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DESIGN GUIDELINES

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Landscape Design Elements



Drainage Ways



Agricultural Grid



Canals



Trails

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Crop Patterns

Windrows

Cottonwood Bosque



Sculpture

Structures

Sentinel Tree





By acknowledging the unique character of Northern Colorado and the Loveland area, a series of Landscape Design Elements have been developed to create the vision for Centerra's Landscape Master Plan. Influences such as agriculture, mountain views, irrigation canals, railroad lines, and sculpture are recognized and celebrated in order to achieve a community that expresses the Front Range Colorado character.

Overall Landscape Master Plan

The overall Landscape Master Plan achieves several key goals to help develop the vision for Centerra. First, a recognizable character and identity has been established for the entire community that will make Centerra as a whole identifiable. People passing by or through Centerra will know exactly when they have entered or left the community as a result of the unique character and high quality of the consistent landscape and community features. Entryways, bridges, open space, parks, and streetscapes, will express a level of quality that establishes Centerra as a highly desirable community in which to live, work, or play.

Second, many parcels and places within Centerra have been given a unique identity of their own in order create recognizable districts and neighborhoods within the overall community. Design elements such as cottonwood groves, orchards, agricultural patterns, and windrows are used to establish places and destinations within Centerra that residents and visitors can relate to and remember. Districts next to the lakes will be intensified with cottonwoods and riparian plantings in order to enhance the special character of this district. The I-25 corridor in particular uses a variety of Design Elements to provide an enticing and memorable experience for commuters along I-25 drawing in shoppers and homebuyers.



CATEWAY

Design Guidelines **ENTERRA**



LANDSCAPE - General Landscape Design



General Landscape Design Guidelines

Introduction: Landscape Master Plan Vision and Guidelines

Northern Colorado has a character all it's own; majestic mountain views, expansive rolling hills of agriculture, winding waterways, one hundred year old cottonwood groves, and historic lakes and reservoirs teeming with wildlife. It is this character that inspired the Landscape Vision for Centerra. Special attention has been paid to preserving and enhancing the natural amenities within Centerra. Additionally, a new and complementary palette of landscape elements has been developed, such as bridges, signage, water features, sculptural landforms, agricultural patterns, and orchards, that reflect the Front Range Colorado character. Centerra has also made a commitment to express the historic culture of Loveland by integrating a number of parks and special landscape areas dedicated to the display of sculpture and public art.

Applicants for individual projects within Centerra will be expected to develop a landscape for individual projects that is in harmony with the overall Landscape Master Plan; building upon the established landscape framework. This will include edge conditions that take direction from and complement the Master Plan. Components interior to individual sites will utilize the basic landscape design principles and icons appropriately. These landscape design principles and icons include:

- Utilizing cottonwoods and other riparian plant materials and design strategies in and around drainage ways, wetlands, and other natural and sensitive areas designed to support wildlife habitat.
- Building upon Northern Colorado's agricultural heritage by using the agricultural grid, crop patterns, irrigation canals, windrows, and orchards in an appropriate manner.
- Celebrating Loveland's strong art community by incorporating sculptural landforms and sculpture in the landscape.
- Connections to and enhancing Centerra's overall trail, park, and open space system. This is the

system that is the primary unifying element in Centerra.

- Incorporate the "Sentinel Tree" as the focus of key vistas, especially along roadways.
- Embracing the iconic architectural features and other man-made elements such as the rail line and bridge structures in the design character of the project.
- Utilize a palette of plant material (see Centerra Plant List) that incorporates native plantings when the landscape strategy supports native plantings. Group plants with similar water requirements together to reduce irrigation water consumption, and incorporate a xeriscape, drought tolerant approach.
- Beyond these general concepts and principles, there are parcels and places within Centerra that have been given a unique identity of their own in order to create recognizable districts and neighborhoods within the overall community. These unique places will be characterized by appropriate landscape treatments designed to help them be memorable destinations.

Please refer to the following figures, the District Guidelines, and the Millennium General Development Plan for additional information.

