropriate materials include flagstone, concrete unit pavers, and brick pavers. Pavers or flagstone, used in combination with concrete, can provide interesting patterns which can emphasize a particular area along the sidewalk.
B. Concrete unit pavers or brick pavers are preferred over the use of patterned concrete.
C. Concrete should be at least 4 inches thick and meet City standards for concrete mix, finishing, curing, and sealing.
D. Integral concrete color systems are acceptable for use in sidewalks. Select subtle earth tones, not bright colors, when using integral concrete colors.
E. Scoring and expansion joints should be spaced uniformly along the length of the sidewalk.
F. Brick pavers shall be specifically designed for sidewalk use according to City specifications.
G. Interlocking concrete pavers and precast concrete pavers may be installed on a sand base or a concrete slab and should meet City specifications.
H. Flagstone pavers are most appropriate in historic areas. They can be laid on a sand base with sand joints or on a concrete base with mortared joints.

Figure 3.3 - Example of a concrete sidewalk

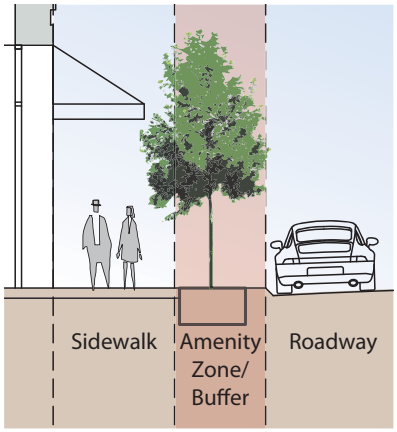


Figure 3.4 - The amenity zone, or buffer, is the area between the sidewalk and the roadway

3.2 Amenity Zones

The amenity zone is the area between the curb and the sidewalk. It provides a buffer between the roadway and the area where pedestrians travel. Amenity zones may be landscaped - often called a "tree lawn" - or hardscaped. The amenity zone is the location for street amenities, including plants, trees, furniture, and lights, as well as utilities. Hardscaped amenity zones are most appropriate for retail districts, especially those with higher pedestrian traffic and where on-street parking is provided. Some streetscapes, especially in retail areas, may incorporate a private amenity zone, which is located between the building face and the sidewalk. This area provides outdoor seating opportunities and can add significantly to the pedestrian experience.

Width

A. Amenity zones shall be at least 6 feet wide. Amenity zones less than the minimum required width may be allowed, subject to approval of the Public Works Department.

Figure 3.5 - An example of a landscaped amenity zone

Landscaped Amenity Zones

A. Landscaped amenity zones shall be planted with low groundcover plantings, ornamental grasses, or turfgrass, as well as regularly-spaced street trees. Landscaped amenity zones shall contain uniform street furnishings, including benches or other seating areas.

B. Where trees are planted, a 5 foot minimum width is required. In certain circumstances, where space is limited, a narrower width may be approved. Please refer to Section 2.3 Street Trees for further guidelines about appropriate planting area widths and soil volumes.

C. Where the width needed for trees is not available, shrubs may be used.

D. Entry walks, which provide a paved pedestrian route from the sidewalk to the curb, are an appropriate feature for landscaped amenity zones. They should be 3 to 5 feet in width and may be constructed of concrete, concrete pavers, flagstone, or brick. Entry walks are highly encouraged where on-street parking is provided and should be coordinated with step-out strips.

E. Step-out strips should be utilized where on-street parking borders a landscaped amenity zone. Step-out strips should be 1 to 2 feet in width and may be constructed of concrete, concrete pavers, flagstone, or brick. Step-out strip locations should be coordinated with entry walks.

Figure 3.6 - An example of a hardscaped amenity zone

Hardscaped Amenity Zones

A. Hardscaped, or paved, amenity zones are most appropriate in retail districts , areas with high pedestrian traffic, and where on-street parking is provided. Hardscape amenity zones may be as wide as 12 feet.

B. Hardscaped amenity zones should be paved with one of the following materials:
    - Concrete
    - Concrete unit pavers
    - Brick pavers
    - Flagstone pavers

C. Paving materials in the amenity zone shall follow the same installation standards and guidelines as those established in Section 3.1 Sidewalks.

D. Concrete unit pavers or brick pavers are preferred over the use of patterned concrete.

E. Where concrete is utilized in the amenity zone, it should be differentiated from the sidewalk area by the use of textures, integral color, or scoring patterns. Wherever possible, pavers or flagstone should be used in combination with the concrete to provide interesting patterns and to enhance the design of the amenity zone.

F. Hardscape amenity zones shall contain regularly-spaced street trees and uniform street furnishings , including seating areas and trash receptacles. Please see Sections 3.3 Street Trees and 3.5 Street Furnishings for standards and guidelines about placement and spacing for these items.

G. Trees may be planted in tree vaults, with tree grates or pavers above, or in at-grade, open planters. Tree grates and pavers are most appropriate for high-traffic pedestrian areas. Please refer to Section 3.3 Street Trees below for further guidelines about appropriate planting area widths and soil volumes.

Figure 3.7 - An example of a hardscaped amenity zone

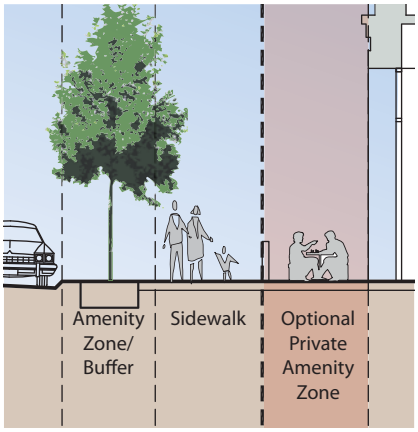


Figure 3.8 - The private amenity zone is located between the sidewalk and the building face

Private Amenity Zones

A. The private amenity zone is an optional element of the streetscape that occurs between the sidewalk and building face. These zones are encouraged in retail areas, especially where restaurants, cafes, and other businesses with outdoor seating are planned.

B. Private amenity zones should contain outdoor seating areas, planting pots, and other amenities that complement street furnishings in the public amenity zone.

C. Where outdoor seating is provided, a railing should be provided to separate the seating area from the sidewalk.

D. Private amenity zones should be paved with one of the following materials:
    - Concrete
    - Concrete unit pavers
    - Brick pavers
    - Flagstone pavers

E. Paving materials in the private amenity zone shall follow the same installation standards and guidelines as those established in Section 3.1 Sidewalks.

Figure 3.9 - An example of a private amenity zone with outdoor seating

Figure 3.10 - Mature street trees in a landscaped amenity zone on W. 38th Avenue

3.3 Street Trees

Street trees are a vital component of streetscape design. They provide a positive aesthetic impact, creating attractive streets that encourage pedestrian use. They also provide many practical benefits, including buffering of pedestrians from vehicular traffic, providing shade, buffering from wind, and reducing air pollution. For street trees to be healthy and contribute to the character of a street in the long term, adequate soil volume and room for growth must be provided at the time of planting.

Street Tree Design

A. Trees should be planted in a uniform pattern in all amenity zones, both landscaped and hardscaped. For private development and redevelopment, street trees in the public right-of-way shall be provided in addition to any on-site landscaping requirements per Section 26-502 of the Wheat Ridge Zoning and Development Code.
B. In most cases, the same species should be planted on the same block to maintain continuity. However, to prevent the loss of species, tree species should vary from block to block. Trees of a similar form, texture, and color can be alternated with the predominant tree species, typically from block to block, to avoid over-use of one species on a street. Random changes in species should be avoided.
C. Trees should have the same characteristics on both sides of the street.

Figure 3.11 - New street trees in open planters with adequate room for future growth and water needs

Location and Spacing

A. Street trees should be planted in a straight row with regular spacing, midway between the sidewalk and the curb, where adequate space allows.
B. Tree location should be based on the mature height and spread of the tree. Adjustments in spacing or species should be made where signs, lights, overhead or underground utilities, utility poles, fire hydrants, or buildings would limit mature tree size.
C. Tree spacing should be in regular intervals. Some variation may be approved due to existing obstructions or special conditions. See the following table for recommended tree spacing based on the mature height of trees:

	Small Trees Mature Height 25’ or less	**Medium Trees** Mature Height 30’ - 45’	**Large Trees** Mature Height over 45’
Recommended Spacing between Trees	15’ minimum, 20’ recom-mended	25’ minimum, 30’ recom-mended	30’ minimum, 40’ recom-mended

Source: “Choosing Suitable Trees for Urban and Suburban Sites,” Edward F. Gilman and Laura Sadowski, Document ENH 1057, University of Florida Institute of Food and Agricultural Sciences, September 2007.

D. Visibility of signs, as well as sight triangles at intersections, should be considered when placing trees (reference Section 26-603 of the Wheat Ridge Zoning and Development Code for regulations on sight triangles).
E. Tree locations should be coordinated with utility locations and adequate separations maintained. Generally, a minimum of 5 feet between street trees and underground utilities should be maintained. The City and utility companies must approve streetscape and utility plans.

Figure 3.12 - Distances between the tree -- at its mature height and width -- and nearby buildings and utilities should be considered when selecting the appropriate street tree. This will ensure that the tree has adequate room to grow to its full size.

Size and Form

A. The size and form of a tree should appropriately relate to space in which it is planted. Trees should be large enough to add significant shade and should reach a height appropriate to adjacent buildings.
B. Street trees shall have a minimum 2 1/2 inch caliper.
C. The branching height of mature trees shall be no less than 8 feet on the pedestrian side of the tree, and no less than 14 feet on the street side of the tree.
D. Lower-branching trees may be used in medians, planters, and landscaped areas that are not adjacent to the street edge and where low branches would not interfere with vehicular or pedestrian traffic.
E. Lower-branching trees may be used in areas where overhead utility wires would require large trees to be pruned.

Planting Area and Soil Volume

A. Adequate planting area is essential to ensuring the long-term health of a tree. Where trees are planted, the minimum width of the planting area shall be 5 feet. In certain instances, where space is constrained, a narrower width may be approved depending on the proposed tree species. The following table establishes recommended planting area widths based on the mature size of a tree:

	Small Trees Mature Height 25’ or less	**Medium Trees** Mature Height 30’ - 45’	**Large Trees** Mature Height over 45’
Recommended Width of Planting Area	5’ minimum	6’ minimum	8’ minimum

Source: “Choosing Suitable Trees for Urban and Suburban Sites,” Edward F. Gilman and Laura Sadowski, Document ENH 1057, University of Florida Institute of Food and Agricultural Sciences, September 2007.

B. Sufficient soil volume is required for a tree to grow to its mature size. The larger the soil volume, the larger the tree. Soil volume is an essential factor when selecting tree species and designing the streetscape. Where trees are planted, the

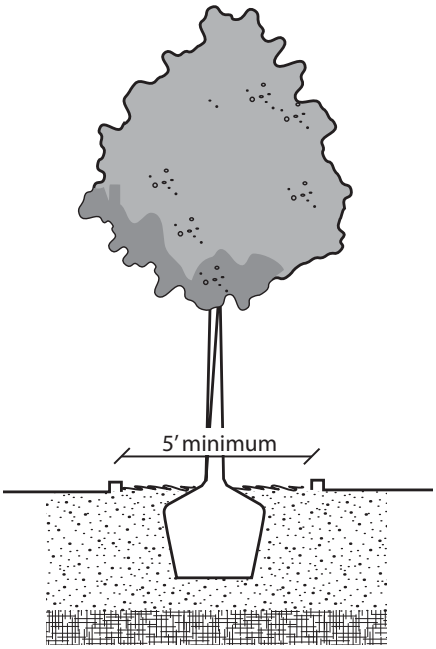


Figure 3.13 - The minimum width for any planter or tree grate where a tree is planted should be 5 feet. Where tree vaults, or pits, are used, the width below-grade may be wider to provide adequate soil volume

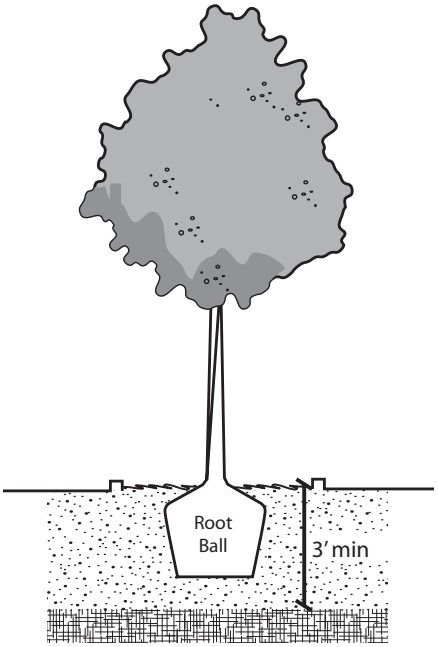


Figure 3.14 - The minimum soil depth where trees are planted should be 3 feet.

depth of soil shall be at least 3 feet. Appendix A contains guidelines for determining the appropriate amount of soil volume based on the size of a tree.

C. Where trees are planted in a tree vault with a tree grate or pavers above, structural soil shall be utilized. Structural soil is designed to meet pavement design installation requirements while also supporting root growth. For more information, please see Appendix A.

Tree Selection

A. Street trees shall be hardy, strong, wooded trees with strong branching characteristics according to their species. They shall be disease-resistant varieties, have upright growth, and be single stem.

B. Trees near sidewalks and pedestrian areas should be fruitless and thornless to minimize maintenance and to reduce pedestrian hazards.

C. Trees should be selected so that they have room to mature to their full height and spread. Street trees should be selected to minimize the obstruction of signage and to be consistent with the character of the given street or district.

D. Wherever possible, street trees should have a low to moderate water rating in the recommended street tree list (Appendix B). Irrigation must be installed for street trees and the proper amount of water must be given to each tree.

E. Please see Appendix B for a list of recommended tree species.

F. The following species are prohibited from planting in any right-of-way:

- Box Elder *(Acer negundo)*
- Silver Maple *(Acer saccharinum)*
- Tree of Heaven (*Ailanthus altissima)*
- Russian Olive *(Elaeagrus angustifolia)*
- All Poplar *(Populus)* species
- Buckthorn *(Rhamnus cathartica)*
- All Willow *(Salix)* species
- Salt Cedar *(Tamarix)*
- Siberian Elm *(Ulmus pumila)*
- Chinese Elm *(Ulmus panifolia)*

G. Other restrictions regarding street tree selection:

- Trees should not have weeping or pendulous branches
- Trees may not have bushy growth habit, which cannot be maintained to a single trunk

H. All existing trees within a given streetscape area must be considered. Each existing tree should be evaluated to determine if it should be preserved. Those trees determined to be preserved must be protected during any construction activity. Please see Appendix A for a reference on tree protection.

Figure 3.15 - Street trees should be compatible with the height and style of buildings along the street

3.4 Groundcovers and Shrubs

Besides trees, plantings in the streetscape may include turf, groundcovers, and shrubs. Groundcovers provide functional and aesthetic value, softening the street edge in areas where pedestrian travel is low. Shrubs create areas of interest and add form, texture, and color to the streetscape. Xeriscape design, which requires less water consumption for irrigation, is highly encouraged. Vegetable and fruit-producing plants may also be allowed in the streetscape area. Within the public right-of-way, such plants will first require approval by City staff through the streetscape plan review process.