1.0 Landscaping

- I.I General
 - 1.1.1 Create a landscape that is sustainable, attractive, comfortable, and complementary to the natural and man-made environment.
 - 1.1.2 Refer to the Master Landscape Plan for appropriate patterns along development edges, major roadways, in open space and natural areas.
 - 1.1.3 In less urban areas, define collectors and local streets with crop patterns, windrows, informal masses of trees and shrubs, and orchards at corners. In more urban areas, define these streets with uniform placement of deciduous

shade and ornamental trees, either in turf grass strips between the street and sidewalk, or near the back of the sidewalk.

- 1.1.4 Use plant materials that are massed and placed to provide variety and focal points at strategic locations.
- 1.1.5 Where appropriate to the intent of the Landscape Master Plan, use large-scale plantings with the intent of replicating thickets of shrubs and broad sweeps of flowers in meadows that occur naturally in the Colorado plains and foothill regions.
- 1.1.6 Plant evergreen trees on uplands, while locating cottonwoods, willows, and other riparian plants in drainages.
- 1.1.7 Locate ornamental trees in groves and as specimens on uplands and side slopes.
- 1.1.8 Create windrows and orchard-style plantings, designed to reflect the agrarian heritage of Centerra.
- 1.1.9 Use ordered planting patterns to mark community wide architectural elements and special areas, such as at bridge crossings, public areas, and along interior streets within tree lawns, designed to project an organized artful landscape expression.
- 1.1.10 Use structured landscape statements, such as formal windrow and orchard-style plantings in strategic and limited locations, so as not to lose their effect.
- 1.1.11 All development shall demonstrate adherence to the following landscape design criteria:
 - a) Restore native bio-diversity that relates to the area's natural systems.
 - b) Design to provide an attractive, comfortable environment for users while minimizing maintenance needs, irrigation water requirements, and the use of herbicides and pesticides.
 - c) Use environmentally friendly "green" materials, where possible.

- d) Except where agricultural character is desired, design landscape to create a naturalized appearance. Use plant materials that are indigenous to Northern Colorado, where possible (see plant list).
- e) Use only introduced species in order to achieve design objectives that cannot be achieved with the use of native species (see Plant List).
- f) Locate plants in microclimate conditions that are appropriate for that species. Only use high water-requiring plants in areas where they will naturally benefit from runoff or available ground water (see fig. la).
- g) Avoid relying solely upon an irrigation system to provide water to high water-requiring plants.
- h) Group plant materials of similar water needs and arrange in concentric circles or layers of progressively less water use in order to maximize the efficiency of applied irrigation.
- i) Use plant materials to provide buffering of structures and outdoor formal open space areas from extreme climate.
- j) Use plant materials to soften building architecture.
- k) Coordinate the design of the landscape with site erosion protection, storm drainage, and water quality improvement systems.



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- I) Use a minimum three-inch deep mulch to reduce soil moisture loss and moderate soil temperatures.
- m) Improve soil structure by the addition of composted organic material.
- n) Design and manage irrigation systems to achieve peak efficiency.
- o) In landscape adjacent to natural areas weed barrier and steel edging are strictly discouraged.

2.0 Landscape Performance Standards

2.1 Irrigation Water Use

(See also Irrigation Design and Construction Criteria sub-section, which follows, for more detailed information regarding irrigation system design)

- 2.1.1 Public areas and private parcels shall have a specified maximum amount of water that is available for irrigation, based upon the landscape prototype for the type of use and size of parcel.
- 2.1.2 The following table lists the maximum irrigation water use per square foot, per year, based upon gross lot size for each type of land use. Landscape and irrigation system designs shall demonstrate that they will not exceed the water allotment assigned to the specific parcel by submitting a water budget with the landscape plan.

	Allowable Met	ered Gallons Per
Land Use	Square Foot of Gross L	ot Area Per Year
Business Park		4.5
Commercial		3.5
Residential		5.5
Parks/Irrigated C	Open Space	12.0
Naturalized Ope	n Space	3.0*

* Use based on drip irrigation to trees and shrubs. Temporary irrigation for the purposes of seed establishment is allowed for up to three years.

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2.1.3 All irrigation improvements shall allow for the option of using non-potable water if it becomes available.



Design for very low water use where a parcel abuts an open space in detention areas.

Limit moderate water use to heavily used areas, i.e.: employee courtyards, entrances.

Design for low water use at site perimeter or low-use areas.

fig. 2a Water Use Zones

- 2.1.4 Separate zones for turf, shrubs, perennials, annuals, etc. are required.
- 2.1.5 Separate zones for landscape in easement areas to be maintained by the Centerra Master Association or Metropolitan District are required.
- 2.1.6 The amount of irrigation water actually applied shall be the minimum amount necessary to result in plant life of acceptable health and vigor.
- 2.1.7 The irrigation application shall be in accordance with the local historical evapotranspiration (ET)

rate curve and modified in response to recent ET rates. Although during periods of extreme ET, the amount of water applied will need to be greater than the historical ET value, at no time shall it exceed the historical ET by more than 30%. ET data is available from an on-site weather station, which will download weather data to the irrigation central control system.

- 2.1.8 Irrigation systems shall be designed to prevent runoff, over-spray, or ponding on sidewalks, streets, paved areas, fences, walls, buildings, or structures.
- 2.1.9 Sidewalks shall not be "overthrown" or receive direct over spray.
- 2.1.10 All Public area irrigation shall be connected to the Centerra central control system, which is capable of communicating with all field satellite units as well as assessing and downloading environmental data from on-site weather stations. Communication method shall be in compliance with control system manufacturer's instructions and the current Centerra irrigation master plan.
- 2.1.11 All irrigation control systems on individual building sites shall utilize technology compatible with Centerra's central control system and shall connect to it. The site system shall be capable of addressing individual landscape water requirements and appropriate scheduling needs to maximize water conservation potential. Utilize Toro Sentinal Central Controller with flow sensor for each point of connection and two wires back to the controller.
- 2.1.12 Use drip irrigation for plant material whenever possible. Plant material irrigated with overhead spray shall be minimized.
- 2.1.13 Tree and shrub planting in low water or nonirrigated grass areas shall be supplemented with a permanent drip irrigation system or other low water alternative.



fig. 2b Irrigation Obstructions

- 2.1.14 Design all overhead irrigation to create a uniform water distribution pattern, taking into account wind velocity, slopes, berms, landforms, and tree obstructions.
- 2.1.15 Design laterals to allow for plant zoning according to varying plant water needs, exposure and slopes, mowing heights, turf maintenance practices, topography, building shade, and paving reflection.
- 2.1.16 Avoid any direct or wind blown spray onto any roadways, parking lots, hardscape surfaces, or structures. Wind sensor technology shall be used with the central control system to adjust watering schedules during periods of high winds. Low trajectory nozzles and subsurface irrigation shall be used as necessary.
- 2.1.17 All head spacing shall be adjusted for constant ten MPH wind conditions.
- 2.1.18 Border roadways with pop-up spray heads or low trajectory pop-up rotors to better control potential over spray.
- 2.1.19 Provide pressure regulating control valves on all zones that should be reduced by 20 PSI or more to allow heads/emitters on that zone to

operate at the manufacturer's recommended operation pressure. For spray sprinkler laterals, a pressure-compensating device integral to the sprinkler head is acceptable.

- 2.1.20 Laterals shall be designed so that all heads on that zone shall operate within a ten percent pressure differential.
- 2.1.21 Provide sprinkler head check valves where required to prevent low head drainage.
- 2.2 Installation Period
 - 2.2.1 Install landscaping and irrigation within the first available planting season, or as soon as weather conditions permit.
 - 2.2.2 Complete areas to be landscaped within nine months of the date of occupancy.
 - 2.2.3 For all land uses except individual residential buildings on separate lots, the City of Loveland shall require escrow in the amount of 125 percent of the value of the installed landscaping and irrigation (at the time of a temporary Certificate of Occupancy) until the landscaping is installed.
 - 2.2.4 A professional landscape architect or landscape designer shall prepare all landscape plans for non-residential uses.
- 2.3 Existing Topsoil Management
 - 2.3.1 The contractor shall strip top soil off the site at the beginning of a project and pile in windrows not more than 5 feet high. Rows should be seeded with a sterile cover crop to prevent weed seeds contaminating the soil. This process will keep the soil healthy and alive during the construction process and will foster beneficial conditions for installed landscapes.