Figure 3.16 - A landscaped amenity zone with groundcover plantings

Groundcovers

A. Groundcovers provide a viable alternative to turf grass in areas such as landscaped amenity zones and open planters.
B. Areas planted with turf should be at least 5 feet wide, with a recommended width of 8 feet. Where adequate width is not available, groundcover plantings should be used instead.
C. Please see Appendix B for a list of recommended groundcover plants.
D. Groundcover plantings that require low water use are encouraged.
E. Sufficient irrigation must be provided at the time of installation, as well as during the period of establishment. This applies to low-water use, or xeric, plants as well.

Shrubs

A. Hardy, maintainable deciduous and evergreen shrubs may be used in landscaped areas and planters. Shrubs are typically not recommended in landscaped amenity zones, or tree lawns, directly along the street edge.
B. <u>Shrubs with thorns shall not be allowed in the public right-of-way.</u>
C. Shrubs may be effectively used to screen parking areas adjacent to the street.
D. Form, texture, timing of flowering and color of foliage should be considered in the planting design of shrubs.
E. Please see Appendix B for a list of recommended shrubs.
F. Shrubs that require low water use are encouraged.
G. Sufficient irrigation must be provided at the time of installation, as well as during the period of establishment. This applies to low-water use, or xeric, plants as well.

Figure 3.17 - Shrubs contribute to the streetscape on W. 38th Ave in Wheat Ridge

3.5 Street Furnishings

Street furnishings are integral elements of the streetscape, especially in retail districts intended to encourage pedestrian traffic. Street furniture should be attractive and appropriate to each streetscape and provide for visual continuity, public service, and the safety of pedestrians.

Figure 3.18 - Typical metal bench

Placement

A. Furniture in the right-of-way should be located at least 3 feet from the curb face where on-street parking or a bike lane adjoins the curb, and at least 4 feet from the curb face where a travel lane adjoins the curb.
B. Any item placed in the right-of-way will require approval by Public Works through a Right-of-Way (ROW) Use Permit.
C. Street furniture shall not obstruct the sidewalk. A minimum 5 foot clear walking zone should be provided at all times.
D. All street furnishings should be of high-quality design, intended for outdoor use, and require minimum maintenance.

Benches and Seating

A. Comfortable seating areas should be provided at regular intervals as part of the streetscape design.
B. Metal benches are a typical element in most streetscape settings. Other appropriate seating options include benches, moveable chairs, planter walls, and steps. Metal benches should typically be painted black or a dark color with a factory-applied finish.
C. Seating should be conveniently placed. Shade, view of storefronts, and proximity to adjacent uses should be considered in the placement of seating.
D. Seating should not interfere with pedestrian flow or plant materials.
E. Seating should be attractive, comfortable, and durable. It should be compatible with other furnishings and adjacent buildings.
F. With the exception of moveable chairs, seating should be secured in place to the pavement for user safety and to prevent vandalism.
G. All seating should meet the following dimensional guidelines:
    - 16 to 18 inches in height
    - 16 inch minimum depth for seats without backs
    - 14 inch minimum depth for seats with backs
H. Seating adjacent to walkways or multi-use paths that receive bicycle use should be set back a minimum of 3 feet from the path.

Figure 3.19 - Seating is an important component of the amenity zone (the space between the sidewalk and the roadway)

Tree Grates

A. Tree grate openings shall comply with ADA regulations.
B. Tree grates shall be made of iron and have an opening for the tree that will provide for its normal growth. Alternate tree grate types may be approved by the Departments of Community Development and Parks and Recreation.
C. Tree grates should either be unpainted or painted with a factory-applied finish.

D. The size and shape of a tree grate should relate to the paving systems and patterns adjacent to the tree.
E. If seasonal tree lights are desired, an electrical outlet should be provided within the tree grate area.

Figure 3.20 - Example of an iron tree grate

Trash Receptacles

A. Trash receptacles should be located so as not to disrupt pedestrian flow and in locations convenient to benches and other street furnishings. They should be compatible with surrounding street furniture and the architecture of nearby buildings.
B. Trash receptacles should be attached to the paving or footings in landscaped areas to discourage vandalism.
C. Each receptacle shall have two parts: an inner container, which will provide for easy trash removal, and an outer shell that is compatible with the other street furnishings in the area. They shall also have a covered top and solid bottom to keep trash dry and out of sight.
D. Trash receptacles should be made of a durable material, such as metal.

Figure 3.21 - Example trash receptacle

Bollards

A. Bollards should be used to define and protect pedestrian areas, separating them from areas of vehicular traffic.
B. Bollards should be compatible with the other street furnishing and other architectural elements in the area.
C. Iron bollards are preferred. Bollards should be of simple design, and typically 24 to 42 inches high. They should be painted black or a dark color with a factory-applied finish.
D. Bollards shall be located a minimum of 3 feet from the curb edge of vehicular traffic ways.
E. Bollards that also serve as emergency access should be of approved type and material the City and Fire Department.

Figure 3.22 - Example of an iron bollard

Bicycle Racks

A. Bicycle racks should be incorporated into the streetscape design. Bicycle racks are required in the streetscape for any street that is designated as a bicycle route in the Wheat Ridge Bicycle and Pedestrian Master Plan. On these streets, a minimum of four bicycle parking spaces (two typical inverted U racks) per block, on each side of the street, shall be provided. These bicycle parking spaces must be provided in addition to any on-site bicycle parking required by zoning.
B. Bicycle racks should be placed in locations that do not interfere with pedestrian or vehicular traffic.
C. Racks should be conveniently placed in visible locations to provide for security.
D. The standard bike parking rack is the inverted U type, or

Figure 3.23 - Example of a standard inverted U bike parking rack

another type as approved by the Community Development Director. Each inverted U rack shall count as two bike parking spaces.

E. Racks should be designed to be compatible with other street furnishings and be made of durable metal materials. Racks must provide for at least one wheel and the frame to be locked to the rack.

F. Racks shall be securely attached to the pavement to provide a stable place to rest bicycles and to prevent vandalism.

Planters and Planting Pots

A. Pots and planters should be used to provide interest to the streetscape and should be planted with annual flowers, perennial flowers, or low-growing shrubs.

B. Large pots or planters may be used in place of bollards to separate pedestrian and vehicular traffic.

C. In determining the location of planting pots, the possibility of pavement staining should be considered.

D. Provisions for watering of planters and pots must be in place to provide for the healthy growing of plants. Each pot should have some provision for drainage in the event of over-watering.

Figure 3.24 - Planting pots incorporated into streetscape

Fencing, Railings, and Gates

A. A sturdy, wrought iron or steel fence painted black or a dark color is preferred. Fences or railings of other high-quality materials may be approved if the materials are consistent with surrounding streetscape furnishings and building architecture.

B. Fence picket spacing should not exceed 4 inches for child safety reasons.

C. The height of fences may vary depending on the purpose and location of the fence. Where pedestrian access needs to be limited, a fence as high as 4 feet may be used. Where a parking lot screen is needed or required, the fences may be as low as 3 feet. Where a fence or railing provides a safe barrier between severe grade changes, a minimum height of 42 inches must be provided.

D. Fencing may be combined with low walls for enhanced design.

E. All structural railings must be designed to support a horizontal and vertical load of 50 pounds per linear foot.

F. All fences and railings must be securely fastened in place in pavement or footings.

G. All fencing shall conform to Chapter 26 of the Zoning and Development Code.

Figure 3.25 - Example of quality metal railing

Newspaper Racks and Enclosures

A. Newspaper racks should be designed to be compatible

with other street furnishings. Enclosures can be provided to screen racks from the street.

B. Newspaper racks and enclosures should be clustered together and located where they have the least visual impact on the streetscape.
C. Newspaper racks and enclosures should be on a neutral color, preferably made of metal, and should be designed to blend in with surrounding street furniture and architecture.
D. Racks and enclosures should be located in convenient locations for pedestrian access and not in locations where they will obstruct the view of motorists.

Community Announcement Boards

A. Community announcement boards, or kiosks, are intended to be used to post community events and notices at special pedestrian areas along the street. They should be used sparingly and primarily in areas of high pedestrian traffic.
B. Community information boards should be designed to be compatible with other street furnishings. They should facilitate the posting of community notices in a convenient manner.
C. Announcement boards should be easily accessible from all sides, adequately illuminated, and designed so that they are easy to clean and maintain.

Figure 3.26 - Example of a community announcement board

Transit Bus Stops

A. The location of bus stops are set by RTD in coordination with the City. With the approval of RTD, shelters may be provided by private companies or the City. Shelters are encouraged for transit stops, especially those with high levels of ridership.
B. Bus shelters should be integrated into the streetscape and may not obstruct pedestrian flow. Public Works and RTD will approve shelter locations.
C. Where bus stops contain vendor benches with advertising, such benches shall be replaced by a standard metal strap bench (Figure 3.28). The Department of Public Works will approve all new benches at bus stops.

Figure 3.27 - Bus shelters are encouraged at bus stop locations

Fountains and Water Features

A. Fountains and water features can add a special element to the streetscape, but they should only be used in situations where there is adequate space to incorporate a focal point in the public space along the street.
B. Fountain and water feature design and placement should consider solar orientation, orientation to winds, surrounding buildings, existing and planned pedestrian circulation, site furnishings, and how the feature will look when water is not available.

Figure 3.28 - Metal strap bench to be utilized at bus stops

Figure 3.29 - Where there is adequate room, public art can add life to the streetscape

Figure 3.30 - Example of a parking lot screen

Figure 3.31 - Gateway markers should be integrated into the design of the streetscape

C. Fountains and water features should have an efficient recirculating pump system which will allow for continued operation, water conservation and ease of maintenance.

D. There must be a long-term commitment from the City, district, or property owner(s) to maintain and manage the water feature or fountain.

Public Art

A. The provision of public art is encouraged and recommended on major streetscape improvements in the City. Public art may be functional or purely an art form and it should be considered as a complement to other amenities in the streetscape.

B. Art objects should not compete with or detract from adjacent storefronts or obstruct pedestrian walkways or vehicular traffic.

C. Art objects should be constructed of durable and maintainable materials such as stone or metal.

Walls and Screens

A. Walls and screens, typically used to screen parking lot or vehicular areas from the streetscape, should be constructed of durable and maintainable materials.

B. The location and design of screen walls must comply with Chapter 26 of the Zoning and Development Code.

C. Walls should be constructed of high-quality masonry units. Integrating iron fencing into the design of the screen wall is encouraged.

Gateway Markers and Monument Signs

A. Monuments and gateway markers help establish the character or identity of a district, street, or neighborhood. They should be located in key locations, primarily in at intersections or important gateways.

B. Gateway markers and monument signs should be integrated into the streetscape, complementing items such as plantings, trees, paving patterns, and street furnishings.

C. Monument signs, which may include neighborhood identification signs, should be constructed of high-quality, durable materials.

D. Monument signs should only be placed where there is adequate room so that the sidewalk is not obstructed. Visibility, location of trees and vegetation, and compatibility with the surrounding landscaping and hardscaping should be considered in the placement and design of the sign.

E. All signs must comply with Chapter 26 of the Zoning and Development Code, including sight triangle requirements.

Utilities

A. All utilities should be inventoried and identified in the design stage of any streetscape project. The location of existing and planned utilities should be considered when determining the location of street furnishings, street trees, plants, signs, and light fixtures.
B. The location of vaults, meters, and irrigation controllers should be consolidated wherever possible.
C. Larger utility cabinets and vaults should be place in low-visibility areas and screened from view wherever possible.
D. Utilities should not be located under amenity zones where they could interfere with or preclude the planting of trees.

Figure 3.32- Utility boxes should be consolidated wherever possible

3.6 Lighting

Lighting contributes to both the character and function of a streetscape. Overhead lighting provides for traffic safety along the street. Pedestrian lighting provides lighting at the human scale and contribute to the aesthetic character of a corridor.

Overhead Street Lighting

A. Street lights should be located at regular intervals as part of an overall system that includes cabinets and transformers. Recommended spacing for commercial streets ranges from 100 to 150 feet.
B. Lights shall be placed at least 2 1/2 feet from the curb face so that there is adequate room for car bumpers and door swings.

Figure 3.33- Example of pedestrian lighting that is not cutoff

Pedestrian Lighting

A. Pedestrian lights shall be no more than 14 feet high. The preferred height is 12 feet.
B. Pedestrian lighting can play a major role in the development of the commercial streetscape and should provide visual continuity along a street. It should be designed to be compatible with surrounding street furniture and architecture.
C. Pedestrian lighting is not recommended in residential areas.
D. Lights shall be placed at least 2 1/2 feet from the curb face so that there is adequate room for car bumpers and door swings.
E. Pedestrian lights should be spaced at least 50 feet apart. 60-115 feet is preferable in most cases to allow room for street trees and street furnishings. Too close spacing can cause unwanted glare.
F. Lighting should be designed to minimize light pollution to comply with dark sky principles. Pedestrian lights shall be semi-cutoff fixtures at a minimum. Full-cutoff fixtures are preferred.

Figure 3.34- Example of a full cutoff pedestrian light fixture

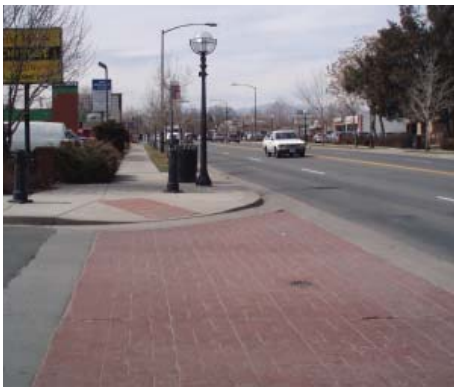


Figure 3.35- Example of an enhanced crosswalk on W. 38th Avenue

3.7 Crosswalks and Curb Ramps

Crosswalk pavement systems are important at all intersections where pedestrians travel. Curb ramps provide safe and convenient movement for all pedestrians.

Crosswalks

A. Crosswalks shall be provided at every intersection and designated mid-block crossings.
B. Crosswalks with enhanced pavement design are encouraged in commercial areas and at major intersections. Special paving in the crosswalk area should contrast with the adjacent street paving in terms of color and texture. Enhanced crosswalk paving can provide for increased safety and help unify the character of a retail district.
C. The recommended material for crosswalks with enhanced paving is concrete. Stamped concrete is prohibited from use.
D. Unit pavers and bricks pavers may be used in the crosswalk area as long as the pounds per square inch (PSI) meets City standards for withstanding automobile use. However, these materials can be expensive to maintain.

Figure 3.36 - Example of a curb ramp

Curb Ramps

A. Curb ramps shall be provided at every intersection in the City. Curb ramps should also be provided at designated mid-block crossings.
B. Curb ramps should be aligned with curb ramps on the other side of the street/intersection.
C. The Department of Public Works will approve the type and design of all curb ramps.

CHAPTER 4 - MAINTENANCE & IRRIGATION

Investments in streetscape improvements are not truly realized without proper maintenance. Adequate maintenance ensures the long-term quality and attractiveness of the streetscape and helps to maintain property values.

4.1 Maintenance

Long-term maintenance of the streetscape is essential. The following standards and guidelines apply to the maintenance of all elements within the streetscape area.

General Maintenance Requirements

A. It is the responsibility of the property owner, maintenance district, or improvement district to maintain all streetscape elements, including landscaping, street furniture, and the sidewalk, in the public right-of-way adjacent to their property.
B. Landscaping must be maintained continuously. This means any necessary watering, weeding, pest control, and pruning, as well as the replacement of dead or diseased plants.
C. Dead or diseased plants shall be replaced in the same location and type as the approved plan.

Trees, Shrubs, and Groundcover

A. Tree plantings and landscaped areas should be regularly maintained, including watering, cleaning, weeding, mulching, mowing, fertilizing and aerating as necessary. This includes removing fallen leaves from the sidewalk or other areas utilized by pedestrians and bicyclists.
B. Tree limbs should be pruned to the standards of the International Society of Arboriculture (ISA) and to ensure proper clearances above sidewalks and streets, established in Section 3.3 Street Trees (minimum 8 feet on the pedestrian side of the tree and minimum 14 feet on the street side of the tree).
C. Mulching serves many benefits for planted areas, including the regulation of soil temperature and the retention of soil moisture. The regular application and maintenance of mulch is recommended.
D. All tree, shrub, and groundcover areas shall be maintained to be free of weeds. Herbicides should be used with care to prevent damage to plants.
E. When maintenance on trees or tree roots within a tree vault is required, grates, pavers, or any other materials installed in the tree space should be removed and then properly reinstalled when the maintenance is complete.
F. Tree grates or paving materials should be replaced when damaged and adjusted as necessary for tree growth.

Sidewalks

A. Cracked, broken, or missing sidewalk paving is hazardous to public safety. Maintenance requirements for sidewalks include:
    - Maintain concrete joints and replace sealant when necessary
    - Remove snow when necessary
    - Remove trash on a regular basis
    - Sweep sidewalks free of sand when necessary

Walls, Fences and Screens

A. Walls, fences, and screens shall be maintained to remain attractive, functional and safe.
B. Maintenance measures include cleaning, refinishing, painting, repair, and replacement if damaged.
C. These elements should be maintained to a level comparable to their condition at installation.

Street Furnishings

A. Walls, fences, screens, and bike racks shall be maintained to remain attractive, functional and safe.
B. Maintenance measures include cleaning, refinishing, painting, repair, and replacement if damaged.
C. These elements should be maintained to a level comparable to their condition at installation.

Lighting

A. Lighting shall be maintained and continuous electrical service shall be provided. The following maintenance standards apply:
   - Maintain lighting control devices, including timers, photocells, etc.
   - Replace damaged or missing light poles or parts within thirty (30) days of damage.
   - Replace burned-out bulbs or lamps within ten (10) days of burn out.
   - Perform general maintenance work including regular cleaning and planting when required.

4.2 Irrigation

A well-designed irrigation system should cover all plantings within the streetscape. A well-maintained irrigation system is critical for the health and growth of plant materials.

Design of Irrigation System

A. Drip irrigation systems use water more efficiently and are the preferred irrigation system, especially in non-turf areas.
B. During establishment period, plants require more water. After establishment, the amount of water for irrigation may be reduced.
C. In order to reduce water usage, rainfall and soil moisture sensors, pressure reducers, check valves, and/or flow sensor valves are recommended.
D. Control valves should be designed to water shrubs, flowers, and trees separately from turf areas. They should also have the time capability to permit the use of low-volume systems over longer cycles.
E. If a traditional sprinkler system is used, the spraying of walks, patios, buildings, parking areas, and fences is discouraged. If the spraying of walks and bikeways cannot be avoided, the controller should be timed to spray at night to prevent conflict with pedestrians and bicyclists.

Maintenance of Irrigation System

A. Maintenance of the irrigation systems is essential for the survival of plants. All necessary start-ups, shut downs, periodic checks, adjustments, and replacements of parts must be performed by the owner or district responsible for irrigation.
B. The system should be completely checked during the start-up period in spring, monitored and adjusted throughout the season, and properly shut down at the end of the season.
C. Soil moisture should be checked at 6” and 12” depths regularly with the use of soil probe and appropriate adjustments made to the control valve.
D. Trees require watering once a month in the winter when the temperature is above freezing.

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APPENDIX A - REFERENCES

1. Soil Volume Guidelines and References

When planning a streetscape project, especially where space is limited, it is important to evaluate how to provide the optimal soil volume for each tree. The first step is to calculate the optimal soil volume per tree. A general rule of thumb is to measure the area within the projected mature drip line of the tree and provide 2 cubic feet of usable soil per square foot (Grabosky and others, 1999; Urban, 1999). Based on this rule of thumb, Urban (1999) correlated crown projection and tree size to identify minimum required soil volume for various size trees (Figure A).

Figure A: Soil volume required for various tree sizes. Assumes a soil depth of 3 feet
(Source: James Urban, 1999)

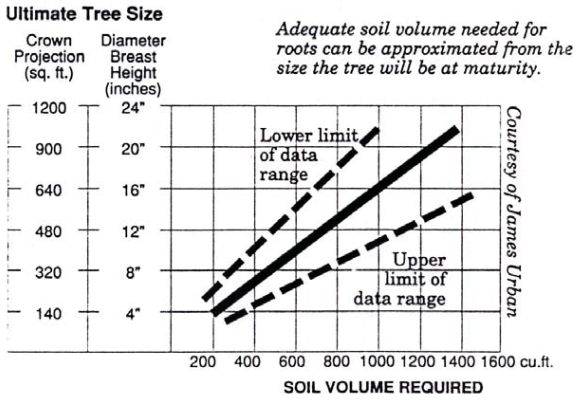
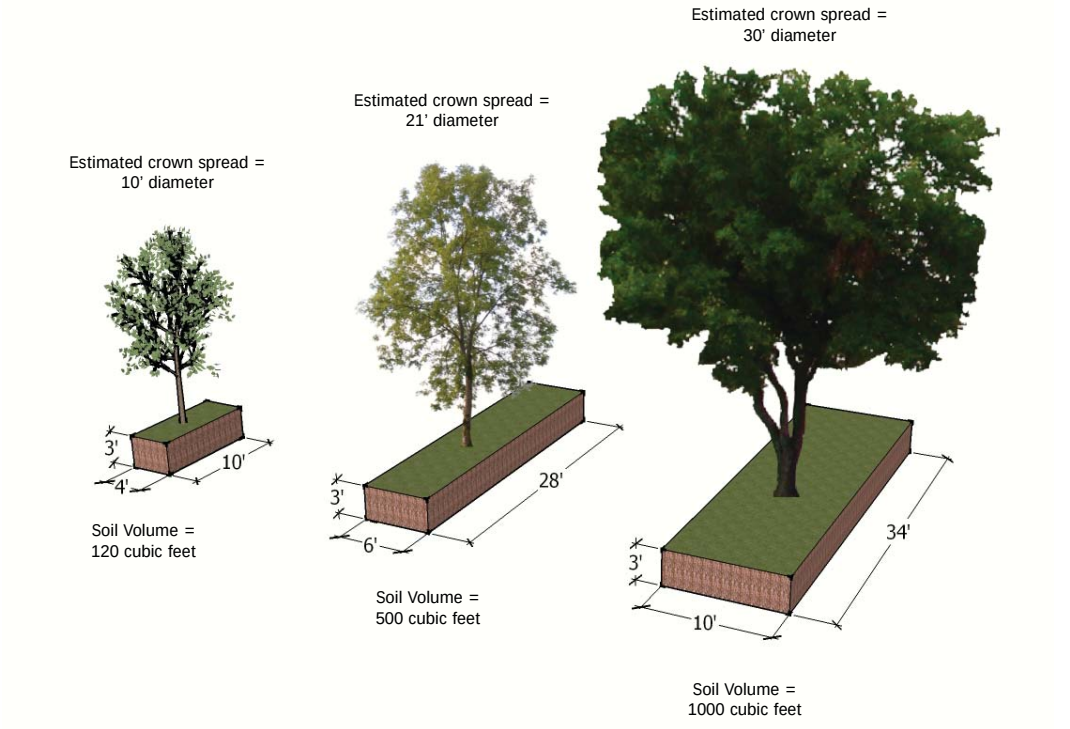


Figure B: Recommended soil volumes based on crown spread of tree (3' minimum depth of soil):



Structural Soil:
An Innovative Medium Under pavement that Improves Street Tree Vigor

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Introduction

The major impediment to establishing trees in paved urban areas is the lack of an adequate volume of soil for tree root growth. Soils under pavements are highly compacted to meet load-bearing requirements and engineering standards. This often stops roots from growing, causing them to be contained within a very small useable volume of soil without adequate water, nutrients or oxygen. Subsequently, urban trees with most of their roots under pavement grow poorly and die prematurely. It is estimated that an urban tree in this type of setting lives for an average of only 7-10 years, where we could expect 50 or more years with better soil conditions. Those trees that do survive within such pavement designs often interfere with pavement integrity. Older established trees may cause pavement failure when roots grow directly below the pavement and expand with age. Displacement of pavement can create a tripping hazard. As a result, the potential for legal liability compounds expenses associated with pavement structural repairs. Moreover, pavement repairs which can significantly damage tree roots often result in tree decline and death.

The problems as outlined above do not necessarily lie with the tree installation but with the material below the pavement in which the tree is expected to grow. New techniques for meeting the often opposing needs of the tree and engineering standards are needed. One new tool for urban tree establishment is the redesign of the entire pavement profile to meet the load-bearing requirement for structurally sound pavement installation while encouraging deep root growth away from the pavement surface. The new pavement substrate, called 'structural soil', has been developed and tested so that it can be compacted to meet engineering requirements for paved surfaces, yet possess qualities that allow roots to grow freely, under and away from the pavement, thereby reducing sidewalk heaving from tree roots.

Convential Tree Pits are Designed for Failure

Looking at a typical street tree pit detail, it is evident that it disrupts the layered pavement system. In a sidewalk pavement profile, a properly compacted subgrade of existing material often is largely impermeable to root growth and water infiltration and significantly reduces drainage if large percentages of sand are not present. Above the subgrade there is usually a structural granular base material. To maintain a stable pavement surface the base material is well compacted and possesses high bearing strength. This is why a gravel or sand material containing little silt or clay is usually specified and compacted to 95% Proctor density (AASHTO T-99). The base layer is granular material with no appreciable plant available moisture or nutrient holding capacity. Subsequently, the pavement surrounding the tree pit is designed to repel or move water away, not hold it, since water just below the pavement can cause pavement failure. Acknowledging that; the above generalizations do not account for all of the challenges below the pavement for trees, it is no mystery why trees are often doomed to failure before they are even planted.

The subgrade and granular base course materials are usually compacted to levels associated with root impedance. Given the poor drainage below the base course, the tree often experiences a largely saturated planting soil. Designed tree pit drainage can relieve soil saturation, but does nothing to relieve the physical impedance of the material below the pavement which physically stops root growth.

A New System to Integrate Trees and Pavement

'Structural soil' is a designed medium which can meet or exceed pavement design and installation requirements while remaining root penetrable and supportive of tree growth. Cornell's Urban Horticulture Institute, has been testing a series of materials over the past five years focused on characterizing their engineering as well as horticultural properties. The materials tested are gap-graded gravels which are made up of crushed stone, clay loam, and a hydrogel stabilizing agent. The materials can be compacted to meet all relevant pavement design requirements yet allow for sustainable root growth. The new system essentially forms a rigid, load-bearing stone lattice and partially fills the lattice voids with soil (Figure 1). Structural soil provides a continuous base course under pavements while

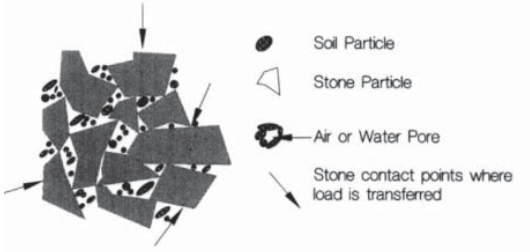

Fig. 1: *The stone lattice bears loading while the soil particle partially fills the lattice voids.*

providing a material for tree root growth. This shifts designing away from individual tree pits to an integrated, root penetrable, high strength pavement system.

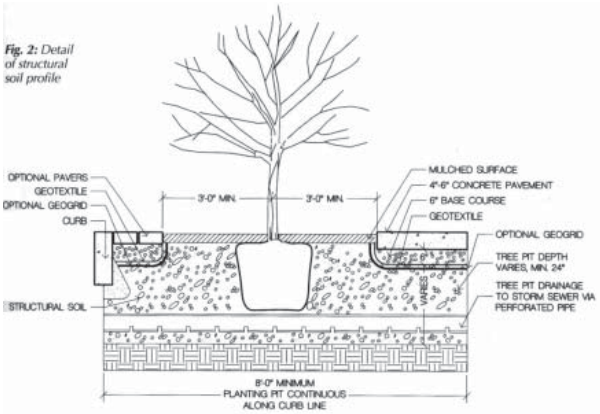

Fig. 2: Detail of structural soil profile

This system consists of a four to six inch rigid pavement surface, with a pavement opening large enough to accommodate a forty year or older tree (Figure 2) . The opening could also consist of concentric rings of interlocking pavers designed for removal as the buttress roots meet them. Below that, a conventional base course could be installed and compacted with the material meeting normal regional pavement specifications for the traffic they are expected to experience. The base course would act as a root exclusion zone from the pavement surface. Although field tests show that tree roots naturally tend to grow away from the pavement surface in structural soil. A geotextile could segregate the base course of the pavement from the structural soil. The gap-graded, structural soil material has been shown to allow root penetration when compacted. This material would be compacted to not less than 95% Proctor density (AASHTO T-99) and possess a California Bearing Ratio greater than 40 [Grabosky and Bassuk 1995,1996]. The structural soil thickness would depend on the designed depth to subgrade or to a preferred depth of 36 inches. This depth of excavation is negotiable, but a 24 inch minimum is encouraged for the rooting zone. The subgrade should be excavated to parallel the finished grade. Under-drainage conforming to approved engineering standards for a given region must be provided beneath the structural soil material.

The structural soil material is designed as follows. The three components of the structural soil are mixed in the following proportions by weight, crushed stone: 100; clay loam: 20; hydrogel: 0.03. Total moisture at mixing should be 10% (AASHTO T-99 optimum moisture).

Crushed stone (granite or limestone) should be narrowly graded from 3/4 -1 1/2 inch, highly angular with no fines. The clay loam should conform to the USDA soil classification system (gravel<5%, sand 25-30%, silt 20-40%, clay 25-40%). Organic matter should range between 2% and 5%. The hydrogel, a potassium propenoate-propenamide copolymer is added in a small amount to act as a tackifier, preventing separation of the stone and soil during mixing and installation. Mixing can be done on a paved surface using front end loaders. Typically the stone is spread in a layer, the dry hydrogel is spread evenly on top and the screened moist loam is the top layer. The entire pile is turned and mixed until a uniform blend is produced. The structural soil is then installed and compacted in 6 inch lifts.

In a street tree installation of such a structural soil, the potential rooting zone could extend from building face to curb, running the entire length of the street. This would ensure an adequate volume of soil to meet the long term needs of the tree. Where this entire excavation is not feasible, a trench, running continuous and parallel to the curb, eight feet wide and three feet deep would be minimally adequate for continuous street tree planting.

There will be a need to ensure moisture recharge and free gas exchange throughout the root zone. The challenge may be met by the installation of a three dimensional geo-composite (a geo-grid wrapped in textile one inch thick by eight inches wide) which could be laid above the structural soil as spokes radiating from the trunk flair opening. This is currently in the testing stage. Other pervious surface treatments could also provide additional moisture recharge, as could traditional irrigation.