2.4 Soil Amendment

2.4.1 Provide soil amendments to improve the perme-

ability, water holding capacity, and nutrient value of the soil.

- 2.4.2 Soils shall be tested by an approved soil-testing agency to determine appropriate soil amendment needs.
- 2.4.3 Peat moss shall not be used as a soil amendment.
- 2.4.4 Soil amendments shall be weed free, low in salt content and formulated to meet soil testing laboratory recommendation.
- 2.4.5 Soil amendments are not recommended in native seeded areas unless a soil test indicates a specific deficiency in the soil.

	Turical	Minimum Sizes within the Special
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Plant Type	Minimum Sizes	District
Deciduous Shade Trees	2" Caliper	3" Caliper
Ornamental Trees	1/2" Caliper	3" Caliper
Evergreen Trees	6' Height	8' Height
Shrubs	5 Gallon	5 Gallon



2.5 Shrub and Tree Sizes and Placement

- 2.5.1 Tree and shrub sizes shall comply with the following minimum standards (except on private residential lots and in open space areas where native landscapes are being restored or created, or where specifically approved by the DRC).
- 2.5.2 Provide streetscape variety and visual interest by providing a wide range of evergreen tree heights within the road ROW or setback area. Provide evergreen trees that are at least one-to-three feet higher than the minimum specified.
- 2.5.3 Canopy shade trees shall constitute a minimum 50 percent of all tree plantings, except as otherwise noted.

3.0 Parking Lot (field) Landscaping

3.1 General

3.1.1 Landscape areas within the perimeter of the parking lot to minimize the feeling of large expanses of pavement, improve parking lot appearance, and to reduce heat build-up (see fig.3a).



fig. 3a Breaking Up Large Parking Lots

- 3.1.2 Divide large parking lots into smaller sections or parking courts. Each section or court shall contain a maximum of 200 parking spaces.
- 3.1.3 Landscape areas used to break-up large expanses of pavement shall be a minimum of 15 feet wide.
- 3.1.4 For parking lots with more than 40 parking spaces, parking bays shall extend no more than 15 spaces without an intervening tree, landscape island, or landscape peninsula.
- 3.1.5 Parking lots containing 15 or more parking spaces shall provide a minimum six percent interior parking lot landscaping, as measured within an area drawn around the exterior limits of the lot.
- 3.1.6 Parking lots containing more than 50 spaces shall provide a minimum 10 percent interior parking lot landscaping, as measured within an area drawn around the exterior limits of the lot (back of curb).
- 3.1.7 A minimum 75 percent of the landscape area should be covered with living materials within three years of installation.
- 3.1.8 Additional internal landscaping shall be provided in parking lots that exceed the recommended parking ratios. Fifty square feet of internal landscaping shall be provided for each parking space, which exceeds the recommendation. The additional landscaping may be distributed throughout the entire parking lot.



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fig. 3b Parking Lots with 40 or More Spaces

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- 3.1.9 Turf grass shall not be planted in parking lot islands or medians unless the turf area is a minimum ten feet wide.
- 3.1.10 Shade trees shall be planted in parking lots at a minimum rate of one tree and five shrubs for every 15 parking spaces.
- 3.1.11 Plant materials shall be placed on end islands; entry drives, pedestrian walks, and along islands, which separate parking from internal drives.
- 3.1.12 Landscape islands shall be a minimum nine feet in width from back of curb (net available area) and the same length as adjacent parking spaces.