When compared to existing practice, additional drainage systems, and the redesigned structural soil layer represent additional costs to a project. The addition of the proposed structural soil necessitates deeper excavation of the site which also may be costly. In some regions this excavation is a matter of standard practice. However, this process might best be suited for new construction and infrastructure replacement or repair, since the cost of deep excavation is already incurred.

The Urban Horticulture Institute continues to work on refining the specification for producing a structural soil material to make the system cost effective. It is patent pending and will be sold with the trademark 'CU-Soil' to insure quality control. Testing over five years has demonstrated that stabilized, gap-graded structural soil materials can meet this need while allowing rapid root penetration. Several working installations have been completed in lthaca, NY, New York City, NY, Cincinnati, OH, Cambridge, MA and elsewhere. To date, the focus has been on the use of these mixes to greatly expand the potential rooting volume under pavement. It appears that an added advantage of using a structural soil is its ability to allow roots to grow away from the pavement surface, thus reducing the potential for sidewalk heaving as well as providing for healthier, long-lived trees.

Grabosky, J. and Bassuk, N. "A New Urban Tree Soil to Safely Increase Rooting Volumes Under Sidewalks", 1995, Journal of Arboriculture 21(4), 197-201. Grabosky, J. and Bassuk, N. "Testing of Structural Urban Tree Soil Materials for Use Under Pavement to Increase Street Tree Rooting Volumes", 1996, Journal of Arboriculture 22(6), 255-263.

G A R D E N I N G S E R I E S

TREES & SHRUBS

Protecting Trees During Construction no. 7.420

by C. Dennis and W.R. Jacobi [1 (6/08)]

Why Preserve Existing Trees?

Shade trees add to the value of residential and commercial properties. During construction, established, healthy trees can be preserved with minimal effort or expense. Many trees are valuable enough to justify the extra concern.

The Preservation Planning Process

Many towns and cities in Colorado have tree protection specifications detailed in their land use code; property owners must adhere to the tree protection specifications spelled out in land use code of their town or city. Prior to beginning a construction project, the property owner should have a city forester, licensed arborist or certified tree appraiser, evaluate every tree in the proposed construction area to determine if preservation is worthwhile. For each existing tree, consider location, present size, future size, species, vigor, cost of preservation, and cost of removal.

While evaluating trees for preservation, visualize the future landscape. If plans call for preservation of trees near buildings or in landscapes, the trees should be sufficiently healthy to justify preservation. Some large, mature trees may not be structurally sound or esthetically appealing to warrant preservation. Older trees do not adapt to environmental changes as well as younger trees, thus it may be more practical to protect a 1- to 8-inch diameter tree than a larger, more mature tree. Some existing trees (particularly the smaller trees) may be dug with a tree spade and relocated on the property. Tree species differ in their ability to adapt to environmental change (Table 1). Recognize that it may be impossible to preserve every tree.

Table 1: Adaptability to environmental change.

Degree of Adaptability		
High	**Moderate**	**Low**
American elm	Aspen	Bolleana white poplar
Common hackberry	Black walnut	Black locust
Cottonwood (spp)	Boxelder	Colorado blue spruce
Ginkgo	Bur oak	English oak
~~Green ash~~	Linden	Lombardy poplar
Honeylocust	Norway maple	Northern red oak
London planetree	Pine (spp)	Norway spruce
Siberian elm	White oak	
Silver maple		
~~White ash~~		
Willow (spp)		

Quick Facts...

Soil compaction and grade changes adversely affect tree root health, and can lead to branch dieback and tree death

Prior to starting construction activities, evaluate existing trees in the area to see if preservation is worthwhile and feasible.

Involve all parties associated with the construction project when determining which trees to preserve.

Establish specific guidelines to prevent tree injury during the construction project.

Minimize injury to existing trees with properly placed and properly sized barricades.

Colorado State University

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Figure 1: Roots lie in the upper 24 inches of soil and are easily damaged.

To avoid short- and long-term problems, early in the planning process consult all parties involved in the project, including the property owner, contractor, architect, engineer, and arborist.

Once trees are selected for preservation, prepare a preservation plan that contains specific tree preservation methods. Set contractor guidelines for tree protection within contracts. Such guidelines include: prominently mark protected areas; erect barricades around designated trees; avoid vehicular traffic or parking in restricted areas; and prohibit material storage, grading, and dumping of chemicals and other materials in restricted areas. To ensure compliance, contractors should have tree preservation bonds to cover potential noncompliance fines. Noncompliance fines are based on trees species, tree value, replacement costs if required, and the amount and type of damage done. Tree preservation bonds create an additional incentive for compliance. All parties should be aware of and agree to the consequences for noncompliance.

Before construction begins, conduct an on-site meeting with all parties, with special emphasis on educating the project contractor. Provide a handout that outlines the preservation plans to everyone working on the project.

The Importance of Protecting a Tree's Root System

Tree root systems contain large, woody roots, and small, short-lived absorbing roots. Large, woody roots are perennial and grow horizontally and are mostly in the top 6 to 24 inches of the soil (Figure 1). Their main functions include anchorage, water and mineral transport, and nutrient and water storage.

Smaller absorbing roots, averaging 1/16 inch in diameter, constitute the majority of the root system's surface area. These roots grow outward and upward from the large roots, near the soil surface where minerals, water and oxygen are abundant. Their major function is to absorb water and minerals.

The root zone extends horizontally from the tree for a distance at least equal to the tree's height. Preserve at least 50 percent of the root system to maintain a healthy tree. During summer construction, trees require adequate water, enough to saturate the soil, every one to two weeks.

Figure 2: Highly visible tree protection barriers.

Preventing Injury to Existing Trees

Preventing damage is less costly than correcting it. Post highly-visible barricades and signs around the trees and areas to be protected (Figures 2 and 3). The optimal size of barricaded areas varies by tree species, size, and construction project. For recently planted trees (one to four years), the area under the branches (dripline) should be adequate. For minimal protection of trees older than four years, barricades should extend beyond the dripline; for each inch of diameter of the tree's trunk, add extend the protection area an additional foot. For additional protection, a layer of wood chips (4 to 6 inches deep) can be placed around each tree prior to placement of the barricades. Examine trees and barricades at least once a week during construction.

Figure 3 (below): Ideally, the protection barriers should extend beyond the dripline. Reprinted with permission from *Tree City USA* Bulletin No. 7, National Arbor Day Foundation.

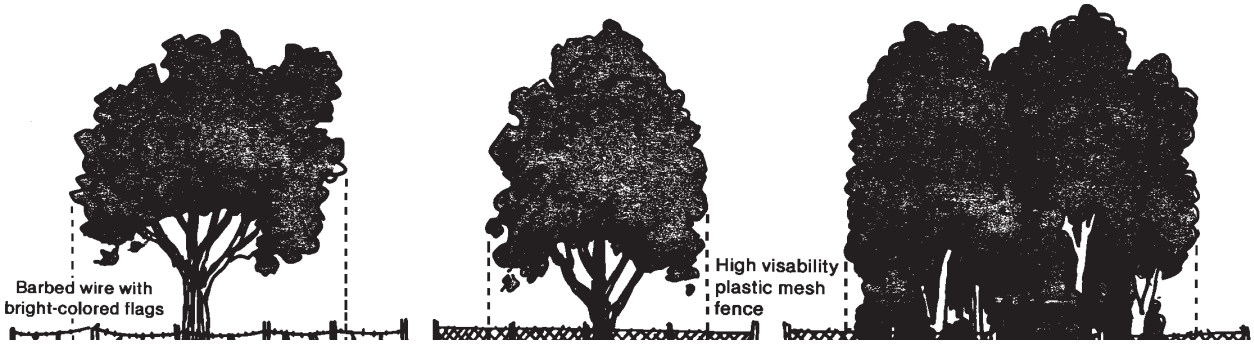

Figure 4: Surface grading severs many roots.

Figure 5: Trenching near trees can severely damage root systems.

Figure 6: Construction vehicles can damage the existing soil structure by compressing soil particles.

Figure 7: Within two years of adding 12 inches of soil, this tree died.

Avoid Direct Injury to Existing Trees

There are four general forms of direct tree injury caused by mechanized equipment: bark removal, branch breakage, surface grading and trenching injury (Figures 4 and 5).

Bark removal or "skinning" of the trunk can be caused by any type of equipment. This can easily kill the tree, because it cannot survive without bark. Breakage of lower branches may make the tree unsightly or remove too many leaves, causing stress. Surface grading removes surface vegetation and topsoil that contains many absorbing roots. Also, injury often occurs to the tree base. Trenching for utilities can also cause substantial root damage and should be done far away from existing trees. In new developments, this can be done easily. Where the trench must pass under or near a tree, avoid substantial injury by using a power auger to bore a tunnel under the roots. If trenching is unavoidable, place the trench as far from the trunk as possible (minimum 8 feet), cutting as few roots as possible. Cleanly prune cut roots and refill trenches as soon as possible to prevent excessive moisture loss. Wounds make the tree highly susceptible to root pathogens and decay fungi. Decline and death can result if more than 40 percent of the stem or roots are damaged or killed. Stressed trees are also more susceptible to insects such as bark beetles and borers.

Avoid Soil Compation Problems

After a tree is established, any activity that changes the soil condition is extremely detrimental to its health. Construction traffic compacts soil most severely near the surface, the area where the majority of tree roots lie (Figure 6). Soil compaction decreases soil permeability and interferes with essential gas exchange processes as well as surface and subsurface drainage. When root growth is restricted by compacted soils, less nutrients and water are available for plant growth. These factors limit root growth, reduce tree vigor and can cause tree death. Decline and dieback may gradually appear over a period of years.

It is much easier to avoid soil compaction than to correct it. Keep construction traffic and material storage away from tree root areas. Apply a 4 to 6 inch layer of wood chips around all protected trees to help reduce compaction from vehicles that inadvertently cross the barricades.

Avoid Soil Fills

When excessive amounts of soil are added around a tree base, the additional soil interferes with normal air and moisture circulation to the roots (Figure 7). Soil fills subject roots to improper gas exchange and can lead to carbon dioxide or toxic gas buildup. Minor fills (less than 3 inches) will not harm most trees. The topsoil should be high in organic matter and have good drainage properties -- it should not be clay. Major changes in grading require an air supply to the roots. This can be accomplished with a drywell.

Early symptoms of decline from excessive fill are small leaf size and premature fall coloration. Dieback of twigs and progressive dying of larger stems in the upper crown also occurs. This dieback may not be noticed for several years, depending on tree species and initial tree health.

Avoid Soil Cuts

Lowering the grade usually is less complicated than fills, but can be equally harmful. Where the grade has been changed near a tree, the most common damage is the complete severing of major roots in that area (Figure 8). This can cause decline, death or decreased stability to high winds. To protect the tree, terrace the grade (Figure 9) or build a retaining wall between the tree and the lower grade. Walls should encompass an area extending at least to the drip line.

Figure 8: Lowering the grade severs roots and kills trees.

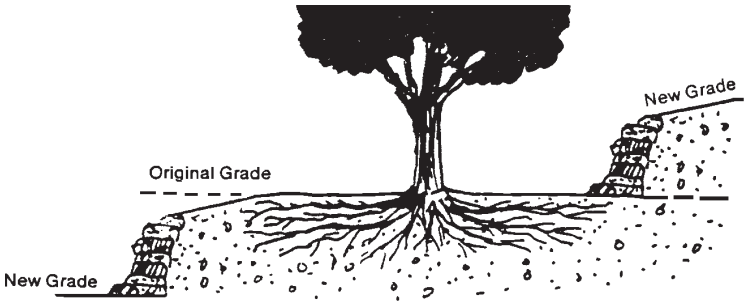

Figure 9: Terracing can substantially limit root injury. Reprinted with permission from *Tree City USA* Bulletin No. 7, National Arbor Day Foundation.

Pruning Injured Trees

Trees with injured roots may show branch dieback quickly or within a few months after the initial injury. Prune dying branches to reduce insect and disease damage to the rest of the tree. Also prune to reduce any hazardous conditions on preserved trees. It is better to wait until the tree exhibits branch die back to see how much to prune, rather than to arbitrarily remove parts of the crown because you assume the root system was damaged. Wildfire regulations may require pruning to a height of 10 feet all trees around your home and outbuildings.

Additional Information

Fact Sheets

- 2.926, Healthy Roots and Healthy Trees
- 6.302, Creating Wildfire-Defensible Zones
- 7.419, Large Deciduous Trees

Planttalk Colorado™

- 1709, Hiring a tree care company
- 1721, Why prune shade trees?
- 1724, Pruning shade trees
- 1730, When to prune trees

Websites

- Colorado State University Extension county office, www.ext.colostate.edu/cedirectory/allcounties2.cfm
- Colorado State Forest Service, csfs.colostate.edu/index.htm
- American Society of Consulting Arborists, www.asca-consultants.org/index.html
- Rocky Mountain Chapter of the International Society of Arboriculture, www.isarmc.org/pro/index.htm

[1]*C. Dennis, Colorado State Forest Service; and W.R. Jacobi, professor, bioagricultural sciences and pest management.*

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APPENDIX B - RECOMMENDED PLANT LIST

City of Wheat Ridge
Recommended Shrubs

		Garden Centers of Colorado Rating		
Botanical Name	**Common Name**	**Highest Water Use**	**Medium Water Use**	**Lowest Water Use**
Acer ginnala	Amur Maple			
Acer ginnala 'Bailey Compact'	Bailey Compact Amur Maple			
Acer ginnala 'Compactum'	Compact Amur Maple			
Acer ginnala 'Emerald Elf'	Emerald Elf Amur Maple			
Acer ginnala 'Flame'	Flame Amur Maple			
Acer tataricum	Tatariam Maple			
Amorpha canescens	Leadplant			
Amelanchier sp.	Serviceberry			
Amelanchier alnifolia	Saskatoon Serviceberry			
Amelanchier alnifolia 'Regent'	Regent Serviceberry			
Amelanchieralniflia 'Autumn Brilliance'	Autumn Brilliance Serviceberry			
Amelanchier canadensis	Shadblow Serviceberry			
Aronia sp.	Chokeberry			
Artemisia sp.	Sage			
Artemisia cana	Silver Sagebush			
Artemisia tridentata	Tall Western Sagebush			
Artiplex canescens	Four-wing Saltbrush			
Buddleia davidii	Butterfly Bush			
Caryopteris x clandonensis	Blue Mist Spirea			
Ceanothus fendleri	Mountain-Lilac			
Ceratoides lanata	Winterfat			
Cercocarpus sp.	Mountain Mahogany			
Cercocarpus brevifolius	Little-flowered Mountain Mahogany			
Cercocarpus intricatus	Littleleaf Mountain Mahogany			
Cercocarpus ledifolius	Curl-leaf Mountain Mahogany			
Cercocarpus montanus	Common Mountain Mahogany			
Chamaebatiaria millefolium	Fernbush			
Chrysothamnus sp.	Rabbitbrush			
Cowania neomexicana	Cliffrose			
Cytisus sp.	Broom			
Cytisus scoparius 'Moonlight'	Moonlight Broom			
Cytisus purgans 'Spanish Gold'	Spanish Gold Broom			
Daphne sp.	Daphne			
Euonymus sp.	Euonymus			
Fallugia paradoxa	Apache Plume			
Forestiera neomexicana	New Mexican Privet			
Hippophae rhamnoides	Sea Buckthorn			
Holodiscuc dumosus	Rock Spirea			
Juniperus sp.	Juniper			
Kolkwitzia amabilis	Beautybush			
Ligustrum sp.	Privet			
Ligustrum obtusifolium var. regalianum	Regal Privet			
Ligustrum vulgare 'Cheyenne'	Cheyenne Privet			
Ligustrum vulgare 'Densiflorium'	Upright Privet			
Ligustrum valgare 'Lodense'	Lodense Privet			
Lonicera sp.*	Honeysuckle			
Lonicera 'Honeyrose'	Honeyrose Honeysuckle			
Lonicera korolkowii var. floribunda 'Blue Velvet'	Blue Velvet Honeysuckle			
Lonicera syringantha var. wolfii	Lilac-flowering dwarf Honeysuckle			
Lonicera tatarica 'Arnold Red'	Arnold Red Honeysuckle			
Lonicera xylosteoides 'Clavey's Dwarf'	Clavey's Dwarf Honeysuckle			
Lonicera xylosteoides 'Miniglobe'	Miniglobe Honeysuckle			
Mahonia repens	Creeping Grape Holly			
Perovskia artiplicifolia	Russian-Sage			
Philadelphus sp.	Mockorange			
Philadelphus lewisii	Lewis Mockorange			
Philadelphus microphyllus	Littleleaf Mockorange			
Physocarpus sp.	Ninebark			
Physocarpus monogynus	Mountain Ninebark			
Physocarpus opulifolius & cultivars	Ninebark			
Pinus mugo	Mugo pine			
Potentilla sp.	Potentilla			
Prunus sp.	Cherries/Plums/Chokecherries			
Prunus besseyi	Western Sand Cherry			

		Garden Centers of Colorado Rating		
Botanical Name	**Common Name**	**Highest Water Use**	**Medium Water Use**	**Lowest Water Use**
Prunus fruiticosa	Ground Cherry			
Prunus tomentosa	Nanking Cherry			
Prunus virginiana	Native Chokecherry			
Quercus gambelii	Gambel Oak			
Rhus sp.	Sumac			
Rhus aromatica	Fragrant Sumac			
Rhus aromatica 'Gro-low'	Gro-Low Sumac			
Rhus glabra	Smooth Sumac			
Rhus glabra var. cismontana	Rocky Mountain Sumac			
Rhus trilobata	Threeleaf Sumac			
Rhus typhina	Staghorn Sumac			
Rhus typhina 'Lacinata'	Cutleaf Sumac			
Ribes sp.	Gooseberry/Currant			
Ribes alpinum	Alpine Currant			
Ribes alpinum 'Green Mound'	Green Mound Currant			
Ribes aureum	Golden Currant			
Ribes cereum	Wax Currant			
Ribes 'Red Lake'	Red Lake Currant			
Ribes 'Pixwell'	Pixwell Currant			
Shepherdia sp.	Buffaloberry			
Spiraea sp.	Spirea			
Symphoricarpus sp.	Snowberry			
Symphoricarpus albus	White Snowberry			
Symphoricarpus chenaultii 'Hancock'	Hancock Coralberry			
Symphoricarpus doorenbosii 'Magic Berry'	Magic Berry Coralberry			
Symphoricarpus doorenbosii 'White Hedge'	White Hedge Snowberry			
Symphoricarpus occidentalis	Western Snowberry			
Symphoricarpus oreophilus	Mountain Snowberry			
Syringa sp.	Lilac			
Syringa hyancinthiflora (all cultivars)	Early Lilac			
Syringa prestoniae (all cultivars)	Late Lilac			
Syringa vulgaris (all cultivars)	Common & French Lilac			
Viburnum sp.	Viburnum			
Viburnum latana	Wayfaringtree			
Viburnum 'Mohican'	Mohican Viburnum			
Viburnum lentago	Nannyberry			
Viburnum rhytidophylloides 'Alleghany'	Alleghany Leatherleaf Viburnum			

** Note: ligustrum species contain thorns*

City of Wheat Ridge
Recommended Grasses and Groundcovers

Ornamental Grasses

Botanical Name	Common Name	Garden Centers of Colorado Rating		
		Highest Water Use	Medium Water Use	Lowest Water Use
Agropyron cristatum	Crested Wheat Grass			
Andropogon gerardii	Big Bluestem			
Bouteloua curtipendula	Sideoats Gramma Grass			
Bouteloua gracilis	Blue Gramma Grass			
Buchloe dactyloides	Buffalograss			
Calamagrostis acutiflora	Feather Reed Grass			
Chasmanthium latifolium	Northern Sea Oats			
Deschampsia caespitosa Hairgrass	Hairgrass			
Erianthus (Sacharrum) ravennae	Hardy Plume Grass			
Festuca arundinacea	Tall Fescue			
Festuca ovina glauca	Blue Fescue			
Helictotrichon sempervirens	Blue Oat Grass			
Imperata cylindrica 'Red Baron'	Japanese Blood Grass			
Miscanthus sinensis	Maiden Hair Grass			
Oryzopsis hymenoides	Indian Ricegrass			
Panicum virgatum Switch Grass	Switch Grass			
Pascopyrum smithii Western Wheatgrass	Western Wheatgrass			
Pennisetum alopecuroides	Fountain Grass			
Pennisetum setaceum 'Rubrum'	Purple Fountain Grass			
Phalaris arundinacea 'Picta'	Ribbon Grass			
Little Bluestem	Little Bluestem			
Sorghastrum nutans	Indian Grass			
Spartina pectinata	Prairie Cordgass			
Sporobolus heterolepsis	Prairie Dropseed			
Stipa Sp. Feather/Needle Grass	Feather/Needle Grass			

Groundcovers

Botanical Name	Common Name
Antennaria rosea	Pink Pussytoes
Cerastium tomentosum	Snow-in-Summer
Delosperma sp.	Hardy Ice Plant
Euonymus fortunei varieties	Wintercreeper
Lysimachia nummularia	Moneywort
Polygonum affine	Himalayan Fleeceflower
Polygonum 'Border Jewell'	Himalayan Border Jewell
Santolina chamaecyparissus	Lavendar Cotton
Sedum spectabile	Showy Stonecrop
Sempervirens sp.	Hens and Chicks
Thymus pseudolanuginosus	Wooly Thyme
Veronica pectinata Blue	Blue Wooly Speedwell
Vinca minor 'Bowles'	Periwinkle
Zinnia grandiflora	Paper Flower

City of Wheat Ridge
Recommended Street Trees

Botanical Name	Common Name	Moisture	Sun	Height	Spread	General Habit	Flowers	Additional Notes	Fruit
Acer buergeranum	Trident Maple	Mod	Full to part	35	25	Irregular oval to rounded; Simple tri-lobed, green to orange-red in fall		No pests or disease problems known.	Paper winged seed "whirly bird"
Acer campestre	Hedge Maple	Min	Full to part	35	30	Rounded and dense, low-branching; Simple, deep dark green turning yellow-green or yellow in fall		Good maple for dry, alkaline soils; a tough urban toerant tree. Pruning for low branching habit	Paper winged seed "whirly bird"
Acer glabrum	Rocky Mountain Maple	Min to Mod	Full to shade	20	20	Ascending narrow; Simple, small coarsely toothed, turning from light green to reddish-orange in fall		Heat tolerance may be biggest issue in landscape setting - use on protected sites; pruning for form and clearance. AKA: Douglas maple	Paper winged seed "whirly bird"
Acer grandidentatum	Bigtooth Maple	Xeric	Full to shade	25	15	Broad and spreading; Simple, dark green to orange/red/yellow in fall		Slower grower than Sugar Maple. Prune for central leader, seed crop negligible. AKA: Wasatch maple or canyon maple	Paper winged seed "whirly bird"
Acer grandidentatum 'Schmidt'	Rocky Mountain Glow Maple	Xeric	Full to shade	25	15	Broad and spreading; Simple, dark green to orange/red/yellow in fall		Slower grower than Sugar Maple. Prune for central leader, seed crop negligible.	Paper winged seed "whirly bird"
Acer griseum	Paperbark Maple	Min to Mod	Full to shade	25	20	Oval to rounded; Simple trifoliate, flat bluish green to russet-red in fall		Slower growing maple. Adaptable to many soils; plant in partial shade as is quite susceptible to scorch. Slow growing. Prune to eliminate multistems	Paper winged seed "whirly bird"
Acer miyabei 'Morton'	State Street Maple	Mod	Full	40	25	Upright, rounded to oval; Simple, dark green to yellow in fall		Tolerates heat and dry sites	Paper winged seed "whirly bird"
Acer nigrum 'Green Column'	Green Column Maple	Mod	Full to part	55	20	Upright columnar ; Simple, dark green and glossy to yellow in fall	Greenish yellow in spring prior to bud break	Good heat and drought tolerance, some scorch. Some research offers conflicting reports on this tree's salt tolerance (rating it from very tolerant to sensitive)	Paper winged seed "whirly bird"
Acer platanoides 'Globosum'	Globe Maple	Mod	Full	20	15	Dense rounded; Simple, dark green to yellow in fall		Late summer scorch an issue, as with most Norway Maples	Paper winged seed "whirly bird"
Acer pseudoplatanus	Sycamore Maple	Mod	Full to part	50	40	Upright, spreading to rounded; Simple, dark green turning yellow-brown in fall		Needs room, Rapid growth rate. Height may vary, can grow up to 60'+ Soil adaptable. Heart rot may be a long-term issue	Paper winged seed "whirly bird"
Acer pseudosieboldianum	Korean Maple	Mod	Full to part	20	20	Upright spreading ; Palmate, green to yellow/orange-red in fall	Reddish purple in spring	Plant in protected area from cold winter winds	Paper winged seed "whirly bird"
Acer rubrum 'Autumn Flame'	Autumn Flame Maple	Mod	Full to part	40	35	Upright, oval to pyramidal form; Simple, medium green leaves to bright red in fall	Showy red in spring	Our native soils could lead to chlorosis problems. Rapid growth rate, needs structure pruning	Paper winged seed "whirly bird"
Acer × freemanii 'Armstrong'	Armstrong Maple	Mod	Full to part	50	15	Upright columnar ; Simple, green and glossy to orange/red/yellow in fall	Showy red in spring	Our native soils could lead to chlorosis problems. Rapid growth rate	Paper winged seed "whirly bird"
Acer rubrum 'Bowhall'	Bowhall Maple	Min to Mod	Full	40	25	Upright columnar ; Simple, glossy green to orange/red/yellow in fall	Showy red in spring	Our native soils could lead to chlorosis problems. Rapid growth rate. Moderately drought tolerant	Paper winged seed "whirly bird"
Acer 'Frank Jr.'	Redpointe Maple	Mod	Full	40	25	Broadly pyramidal: Simple, dark green to bright red in fall			Paper winged seed "whirly bird"
Acer rubrum 'Brandywine'	Brandywine Maple	Mod	Full	30	30	Upright, oval to pyramidal; Simple, medium green leaves to bright red/purple in fall		Our native soils could lead to chlorosis problems. Faster growing. Seedless variety, resistant to leafhopper	Paper winged seed "whirly bird"
Acer rubrum 'Sun Valley'	Sun Valley Maple	Mod	Full	40	35	Broadly pyramidal, ovate; Simple, dark green to brightred in fall		Our native soils lead to chlorosis problems. Improved resistance to anthracnose, spider mites and leafhoppers	Paper winged seed "whirly bird"
Acer saccharum 'Astis'	Steeple Maple	Mod	Full to part	45	20	Narrow oval canopy; Simple, dark green turning yellow to orange-red in fall.		Good heat and drought tolerance for a sugar maple.	Paper winged seed "whirly bird"
Acer saccharum 'Autumn Splendor'	Autumn Splendor Maple	Min to Mod	Full to part	40	35	Broadly round; Simple, glossy green foliage to orange-red in fall		Rapid growth rate, heat resistant. Selected from the Caddo strain native to Oklahoma	Paper winged seed "whirly bird"
Acer saccharum 'Balista'	Fall Fiesta Maple	Mod	Full to part	60	40	Broadly ovate ; Simple, shiny dark green in summer with a tint of red on emergence to orange/red in fall		Rapid growth rate. Touted for heat resistance, sunscald and frost crack tolerance	Paper winged seed "whirly bird"
Acer saccharum 'Barrett Cole'	Apollo Maple	Mod	Full	25	10	Narrow upright to columnar; Simple, dark green to yellow-orange/red in fall		Dwarf columnar selection. Not drought tolerant	Paper winged seed "whirly bird"
Acer saccharum 'John Pair'	John Pair Maple	Min to Mod	Full	30	30	Rounded; Simple, glossy green leaves to red in fall		Heat resistant. Selected from the Caddo strain native to Oklahoma	Paper winged seed "whirly bird"
Acer saccharum 'Legacy'	Legacy Maple	Mod	Full to part	50	35	Oval to round; Simple, dark green in summer to yellow-orange to red in fall		Legacy has thicker leaves that resist tatter and is more drought toleran than is typical for sugar maples.	Paper winged seed "whirly bird"
Acer saccharum 'Morton'	Crescendo Maple	Mod	Full to part	40	30	Broadly oval; Simple, dark green leaves in summer to orange - red in fall		Salt can be very problematic. Heat tolerant	Paper winged seed "whirly bird"
Acer saccharum 'Reba'	Belle Tower Maple	Mod	Full	45	20	Narrow oval; Simple, bright green to orange-yellow in fall			Paper winged seed "whirly bird"
Acer tataricum 'GarAnn'	Tatarian Maple	Xeric	Full	20	15	Rounded to irregular; Simple trifoliate, softer green to yellow /red in fall	White clusters in spring	Rarely suckers, pruning to maintain outline. Hot Winfs planted for heavy showy red seed crop	Paper winged seed "whirly bird"
Acer tataricum 'JFS-KW2'	Rugged Charm Maple	Xeric	Full	20	15	Compact oval to rounded; Simple trifoliate, softer green to yellow /red in fall	White clusters in spring	Rarely suckers, pruning to maintain outline. Hot Winfs planted for heavy showy red seed crop	Paper winged seed "whirly bird"
Acer triflorum	Three-flower Maple	Mod	Part	25	25	Rounded to upright spreading; Simple trifoliate, green to rich yellow and reds in fall	Pink to greenish yellow clusters of 3	High pH incompatibility may be an issue. Plant on protected site. Plant in wide tree lawn (>6')	Paper winged seed "whirly bird"
Acer 'Keithsform'	Norwegian Sunset Maple	Min	Full	30	20	Vase to rounded oval; Simple, dark green to yellow in fall		Pruning for street use to maintain shape and structure. Heat and drought tolerant	Paper winged seed "whirly bird"
Acer truncatum 'Fire Dragon'	Fire Dragon Maple	Min	Full	30	20	Vase to rounded oval; Simple, dark green to red in summer then deeper red in fall		Pruning for street use to maintain shape and structure. Heat and drought tolerant. AKA: Shandong Maple, Purpleblow Maple	Paper winged seed "whirly bird"