4.0 Parking Lot Screens

- 4.1 General
 - 4.1.1 Screen parking lots from surrounding public streets, sidewalks, trails, parks, and other properties that are used by the public.
 - 4.1.2 Exceptions to parking lot screening requirements may be made in portions of Districts (e.g., District 5 - Town Center) where a more urban image is desired, at the discretion of the DRC.
 - 4.1.3 Use berms, low decorative garden walls, plant material, and planters to screen parking lots (see fig. 4a).



fig. 4a Parking Lot Screens with Berms

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- 4.1.4 Use plant material to soften low decorative garden screen walls, which are visible from adjacent streets, sidewalks, trails, parks, and other properties that are used by the public.
- 4.1.5 Use parking lot setbacks to mitigate the visual impacts of parking lots from adjacent parcels and ROW. Provide parking lot screening, based upon the following standards:
 - a) A minimum three-foot high screen shall be provided between parking lots and the public ROW.
 - b) Provide four-to-six foot high screens between parking lots and the I-25 and US 34 ROW.
 - c) Parking lot screens may be composed of one or a combination of the following: Berms, plant materials, or decorative wall.
 - d) The height of the screen shall be measured from the adjacent parking surface.
 - e) Landscaping shall not be planted as a straight hedge. Instead, informal planting patterns shall be used to accomplish screening objectives.
- 4.1.6 Parking lot screens shall be a minimum three feet higher than the surface of the parking lot. When plant material is used as a screen, plants should create a three-foot high screen within three years.



fig. 4b Parking Lot Screening with Shrubs

5.0 Parking Structures

5.1 General

5.1.1 Minimize the impact of stand-alone parking structures with landscaped earth berms and by limiting the overall height of the structure to 45 feet.

5.1.2 Use of plant materials and planter boxes on the exterior facades of stand-alone parking structures to reduce their visual impact is encouraged.



fig. 5a Parking Structure Design

6.0 Landscape Maintenance

6.1 General

- 6.1.1 Limit the use of pesticides and fertilizers to the minimum required to establish and sustain plant growth.
- 6.1.2 Rely on adequate soil growing medium preparation, aeration, top-dressing with compost, deep and slow watering, variation in species, mulches, and other design and maintenance practices, and less on chemical applications.
- 6.1.3 Minimize the need for mowing by limiting the areas of turf grass is used to landscape areas that receive the most use.
- 6.1.4 Eliminate noxious weeds and hazards per City of Loveland standards.
- 6.1.5 Mow turf grasses to maintain a uniform appearance unless otherwise approved by the DRC (e.g., crop row plantings).

- 6.1.6 Do not mow naturalized grass or meadow areas, except as desired to control weeds or distribute seed heads.
- 6.1.7 Maintain irrigation systems to prevent unnecessary waste of water. Connect irrigation systems, except private residential lots, to the Centerra central irrigation control system (See 2.1 Irrigation Water Use).
- 6.1.8 Tree lawns, sidewalks along arterial roadways, and common open space shall be maintained by the Centerra Master Association, Metro District, High Plains Environmental Center, or applicable homeowners association. Maintenance of all other landscape areas shall be the responsibility of the adjacent property owner unless special agreements are made with others.
- 6.1.9 Provide for snow storage and removal on each nonresidential site. Pushing snow into the street or street medians shall not be permitted.

7.0 Landscape Materials

- 7.1 Edging, Weed Barriers, and Mulches
 - 7.1.1 Provide steel edging, minimum four-inches deep, with a non-sharp edge (rolled or protected with plastic strip).
 - 7.1.2 No plastic may be used as a weed control barrier under mulches. When used, weed barriers shall be nonwoven polypropylene that allows water and air to penetrate.
 - 7.1.3 Weed barriers are discouraged in conjunction with wood mulch.
 - 7.1.4 Provide a three-to-four inch mulch depth to prevent weed growth.
 - 7.1.5 Permitted mulch types include the following:
 - a) Peastone is preferred material.
 - b) Crushed granite river rock, river cobble (Colors: tan, brown, and slate gray).
 - c) Sandstone quarry tailings.

- d) Wood mulch (Types: local pine/fir, red cedar, and other regionally produced products).
- e) No white, black, pink, red, green, or other color rock, or dyed wood mulch is permitted.