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Botanical Name	Common Name	Moisture	Sun	Height	Spread	General Habit	Flowers	Additional Notes	Fruit
Acer 'Warrenred'	Pacific Sunset Maple	Min	Full to part	30	25	Rounded, upright spreading more than Norwegian; Simple, dark green to yellow-orange in fall	Greenish yellow in spring prior to bud break	Pruning for clearance	Paper winged seed "whirly bird"
Acer 'JFS-KW202'	Crimson Sunset Maple	Mod	Full to part	25	25	Upright oval; Deep purple to maroon/reddish bronze in fall		Touted as more heat tolerant than most platanoides	Paper winged seed "whirly bird"
Aesculus × carnea 'Fort McNair'	Fort McNair Horsechestnut	Min	Full	40	30	Rounded-pyramidal to rounded: Palmate, dark green to yellow in fall	Upright panicles of pink with yellow throat	Large, well drained sites best. Large spiny fruit and twig drop. Ruby Red (AKA: Briotii) variety nearly fruitless.	Round hard nuts, 1 inch in diameter
Aesculus × carnea 'Briotii'	Ruby Red Horsechestnut	Min	Full	35	30	Rounded-pyramidal to rounded: Palmate, dark green to yellow in fall	Upright panicles of pink to deep red	Large, well drained sites best. Large spiny fruit and twig drop. Ruby Red (AKA: Briotii) variety nearly fruitless.	Round hard nuts, 1 inch in diameter
Aesculus flava	Yellow Buckeye	Mod	Full	50	25	Dense symmetrical upright oval; Palmately-compound, dark green to yellow/brown in fall	Upright clusters ofWhite/green showy in spring	Large fruit and twig drop, scorch	Round hard nuts, 1 inch in diameter
Aesculus glabra	Ohio Buckeye	Mod	Full	35	35	Dense, symmetrical round; Palmate, bright green in summer to yellow/orange-brown in fall	Uprighht yellow clusters in spring	Frequently scorches, can be messy with twig, fruit, and early leaf drop. Occasionally much larger than size listed	Round hard nuts, 1 inch in diameter
Aesculus hippocastanum	Common Horsechestnut	Mod	Full	50	40	Upright oval to rounded; Palmate, dark green in summer to yellow in fall	Large upright creamy yellow in late spring	Spiny fruit and twig drop. Scorch a problem	Round hard nuts, 1 inch in diameter
Aesculus hippocastanum 'Baumannii'	Baumann Horsechestnut	Mod	Full	60	40	Dense symmetrical oval; Palmate, dark green in summer to yellow in fall	Upright, double white in late spring	No fruit. Scorch still an issue	Round hard nuts, 1 inch in diameter
Alnus cordata	Italian Alder	Min to Mod	Full to part	40	25	Pyramidal to rounded pyramidal; Simple, glossy green in summer with little fall color		Prefers moist soils, will tolerate dry. Leaf miner could be an issue.	Small winged seed
Alnus glutinosa 'Pyramidalis'	Pyramidal Alder	Mod	Full to part	40	20	Dense irregular oval to pyramidal; Simple, ovate to round with double serrated dark green, poor fall color.		Prefers wetter soils. Leaf miner, tent caterpillar, powdery mildew. Cultivar AKA: Fastigiata.	Small winged seed
Amelanchier × grandiflora 'Autumn Brilliance'	Autumn Brilliance Serviceberry	Xeric to Min	Full to part	25	15	Upright, oval to rounded; Simple, medium green turning orange-red/red in fall.	White	Moderate grower. Pruning for single stem. Are susceptible to many insect and disease problems	Small berry
Amelanchier × grandiflora 'Cole'	Cole's Select Serviceberry	Xeric to Min	Full to part	20	15	Oval, rounded with multi-stem; Simple, medium green turning orange-red/red in fall	Pendulous white clusters	Moderate grower. Pruning for single stem.	Small berry
Amelanchier × grandiflora 'Princess Diana'	Princess Diana Serviceberry	Xeric to Min	Full to part	25	15	Upright spreading with multi-stem; Simple, medium green turning orange-red/red in fall	White	Moderate grower. Pruning for single stem.	Small berry
Amelanchier × grandiflora 'Robin Hill'	Robin Hill Serviceberry	Xeric to Min	Full to part	25	18	Oval, rounded with multi-stem; Simple, medium green turning orange-red/red in fall	Opening pink, fade to white	Moderate grower. Good tree form	Small berry
Amelanchier arborea	Downy Serviceberry	Min to Mod	Full to part	30	15	Dense and irregular; Simple, green to yellow-orange to red in fall	Pink to white	AKA: Juneberry, Shadbush, Sarvis-berry, Indian Cherry, Sugarplum	Small berry
Amelanchier canadensis	Shadblow Serviceberry	Xeric	Full to part	20	15	Oval, multi-stem or single; Simple, green to dark green in summer, yellow to red in fall	Clusters of white	Rootstock suckering possible; needs moist, well, drained	Small berry
Amelanchier laevis 'JFS-Arb'	Spring Flurry Serviceberry	Min	Full to part	35	20	Upright, oval; Simple, medium green foliage turns orange in fall	Clusters of white	Single-stemmed with a dominant leader. 3/8" purple fruit is edible.	Small berry
Betula nigra 'BNMTF'	Dura-Heat River Birch	Min to Mod	Full	45	30	Upright-oval to pyramidal; Simple, leathery dark green to yellow in fall		Tolerant of local soils	Thin flexible catkins, 1-3 inches
Betula nigra 'Cully'	Heritage River Birch	Min to Mod	Full to part	45	30	Upright-oval to pyramidal; Simple, dark green to yellow in fall		Tolerant of local soils	Thin flexible catkins, 1-3 inches
Betula platyphylla	Siberian Silver Birch	Mod	Full to part	40	20	Upright-oval to pyramidal; Simple, dark green to yellow in fall			Thin flexible catkins, 1-3 inches
Betula utilis var. jacquemontii	White-Barked Himalayan Birch	Mod	Full	35	15	Pyramidal; Simple, dark green to yellow in fall		Bark whitest of all Birches. Tolerant of local soils	Thin flexible catkins, 1-3 inches
Carpinus betulus 'Columnaris'	Columnar Hornbeam	Mod	Full to part	35	20	Upright-oval, compact. Simple, dark green to yellow		Heat produces scorch and poor vigor. Strong central leader and is the best selection.	Small nut attached to a paper wing
Carpinus betulus 'Frans Fontaine'	Frans Fontaine Hornbeam	Mod	Full to part	35	20	Upright, compact crown. Simple, green to yellow in fall		Heat produces scorch and poor vigor	Small nut attached to a paper wing
Carpinus caroliniana 'CCSQU'	Palisade Hornbeam	Mod	Part	30	15	broad upright; Simple, green leaves turn yellow to orange in fall.		Attractive gray bark is muscle-like.	Small nut attached to a paper wing
Carpinus caroliniana	American Hornbeam	Mod	Part	25	25	Broadly conical; Simple, dark green to yellow/red/orange to purple in fall	4" long white	Heat produces scorch and poor vigor. AKA: Musclewood, Ironwood	Small nut attached to a paper wing
Carpinus japonica	Japanese Hornbeam	Mod	Part	20	15	Rounded narrow with spreading limbs; Simple, dark green leaves turn yellow in fall		Grows well as an understory tree (tolerates shade well)	Small nut attached to a paper wing
Catalpa speciosa	Northern Catalpa	Xeric to Min		60	40	Narrow oval, irregular and open; Broad ovate to cordate green to yellow-brown in fall	White bell shaped with yellow and purple spots in June	Cigar-like fruit and large leaves make this a fairly messy tree. Very adaptable to its growing environment. Too much water may be detrimental.	Prencil thin pods, 8-20 inches long
Celtis laevigata 'All Seasons'	All Seasons Sugarberry	Xeric to Min	Full to part	60	40	Rounded to broad rounded; Simple, glossy and green to dull yellow in fall			Small hard seed on a paper wing
Celtis 'Magnifica'	Magnifica Hackberry	Min to Mod	Full to part	50	40	Broadly oval to vase; Simple, green to yellow in fall		Faster growth rate. Heat tolerant	Small hard seed on a paper wing
Celtis occidentalis 'JFS-KSU1'	Prairie Sentinel Hackberry	Xeric to Min	Full to part	45	15				Small hard seed on a paper wing

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Celtis occidentalis	Common Hackberry	Xeric to Min	Full to part	60	45	Pyramidal to irregular-rounded when mature; Simple, light to medium green in summer to yellow in fall		Very susceptible to Nipple Gall, aesthetic problem unless major and repeated infestations	Small hard seed on a paper wing
Celtis reticulata	Netleaf Hackberry	Xeric to Min	Full	25	25	rounded and spreading; Simple, green to yellow in fall		Slow growing, pruning for structure and clearance; small fruit can be messy. AKA: Douglas hackberry.	Small hard seed on a paper wing
Cercis canadensis	Eastern Redbud	Min to Mod	Full to part	25	25	Dense, broad rounded; Simple, green to yellow-green in fall	deep pink to purple opening up in to magenta-pink to mid May	Shape makes maintaining clearance difficult. Structure pruning when young is extremely important. AKA: Judas Tree	Thin papery pod 1-3 inches long
Corylus colurna	Turkish Filbert	Xeric	Full to part	50	30	Pyramidal to spreading round; Simple, green in summer to yellow in fall		Needs 8' wide tree lawn or more, can be difficult to transplant, pruning for clearance issues. Full sun best, tolerates air pollution	Nuts 3/4 inch
Crataegus × lavallei	Lavalle Hawthorn	Min to Mod	Full to part	20	15	Rounded to irregular vase;	Large white in late may	Persistant red fruit	Clusters of small berries
Crataegus × mordenensis 'Snowbird'	Snowbird Hawthorn	Xeric to Min	Full to part	20	20	Small tree with a rounded crown and a fluted trunk; Simple, green leaves without significant fall color; flowers vary by cultivar from pink to white	Double white turning pink	Has some thorns. Drought tolerant, but susceptible to fireblight	Clusters of small berries
Crataegus × mordenensis 'Toba'	Toba Hawthorn	Xeric to Min	Full	20	20	Rounded; Simple, green to dull yellow in fall	White with pink borders	Drought tolerant, thornless, susceptible to fireblight	Clusters of small berries
Crataegus ambigua	Russian Hawthorn	Xeric	Full	20	20	Rounded; Simple, medium-green to yellow in fall	Small clusters of white	Has the occasional small thorn but is essentially thornless. Exfoliating bark	Clusters of small berries
Crataegus crus-galli inermis	Thornless Cockspur Hawthorn	Xeric	Full	20	25	Dense, rounded; Simple, glossy dark green to yellow in fall	White clusters	Shape makes maintaining clearance difficult. Structure pruning when young is extremely important. Fruit litter can be extensive. Exfoliating bark	Clusters of small berries
Crataegus laevigata 'Crimson Cloud'	Crimson Cloud Hawthorn	Xeric to Min	Full	20	15	Upright elliptical; Simple, dark green to yellow in fall	Red with white center	Susceptible to leaf spot/blight and Cedar Hawthorn rust.	Clusters of small berries
Crataegus laevigata 'Paulii'	Paul's Scarlet Hawthorn	Xeric to Min	Full	25	20	Irregular, oval-Rounded; Simple, dark green to red in fall.	Varies- lavendar, pink to white	Can be many insect and disease issues in our area	Clusters of small berries
Crataegus viridis 'Winter King'	Winter King Hawthorn	Min	Full to part	15	20	Upright vase when young to spreading;	White	Fewer thorns than species, persistant red fruit	Clusters of small berries
Fagus sylvatica	European Beech	Min to Mod	Full	50	45	Boradly pyramidal; Simple, green with tinge of red to reddish bronze in fall		Slower growth rate. Needs large root space	Small thin winged seed 1 inch
~~Fraxinus mandschurica 'Mancana'~~	~~Mancana Ash~~	Min to Mod	Full to part	45	25	Dense broadly oval; Compound, green to yellow in fall	Small, greenish -yellow, not showy	Seedless. Susceptible to sunscald. Not for use in plaza/hardscape areas	Small thin winged seed 1 inch
~~Fraxinus nigra 'Fallgold'~~	~~Fallgold Ash~~	Mod	Full to part	40	25	Dense more narrow upright; Compound, green to yellow in fall	Small, greenish -yellow, not showy	Nees more moisture than green ash Seedless	Small thin winged seed 1 inch
~~Fraxinus pennsylvanica 'Bergeson'~~	~~Bergeson Ash~~	Min to Mod	Full to part	45	25	Upright rounded; Compound, glossy green to yellow in fall	Small, greenish -yellow, not showy	Faster growth than typical green ash, seedless	Small thin winged seed 1 inch
~~Fraxinus pennsylvanica 'Cimmzam'~~	~~Cimarron Ash~~	Min to Mod	Full to part	50	25	Narrow upright to rounded; Compound, glossy dark green to orange-red in fall	Small, greenish -yellow, not showy	Not for use in plaza/hardscape areas. Over-used in landscape design. Seedless.	Small thin winged seed 1 inch
~~Fraxinus pennsylvanica 'Marshall Seedless'~~	~~Marshall Seedless Ash~~	Min to Mod	Full to part	50	35	Symmetrical Oval to upright; Compound, green to yellow in fall	Small, greenish -yellow, not showy	This tree **may become an extremely high maintenance** tree with annual preventative pesticidal spraying necessary if emerald ash borer becomes established in Colorado. **Not for use in plaza/hardscape areas. Over-used in landscape design. Faster growing but has weak branch crotches and insect problems, is seedless.**	Small thin winged seed 1 inch
~~Fraxinus pennsylvanica 'Patmore'~~	~~Patmore Ash~~	Min to Mod	Full	50	30	Symmetrical Oval to upright; Compound, green to yellow in fall	Small, greenish -yellow, not showy	This tree **may become an extremely high maintenance** tree with annual preventative pesticidal spraying necessary if emerald ash borer becomes established in Colorado. **Not for use in plaza/hardscape areas. Over-used in landscape design. Has weak branch crotches, seed crops, and insect problems.**	Small thin winged seed 1 inch
~~Fraxinus pennsylvanica 'Urbanite'~~	~~Urbanite Green Ash~~	Min to Mod	Full	55	40	Symmetrical Oval to upright; Compound, green to yellow in fall	Small, greenish -yellow, not showy	This tree **may become an extremely high maintenance** tree with annual preventative pesticidal spraying necessary if emerald ash borer becomes established in Colorado. **Not for use in plaza/hardscape areas. Over-used in landscape design. Faster growing but has weak branch crotches, heavy seed crop, and insect problems.**	Small thin winged seed 1 inch
~~Fraxinus quadrangulata~~	~~Blue Ash~~	Min to Mod	Full to part	50	35	Symmetrical Oval to upright; Compound, green to yellow in fall	Small, greenish -yellow, not showy	Tolerant of high ph soils and urban conditions. This tree **may become an extremely high maintenance** tree with annual preventative pesticidal spraying necessary if emerald ash borer becomes established in Colorado.	Small thin winged seed 1 inch
Ginkgo biloba 'Autumn Gold'	Autumn Gold Ginkgo Maidenhair Tree	Mod	Full to part	45	35	Symmetrically pyramidal when young, broad spreading with age; Simple, unique fan-shaped green leaves to excellent gold fall color		Male clone, fruitless. Faster than species, needs root space	Male trees, no fruit
Ginkgo biloba 'Golden Colonnade'	Golden Colonnade Ginkgo	Mod		45	30	Uniform compact oval; Simple fan shaped, green to yellow fall color		Male clone, fruitless. Slow grower	Male trees, no fruit
Ginkgo biloba 'Shangri-La'	Shangri-La Ginkgo								Male trees, no fruit

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Ginkgo biloba 'Magyar'	Magyar Ginkgo	Mod		50	25	Upright symmetrically pyramidal to narrowly pyramidal with age; Unique fan-shaped leaves with bright yellow fall color		Male clone, fruitless. Moderate growth rate	Male trees, no fruit
Ginkgo biloba 'President'	President Ginkgo	Mod		50	40	Broad to pyramidal oval; Unique fan-shaped medium green leaves turning bright yellow in fall.		Male clone, fruitless.	Male trees, no fruit
Ginkgo biloba 'Princeton Sentry'	Princeton Sentry Ginkgo	Mod		40	15	Symmetrically upright and narrow pyramidal; Unique fan-shaped leaves with bright yellow fall color		Male clone, fruitless. Slow grower	Male trees, no fruit
Gleditsia triacanthos inermis 'Imperial'	Imperial Honeylocust	Xeric		60	40	Broadly rounded, good horizontal branching angles; Compound, ovate dark green in summer, yellow to orange fall color		Essentially fruitless; **over-used in landscape design**	Stout pod, 1 inch wide and 8-12 inches long
Gleditsia triacanthos inermis 'Moraine'	Moraine Honeylocust	Xeric		45	35	Vase shaped, rounded, flat topped with maturity; Compound ovate leaflets green to yellow in fall. Skyline best structure of group.		Essentially fruitless; **over-used in landscape design**	Stout pod, 1 inch wide and 8-12 inches long
Gleditsia triacanthos inermis 'Northern Acclaim'	Northern Acclaim Honeylocust								Stout pod, 1 inch wide and 8-12 inches long
Gleditsia triacanthos inermis 'Shademaster'	Shademaster Honeylocust								Stout pod, 1 inch wide and 8-12 inches long
Gleditsia triacanthos inermis 'Draves'	Street Keeper Honeylocust			45	20				Stout pod, 1 inch wide and 8-12 inches long
Gleditsia triacanthos inermis 'Skyline'	Skyline Honeylocust								Stout pod, 1 inch wide and 8-12 inches long
Gleditsia triacanthos inermis 'Trueshade'	Trueshade Honeylocust	Xeric		40	35	Broadly oval; Compound ovate leaflets medium green to yellow in fall.		Essentially fruitless; **over-used in landscape design**. Faster growth and better branch angles than other varieties	Stout pod, 1 inch wide and 8-12 inches long
Gymnocladus dioicus	Kentucky Coffeetree	Xeric		60	40	Sparse branching when young; Oval to vase shaped, upward branching; Filtered shade; Leaves emerge late spring; Blue green in summer and yellow fall color		Female trees have fruit litter.	Thick, leathery pod, 1-2 inches wide and 8-12 long
Gymnocladus dioicus 'Espresso'	Espresso Coffeetree	Xeric		60	40	Sparse branching when young; Oval to vase shaped, upward branching; Filtered shade; Leaves emerge late spring; Blue green in summer and yellow fall color		Fruitless.	
Juglans nigra	Black Walnut	Min		55	50	Rounded with pendulous lower branches as matures; Alternate pinnately compound dark green to dull yellow in fall; Pendulous green catkins.		Fruit litter is a larger nut, attracts squirrels. Exudes a chemical that prevents certain other plants from growing nearby. 1000 Cankers disease makes planting this tree a gamble at best.	Walnuts
Koelreuteria paniculata	Goldenraintree	Xeric		30	30	Irregular rounded, open; Purple red while emerging, bright green to blue-green in summer, yellow in fall		Volunteer seedlings could be problematic in neglected spaces.	Clusters of paper lanterns
Maackia amurensis	Amur Maackia	Min		25	35	Upright branching in youth, branches relaxing downward with age; Dull dark green in summer; no appreciable fall color		Structural pruning is necessary to prevent need to remove large limbs as the tree matures.	Thin flat pod 2-3 inches
Malus 'Adams'	Adams Crabapple	Min to Mod		20	20	Rounded canopy		Not the showiest crabapple. Persistent 1/2" fruit is a dull red. Flowers are a deep pink.	Crabapple, 1/2 inch
Malus 'Adirondack'	Adirondack Crabapple			15	8	Small upright tree.		Persistent 1/2" red to red-orange fruit. Large flowers are white tinged with red, almost 2" across.	Crabapple, 1/2 inch
Malus 'Centruion'	Centurion Crabapple			20	15	Columnar when young, spreading with age. Yellow fall color.		Persistent 1/2" red fruit. Flower color is rose-red.	Crabapple, 1/2 inch
Malus 'David'	David Crabapple			12	12	Compact, rounded canopy.		Persistent 1/2" red fruit. Flower color is pink-tinged white.	Crabapple, 1/2 inch
Malus 'Donald Wyman'	Donald Wyman Crabapple			20	20				Crabapple, 1/2 inch
Malus 'Doubloons'	Doubloons Crabapple			12	10	Small, upright spreading tree.		Persistent 1/3" yellow-gold fruit.	Crabapple, 1/3 inch
Malus 'Harvest Gold'	Harvest Gold Crabapple			20	15	Upright tree.		Persistent 1/2" gold fruit. Flowers are white.	Crabapple, 1/2 inch
Malus 'Indian Magic'	Indian Magic Crabapple			15	15	Upright, spreading form.		Persistent 1/2" red-orange fruit. Flower color is deep pink.	Crabapple, 1/2 inch
Malus 'Indian Summer'	Indian Summer Crabapple			18	20	Rounded canopy.		Persistent 3/4" bright red fruit. Flower color is rose-red.	Crabapple, 3/4 inch
Malus baccata 'Jackii'	Jack's Siberian Crabapple			20	20	Broad, upright, rounded form.		1/2" bright red fruit. Flowers are white.	Crabapple, 1/2 inch
Malus 'Liset'	Liset Crabapple			15	15	Rounded, open, loose canopy. Leaves open red-maroon and mature bronze-green.			Crabapple, 1/2 inch
Malus 'Margaret'	Margaret Crabapple			15	15				Crabapple, 1/2 inch
Malus ioensis 'Prairie Rose'	Prairie Rose Crabapple			20	20			**Fruitless.** Flower color is pink.	Fruitless
Malus 'Prairiefire'	Prairiefire Crabapple			20	20	Rounded, spreading form. Orange-red fall color.		Persistent 1/4" purple-red fruit. Flower color is purple-red.	Crabapple, 1/4 inch
Malus 'Professor Sprenger'	Professor Sprenger Crabapple			20	20				Crabapple, 5/8 inch
Malus 'Profusion'	Profusion Crabapple			20	20	Upright, spreading form. Leaves open purplish and turn to bronze.		Persistent 1/2" maroon fruit. Flower is a deep pink.	Crabapple, 1/2 inch
Malus × purpurea 'Lemoinei'	Purple Crabapple			18	18			Perhaps the most popular red-flowering crabapple.	Crabapple, 5/8 inch

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Malus 'Purple Prince'	Purple Prince Crabapple			15	15				Crabapple, 5/8 inch
Malus baccata 'Radiant'	Radiant Crabapple			25	20	Rounded canopy. Leaves open reddish purple and turn to green.		Persistent 1/2" red fruit. Flower is a deep pink.	Crabapple, 1/2 inch
Malus 'Red Barron'	Red Barron Crabapple			18	8	Columnar tree with purplish leaves in spring, turning bronze.		Persistent 1/2" red fruit. Flower is a reddish pink.	Crabapple, 1/2 inch
Malus baccata 'Red Splendor'	Red Splendor Crabapple			20	20				Crabapple, 5/8 inch
Malus 'Robinson'	Robinson Crabapple			25	25	Upright spreading canopy of bronze-green leaves.		Persistent 3/8" red fruit. Flower is a deep pink.	Crabapple, 3/8 inch
Malus 'Royal Raindrops'	Royal Raindrops Crabapple			20	15	Purple leaves look very similar to maple leaves and turn orange-red in fall.		Persistent 1/2" red fruit. Flower color is bright pinkish red.	Crabapple, 1/2 inch
Malus 'Sentinel'	Sentinel Crabapple			20	12	Upright, narrow form.		Persistent 1/2" red fruit. Flower bud opens red and turns to white.	Crabapple, 1/2 inch
Malus baccata 'Spring Snow'	Spring Snow Crabapple			25	20	Rounded canopy of bright green leaves that turn yellow in fall.		**Fruitless.** Flower color is white and flowers are fragrant.	Crabapple, few to none
Malus 'Sugar Tyme'	Sugar Tyme Crabapple			18	15				Crabapple, 1/2 inch
Malus 'Thunderchild'	Thunderchild Crabapple			15	15	Rounded form with purple leaves.		Persistent 1/2" purple-red fruit. Flower color is rose pink.	Crabapple, 1/2 inch
Malus 'Velvet Pillar'	Velvet Pillar Crabapple			20	14				Crabapple, 1/2 inch
Malus 'White Angel'	White Angle Crabapple			20	20				Crabapple, 1/2 inch
Malus 'White Candle'	White Candle Crabapple			18	15				Crabapple, 1/2 inch
Ostrya virginiana	American Hophornbeam	Min to Mod		40	25	Upright oval canopy with dark green foliage, turning yellow in fall		Pest resistant and drought tolerant. Flexible limbs resist snow & ice breakage. Hop-like fruits.	Small papery seed pod
Platanus × acerifolia 'Bloodgood'	Bloodgood London Planetree	Mod		55	35	Pyramidal when young, open and spreading with age; Bark is extremely showy, mottled with cream, olive and light brown colors; Medium to dark green leaves in summer; yellow-brown in fall		1' globe-shaped (syncarp), pendulous, on long stalks; Large root system.	Round light weight ball containing many seeds 1 inch
Platanus × acerifolia 'Encore'	Encore London Planetree	Mod		55	35	Pyramidal when young, open and spreading with age; Bark is extremely showy, mottled with cream, olive and light brown colors; Medium to dark green leaves in summer; yellow-brown in fall		1' globe-shaped (syncarp), pendulous, on long stalks; Large root system.	Round light weight ball containing many seeds 1 inch
Platanus occidentalis	American Sycamore	Mod		65	45	Pyramidal to rounded; Large leaves, green in summer to yellow in fall		Large root system. Fruit litter. Requires a tree lawn at least 8 feet wide.	Round light weight ball containing many seeds 1 inch
Prunus × cistena 'Schmidtcis'	Big Cis Plum	Xeric to Min		15	10	Dense round canopy; Dark purple foliage; Light pink fragrant flowers		Rapid grower	Small 1 inch fruit
Prunus × fontanesiana	DeFontaine's Cherry	Min		40	30	Vase shaped in maturity; Simple, green turning orange in fall; pendulous white flowers in spring.			Small crerries
Prunus × hillieri 'Spire'	Spire Cherry	Min		30	10	Very narrow upright form; excellent soft-pink flowers in spring; fall color is a dull red			Small cherrirs
Prunus cerasifera 'Crimson Pointe'	Crimson Pointe Plum	Min		25	15	Columnar to narrow oval canopy. Leaves are purple-red to bronze with reddish fall color.		Rapid growth rate with a strong central leader. Flowers are white.	Small 1 inch fruit
Prunus cerasifera 'Minnesota Purpleleaf'	Purpleleaf Plum	Min		20	20	Round with horizontal branching; Reddish-purple leaves; Pinkish-white showy spring flowers		Pruning for street use	Small 1 inch fruit
Prunus cerasifera 'Mt. St. Helen's'	Mt. St. Helen's Plum	Min to Mod	Full	20	20	Upright rounded; Simple, dark purple leaves turning a darker purple in fall	Light pink fragrant flowers		Small 1 inch fruit
Prunus cerasifera 'Newport'	Newport Plum								Small 1 inch fruit
Prunus padus	European Birdcherry	Min to Mod		25	15	Narrow ascending branches spreading with age;Simple, bright green to yellow in fall,; Clusters pf white flowers in spring		Pruning for single stem, small fruit can stain concrete; Susceptible to black knot; AKA: Mayday Tree	Cluster of small cherries
Prunus sargentii	Sargent Cherry	Mod		35	25	Equal height and spread; Purplish new growth dark green to yellow/orange/red in fall		Clean up maintenance due to 1/2" small fruits. Listed cultivars are upright varieties.	Cluster of small cherries
Prunus sargentii 'Columnaris'	Columnar Sargent Cherry								Cluster of small cherries
Prunus sargentii 'Rancho'	Rancho Cherry								Cluster of small cherries
Prunus sargentii 'JFS-KW58'	Pink Flair Cherry								Cluster of small cherries
Prunus serotina	Black Cherry	Min to Mod		50	35	Oval with pendulous branches; Simple and lanceolate-ovate medium to dark green turning dull yellow to reddish in fall; White flowers are long pendulous racemes in mid to late May.		Black knot and tent caterpillar. Attracts birds that scatter seeds resulting in unwanted volunteer trees. Fruit is messy and can stain. Prone to snow/ice breakage.	Cluster of small cherries
Pyrus calleryana 'Aristocrat'	Aristocrat Pear	Min to Mod		35	25	Upright pyramidal to oval; Glossy green leaves turning copper-red to red-purple in fall; Showy white clusters in spring		Possible storm damage given branch angles and density; fireblight is rare	Small berry like, 1/2 inch
Pyrus calleryana 'Autumn Blaze'	Autumn Blaze Pear								Small berry like, 1/2 inch