8.0 Residential Landscape (Residential Lots)

8.1 General

- 8.1.1 Provide arrangement of plant materials that complement building architecture, accent entries, frame windows, and offer a setting for the height and mass of structures.
- 8.1.2 Mass plant materials to create sheltered outdoor rooms associated with patios, porches, and sitting areas.
- 8.1.3 Principles of sustainability and xeriscape should be incorporated in selection of materials, design and maintenance of landscapes.
- 8.2 Environmental Considerations
 - 8.2.1 Strategically place landscape materials to buffer structures from winter winds (predominantly north, northwest) allowing solar exposure in the winter, and shade in the summer.
- 8.3 Irrigation and Water Use
 - 8.3.1 Limit turf grass to areas that are most heavily used and which are central organizing spaces. A maximum of 45 percent of the landscape area on any parcel shall be irrigated turf grass.
 - 8.3.2 Arrange the landscape in zones of progressively less water use. This allows for the maximum efficiency of applied irrigation water, with the drier zone benefiting from potential over spray, runoff, and ground moisture of the adjacent higher water use zone.
 - 8.3.3 Design landscape zones to reduce water consumption. No landscape zone should require

more than 22 inches of supplemental irrigation in an average year, which is equivalent to what turf type Tall Fescue grasses need to thrive in Loveland.

- 8.3.4 Place hydric, or moisture-loving plants in depressions and other areas where they will naturally receive more moisture.
- 8.3.5 Irrigate all landscape areas greater than 100 square feet that require irrigation, with an automatic irrigation system. Private courtyards, culinary gardens, and small landscape areas with unusual constraints are excepted.
- 8.3.6 Irrigation systems shall be automatically controlled and operated only between the hours of 10 pm to 10 am. Exception: Culinary Gardens.
- 8.4 Landscape Edges
 - 8.4.1 Blend landscape edges of residential parcels with adjacent properties. Harsh lines at the edges of properties, such as abrupt changes of mulch type, or plant materials placed in obvious lines shall be avoided.
 - 8.4.2 Vary landscaping in height and density adjacent to common open space areas, so as to avoid a hedge or total screen appearance. Instead, the landscape treatment should provide view corridors between the private yard and common open space.
- 8.5 Fences
 - 8.5.1 All fence design and construction shall be subject to DRC review and approval.
 - 8.5.2 Picket fences, or other low (30 42 inch high) "open" fencing, as approved by the DRC, may be used in private yards as long as the fence does not affect sight triangles.
 - 8.5.3 In rear yards, side yards (behind the front yard setback), and other areas where privacy

and noise mitigation are desirable, fences up to a maximum height of six feet shall be permitted as approved by the DRC. The lower four-foot portion of such fences may be solid, while the upper two feet shall be an "open" design.

9.0 Office/Employment Landscape

- 9.1 General
 - 9.1.1 Provide arrangement of plant materials that complement building architecture, accent entries, frame windows, and offer a setting for the height and mass of structures.
 - 9.1.2 Mass plant materials to create sheltered outdoor rooms associated with plazas and forecourts.
 - 9.1.3 Select xeriscape plant materials that promote sustainability.



fig. 9a - Office/Employment Landscape

9.2 Building Landscaping

9.2.1 Provide five-foot wide planting beds adjacent to building elevations visible from public areas or high use areas a minimum of 50 percent of the length of the wall.

9.2.2 Plant trees within 50 feet of a building at a quantity

of one tree per 40 linear feet of building frontage. Exact location and spacing may be adjusted at the option of the applicant and approved of the DRC to support patterns of use, views, and circulation as long as the minimum tree-planting requirement is met.

9.3 Environmental Considerations

9.3.1 Strategically place landscape materials to buffer structures from winter winds (predominantly north, northwest) allowing solar exposure in the winter, and shade in the summer.

9.4 Irrigation and Water Use

- 9.4.1 Limit turf grass to areas that are most heavily used and which are central organizing spaces. A maximum of 40 percent of the landscape area on any parcel shall be irrigated turf grass.
- 9.4.2 Arrange the landscape in zones of progressively less water use. This allows for the maximum efficiency of applied irrigation water, with the drier zone benefiting from potential over spray, runoff, and ground moisture of the adjacent higher water use zone.
- 9.4.3 Design landscape zones to reduce water consumption. No landscape zone should require more than 22 inches of supplemental irrigation in an average year, which is equivalent to what turf type Tall Fescue grasses need to thrive in Loveland.
- 9.4.4 Place hydric, or moisture-loving plants in depressions and other areas where they will naturally receive more moisture.
- 9.4.5 Irrigate all landscape areas greater than 100 square feet that require irrigation, with an automatic irrigation system. Private courtyards, culinary gardens, and small landscape areas with unusual constraints may be excepted at the discretion of the DRC.