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Pyrus calleryana 'Redspire'	Redspire Pear								Small berry like, 1/2 inch
Pyrus calleryana 'Chanticleer'	Chanticleer Pear								Small berry like, 1/2 inch
Pyrus calleryana 'Whitehouse'	Whitehouse Pear	Min to Mod		30	15	Narrow pyramidal with strong central leader; Green to reddish-purple in fall; Showy white clusters in spring		Possible storm damage given branch angles and density; fireblight rare. Chanticleer is alternatively known as Cleveland, Cleveland Select, or Stonehill.	Small berry like, 1/2 inch
Pyrus fauriei 'Westwood'	Korean Sun Pear	Min to Mod		15	15	Rounded and compact; Dark green to yellow, orange, red In fall; Showy white clusters in spring		Fireblight resistant; Pruning for clearance; fast growing	
Pyrus ussuriensis 'Mordak'	Prairie Gem Pear								Small berry like, 1 inch
Quercus × macdanielli 'Heritage'	Heritage Oak	Xeric to Min		60	40	Fast growing. When young is a pyramidal tree that matures into a wide, oval form with a strong central leader. Leaves are a deep, glossy green			Acorn
Quercus × warei 'Chimney Fire'	Chimney Fire Oak	Xeric to Min		60	25			Straight hybrid unavailable in cultivation; cultivars are available.	Acorn
Quercus × warei 'Regal Prince'	Regal Prince Oak	Xeric to Min		60	25			Straight hybrid unavailable in cultivation; cultivars are available.	Acorn
Quercus × warei 'Windcandle'	Windcandle Oak	Xeric to Min		60	25	Foliage dark green with a silvery underside. Fall color varies from yellow to red, depending on cultivar. Upright, narrow selection is great for smaller sites		Straight hybrid unavailable in cultivation; cultivars are available.	Acorn
Quercus alba	White Oak	Mod		60	50	Pyramidal in youth to broadly rounded; Simple , obovate dark green to red-reddish brown in fall.		Acorns.	Acorn
Quercus bicolor	Swamp White Oak	Xeric		50	50	Broad, rounded, open typically has shorter trunk; bark is attractive, grayish-brown, and flaky; Lustrous, leathery, dark green in summer, yellowish in the fall and sometime purple-red		Acorns in heavy crops every 3-5 years	Acorn
Quercus douglasii	Blue Oak			45	40				Acorn
Quercus garryana	Oregon White Oak			55	40				Acorn
Quercus imbricaria	Shingle Oak	Mod		50	40	Pyramidal to upright-oval in youth, broad rounded outline with age; Leaves unfold reddish in spring, lustrous dark green in summer, yellow brown to russet-red in fall		Acorns, hard to transplant, multiple pests if not maintained	Acorn
Quercus kelloggii	California Black Oak			50	30				Acorn
Quercus lobata	Valley Oak			70	40				Acorn
Quercus macrocarpa 'Urban Pinnacle'	Urban Pinnacle Oak	Xeric		60	25	Weakly pyramidal to oval in youth, broadly rounded and open with age; Leathery, lustrous dark green in summer, yellow–green to yellow–brown in fall		Acorns. Urban Pinnacle is 1/2 as wide as species with smaller acorns.	Acorn
Quercus macrocarpa	Bur Oak	Xeric		60	60	Weakly pyramidal to oval in youth, broadly rounded and open with age; Leathery, lustrous dark green in summer, yellow–green to yellow–brown in fall		Acorns. Urban Pinnacle is 1/2 as wide as species with smaller acorns.	Acorn
Quercus prinus	Chestnut Oak	Xeric		50	35	Symmetrical with oval outline although individual trees may vary; Medium green turning yellow to copper or remaining brown in fall		Acorns	Acorn
Quercus robur 'Fastigiata'	Skyrocket English Oak	Xeric to Min		50	15				Acorn
Quercus robur	English Oak	Xeric to Min		55	50	Columnar cultivars available, but usually broadly round and oval; Foliage dark green to blue-green in summer, brown in fall		Long, slender acorns	Acorn
Quercus shumardii	Shumard Oak	Min		50	40	Pyramidal in youth, oval to round with age; Dark green in summer, yellow-bronze or russet-red in fall		Acorns	Acorn
Quercus velutina	Black Oak	Min to Mod		50	40	Narrow to wide Irregularly rounded and open; Simple oblong dark green to variable reds in fall; Yellow-green male catkins		Acorns; may be difficult to transplant because of taproot	Acorn
Sorbus × hybrida	Finnish Whitebeam							AKA: Oakleaf Mountain-Ash	Clusters of small berries
Sorbus × intermedia	Swedish Whitebeam								Clusters of small berries
Sorbus alnifolia	Korean Mountain-Ash	Mod							Clusters of small berries
Sorbus americana 'Red Cascade'	American Mountain-Ash	Mod		20	10	Upright narrow; small green turning yellow in fall; Clusters of white flowers turning orange		Insect and disease resistance unknown in this area	Clusters of small berries
Sorbus aria	Common Whitebeam								Clusters of small berries
Styphnolobium japonicum 'Regent'	Regent Pagodatree	Min		40	50	Oval to round, upright spreading branches, frequently wider than tall; Lustrous bright green in summer, yellowish in fall, late to turn color in fall		Storm damage an occasional concern. Formerly known as *Sophora japonica* .	Group of small hard capsels
Styphnolobium japonicum	Japanese Pagodatree	Min		40	50	Oval to round, upright spreading branches, frequently wider than tall; Lustrous bright green in summer, yellowish in fall, late to turn color in fall	White sprays	Storm damage an occasional concern. Formerly known as *Sophora japonica* . AKA: Scholar-tree	Group of small hard capsels
Syringa pekinensis 'Morton'	China Snow Lilac	Xeric to Min		15	15	Upright then rounded and spreading; Simple dark green to yellow in fall; Creamy white panicles in June	White sprays	Regular pruning to maintain single stem, and avoid drooping lower limbs.	Group of small hard capsels
Syringa pekinensis 'Summer Charm'	Summer Charm Lilac	Xeric to Min		15	15	Upright spreading; Simple dark green to yellow in fall; Creamy white panicles in early summer	White sprays	Regular pruning to maintain single stem, and avoid drooping lower limbs.	Group of small hard capsels

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Syringa reticulata 'Ivory Silk'	Ivory Silk Tree Lilac	Xeric to Min		25	20	Spreading rounded vase; Green leaves, no fall color; Showy, white flowers in early summer	White sprays	Needs pruning for single trunk; leafs out early and frequently suffer frost damage in spring	Group of small hard capsels
Tilia × euchlora 'Redmond'	Redmond Linden	Mod		60	40	Densely pyramidal; Dark green in summer, green–yellow to pale yellow in the fall; Yellow, fragrant flowers in summer		Pruning for clearance	Small hard seed with a papery wing
Tilia 'Glenleven'	Glenleven Linden								Small hard seed with a papery wing
Tilia americana 'American Sentry'	American Sentry Linden	Mod		45	30	Symmetrically pyramidal; Medium green in summer, green–yellow to pale yellow in the fall; Yellow, fragrant flowers in summer		Pruning for clearance	Small hard seed with a papery wing
Tilia americana 'Boulevard'	Boulevard Linden	Mod		50	25	Narrowly Pyramidal with ascending branches; Medium green to yellow in fall; yellow flowers in early summer		Pruning for clearance	Small hard seed with a papery wing
Tilia americana 'Lincoln'	Lincoln Linden	Mod		35	25	Dense compact pyramidal; Simple dark green to yellow in fall		Good heat tolerance	Small hard seed with a papery wing
Tilia americana 'Continental Appeal'	Continental Appeal Linden	Mod		50	28	Narrow oval to pyramidal canopy; Medium green with white undersided leaves; Yellow fall color		Native to midwest	Small hard seed with a papery wing
Tilia cordata 'Baileyi'	Shamrock Linden	Mod		40	30	Symmetrically pyramidal; Glossy medium green to yellow in fall		Pruning for clearance; **intolerant of reflected heat. Not suited for commercial streetscapes or areas where the tree is surrounded by plaza, concrete, tree grates, etc.**	Small hard seed with a papery wing
Tilia cordata 'Chancole'	Chancellor Linden	Mod		35	20	Upright tightly symmetrical pyramid; Dark green to yellow in fall		Pruning for clearance; **intolerant of reflected heat. Not suited for commercial streetscapes or areas where the tree is surrounded by plaza, concrete, tree grates, etc.**	Small hard seed with a papery wing
Tilia cordata 'Corzam'	Corinthian Linden	Mod		40	15	Narrowly pyramidal; Dark green to yellow in fall		Pruning for clearance; intolerant of reflected heat. Not suited for commercial streetscapes or areas where the tree is surrounded by plaza, concrete, tree grates, etc.	Small hard seed with a papery wing
Tilia cordata 'Halka'	Summer Sprite Linden	Mod		15	10	Dense, narrow pyramid; Simple and dark green to yellow in fall.		Dwarf variety; Pruning for clearance; **intolerant of reflected heat. Not suited for commercial streetscapes or areas where the tree is surrounded by plaza, concrete, tree grates, etc.**	Small hard seed with a papery wing
Tilia cordata 'Greenspire'	Greenspire Linden	Mod		50	40	Pyramidal in youth, becomes more rounded with age, dense; Dark and shiny green in summer; green–yellow to yellow in fall; Yellow, fragrant flowers in summer		Pruning for clearance; **intolerant of reflected heat. Not suited for commercial streetscapes or areas where the tree is surrounded by plaza, concrete, tree grates, etc.**	Small hard seed with a papery wing
Tilia cordata 'Moraine'	Moraine Linden	Mod		50	40	Pyramidal in youth, becomes more rounded with age, dense; Dark and shiny green in summer; green–yellow to yellow in fall; Yellow, fragrant flowers in summer		Pruning for clearance; **intolerant of reflected heat. Not suited for commercial streetscapes or areas where the tree is surrounded by plaza, concrete, tree grates, etc.**	Small hard seed with a papery wing
Tilia 'Harvest Gold'	Harvest Gold Linden	Mod		30	25	Upright pyramidal; Simple sharply serrated glossy dark green leaves turning bright golden yellow in fall		Pruning for clearance. Not suited for commercial streetscapes or areas where the tree is surrounded by plaza, concrete, tree grates, etc.	Small hard seed with a papery wing
Tilia tomentosa	Silver Linden	Mod		60	50	Broadly oval and symmetrical; Simple dark green and silver fuzzy underneath to yellow in fall;		Faster growing, heat and drought tolerant. Requires minimum 8' tree lawn. Not suited for commercial streetscapes or areas where the tree is surrounded by plaza, concrete, tree grates, etc.	Small hard seed with a papery wing
Tilia tomentosa 'Green Mountain'	Green Mountain Linden	Mod		60	50	Broadly oval and symmetrical; Simple dark green and silver fuzzy underneath to yellow in fall;		Faster growing, heat and drought tolerant. Requires minimum 8' tree lawn. Not suited for commercial streetscapes or areas where the tree is surrounded by plaza, concrete, tree grates, etc.	Small hard seed with a papery wing
Tilia tomentosa 'Sterling Silver'	Sterling Silver Linden	Mod		50	30	Pyramidal to upright oval; Dark green, silvery underneath to yellow in fall; Yellow-white flowers in spring		Large root system. Requires at least an 8' tree lawn. Not suited for commercial streetscapes or areas where the tree is surrounded by plaza, concrete, tree grates, etc.	Small hard seed with a papery wing
Ulmus americana 'Brandon'	Brandon Elm	Min to Mod	Full	70	60	Broadly vase-shaped; Simple, green leaves in summer, yellow in fall		AKA; White Elm. Winter desiccation may be problematic, listed cultivars open to many insect and diseases including Dutch Elm Disease	Small seed with small paper wing
Ulmus americana 'New Harmony'	New Harmony Elm	Min to Mod	Full	60	60	V-shaped with arching limbs; Simple, dark green to yellow in fall		Rpaid growth rate once established. One of the best Dutch Elm Disease tolerant American Elms, better form that Valley Forge	Small seed with small paper wing
Ulmus americana 'Princeton'	Princeton Elm	Min to Mod	Full to part	60	30	Braod;y verticle to oval; Simple,		Highly Dutch Elm Disease resistant. Rapid growth rate under good conditions	Small seed with small paper wing
Ulmus americana 'Valley Forge'	Valley Forge Elm	Min to Mod	Full	65	55	Vase with arching limbs; Simple, glossy dark green to yellow in fall		Best Dutch Elm Disease resistant American Elm. May need early structure pruning	Small seed with small paper wing
Ulmus 'Frontier'	Frontier Elm	Min to Mod	Full	40	30	Vase-shaped; Simple, glossy green tored/burgundy in fall		Good Dutch Elm Disease resistance and moderate Elm Bark Beetle	Small seed with small paper wing
Ulmus davidiana	David elm	Min to Mod	Full	35	30	Broadly vase-shaped; Simple, glossy green to yellow in fall		Very similar to American elm in all ways except for size touted as good urban tolerance	Small seed with small paper wing
Ulmus × hollandica 'Pioneer'	Pioneer Elm	Min to Mod	Full	45	45	Rounded; Simple, dark green to yellow in fall		Rapid growth rate. New release makes it hard to find.	Small seed with small paper wing
Ulmus davidiana var. japonica 'Discovery'	Discovery Elm	Min to Mod	Full	40	30	Upright vase; Simple, dark green summer to yellow in fall		Dutch Elm Disease and Elm Leaf Beetle resistant	Small seed with small paper wing

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Ulmus davidiana var. japonica 'Freedom'	Freedom Elm	Min to Mod	Full	40	30	Upright vase; Simple, dark green summer to yellow in fall		Dutch Elm Disease and Elm Leaf Beetle resistant	Small seed with small paper wing
Ulmus 'Regal'	Regal Elm	Min to Mod	Full	45	25	Columnar; Simple, dark glossy green to yellow in fall		Rapid growth rate. Dutch Elm Disease and Elm Leaf Beetle resistant; very tolerant of local environmental conditions.	Small seed with small paper wing
Ulmus 'Morton Plainsman'	Vanguard Elm	Min	Full	40	40	Rounded vase; Simple, green to yellow in fall		Touted as drought and heat toelrant	Small seed with small paper wing
Ulmus 'New Horizon'	New Horizon Elm	Min to Mod	Full	35	30	Compact upright oval, arching; Simple, dark green torusty red in fall		Rapid growth rate. Denser more compact canopy of elms	Small seed with small paper wing
Ulmus 'Morton'	Accolade Elm	Min to mod	Full	65	50	Vase with arching limbs; Simple, glossy dark green to yellow in fall		Resistant to Elm Leaf Beelte. Mimics form of American Elm	Small seed with small paper wing
Ulmus 'Morton Red Tip'	Danada Charm Elm	Min to mod	Full	60	50	Vase with arching limbs; Simple, glossy dark green to yellow in fall		Rapid growth rate, but has shown weak crotch angles breaking in wind and snow. Accolade is better of these two	Small seed with small paper wing
Ulmus parvifolia 'A. Ross Central Park'	Central Park Splendor Elm	Min to Mod	Full	40	30	Broad and dense; Simple dark green to yellow/reddish purple in fall		Possibly hardiest of the Parvifolias, rapid growth rate. Dutch Elm Disease and Elm Leaf Beetle resistant. Bark is interesting mottled color of brown, grey, green, and orange	Small seed with small paper wing
Ulmus 'Cathedral'	Cathedral Elm	Min to Mod	Full to part	40	30	Wide vase; Simple, Medium green to yellow in fall		Rapid growth rate, Dutch Elm Disease resistant	Small seed with small paper wing
Ulmus 'Homestead'	Homestead Elm	Min to Mod	Full	50	30	Upright oval with arching branching; Simple, dark green to yellow		Good street tree form. Does need pruning to establis form	Small seed with small paper wing
Ulmus 'Patriot'	Patriot Elm	Min to Mod		45	35	Narrower upright vase; Simple, glossy dark green to yellow in fall		Rapid growth rate, Dutch Elm Disease and higher Elm Leaf Beetle resistance	Small seed with small paper wing
Ulmus 'Morton Glossy'	Triumph Elm	Min to Mod	Full to part	50	45	Upright oval to vase with arching branches; Simple, darkd green to yellow in fall		Rapid growth rate, Dutch Elm Disease and higher Elm Leaf Beetle resistance	Small seed with small paper wing
Ulmus 'Morton Stalwart'	Commendation Elm	Min to Mod	Full to part	55	45	Upright to oval; Simple, green to yellow in fall		Rapid growth rate. Dutch Elm Disease resistant	Small seed with small paper wing
Ulmus davidiana var. japonica f. wilsoniana 'Prospector'	Prospector Elm	Min to Mod	Full to part	40	30	Vase-shaped; Simple, dark glossy green to yellow in fall		Elm Leaf Beetle resistant	Small seed with small paper wing
Viburnum prunifolium	Blackhaw Viburnum	Min		15	15	Oval-rounded, horizontal branching; Simple, medium/dark green to reddish-purple in fall	Small bright white clusters in mid-May.	Shape makes maintaining clearance difficult. Structure pruning when young is extremely important.	Small groups of berries
Xanthoceras sorbifolium 'Clear Creek'	Clear Creek Golden Yellowhorn	Min		20	15				Dry 3 segmented seed capsel, 1 inch