9.4.6 Irrigation systems shall be automatically



controlled and operated only between the hours of 10 pm to 10 am.

9.5 Landscape Edges

- 9.5.1 Blend landscape edges of office/employment parcels with adjacent properties and Rights of Way, in conformance with the Landscape Master Plan. Harsh lines at the edges of properties, such as abrupt changes of mulch type, or plant materials placed in obvious lines shall be avoided.
- 9.5.2 Vary landscaping in height and density adjacent to open space areas, so as to avoid a hedge or total screen appearance. Open space areas should appear to flow into the site and blur the property edge.
- 9.5.3 Locate low water use landscape zones on the perimeter of property designed to blend with adjacent offsite open space.
- 9.5.4 Blend on-site perimeter landscapes with off-site tree and shrub masses within the public ROW. Grass and ground plane landscape treatments shall also harmonize with the streetscape design, and transition gradually to the internal on-site landscape.

9.6 Landscape Screening/Bufferyards

9.6.1 Refer to the Millennium General Development Plan (GDP) and City of Loveland Site Performance Standards and Guidelines for detailed bufferyard performance standards.

10.0 Commercial/Retail Landscape

10.1 General

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- 10.1.1 Provide arrangement of plant materials that complement building architecture, accent entries, frame windows, and offer a setting for the height and mass of structures.
- 10.1.2 Mass plant materials to create sheltered outdoor rooms associated with plazas, courtyards, and greens.



fig. 10a Commercial Landscape

- 10.1.3 Select xeriscape plant materials that promote sustainability.
- 10.2 Building Landscaping
 - 10.2.1 Provide five-foot wide planting beds or raised planters adjacent to building elevations visible from public areas or high use areas a minimum of 50 percent of the length of the wall. Select xeric plantings to maximize extent possible to minimize irrigation requirements adjacent foundations.
 - 10.2.2 Plant trees within 50 feet of a building at a frequency of one tree per 40 linear feet of building frontage. Exact locations and spacings may be adjusted at the option of the applicant and approval of the DRC to support patterns of use, views, and circulation as long as the minimum tree-planting requirement is met.
- 10.3 Environmental Considerations
 - 10.3.1 Place landscape materials strategically to buffer structures from winter winds (predominantly north, northwest) allowing solar exposure in the winter, and shade in the summer.
- 10.4 Irrigation and Water Use
 - 10.4.1 Limit turf grass to areas that are most heavily

used and which are central organizing spaces. A maximum of 25 percent of the landscape area on any parcel shall be irrigated turf grass.

- 10.4.2 Arrange the landscape in zones of progressively less water use. This allows for the maximum efficiency of applied irrigation water, with the drier zone benefiting from potential over spray, runoff, and ground moisture of the adjacent higher water use zone.
- 10.4.3 Design landscape zones to reduce water consumption. No landscape zone should require more than 22 inches of supplemental irrigation in an average year, which is equivalent to what turf type Tall Fescue grasses need to thrive in Loveland.
- 10.4.4 Place hydric, or moisture-loving plants in depressions and other areas where they will naturally receive more moisture.
- 10.4.5 Irrigate all landscape areas greater than 100 square feet that require irrigation, with an automatic irrigation system. Culinary gardens and small landscape areas with unusual constraints may be excepted at the discretion of the DRC.
- 10.4.6 Irrigation systems shall be automatically controlled and operated only between the hours of 10 pm to 10 am.

10.5 Landscape Edges

- 10.5.1 Blend landscape edges of commercial parcels with adjacent properties and Rights of Way. Harsh lines at the edges of properties, such as abrupt changes of mulch type, or plant materials placed in obvious lines shall be avoided.
- 10.5.2 Vary landscaping in height and density adjacent to open space areas, so as to avoid a hedge or total screen appearance. Open space areas should appear to flow into the site and blur the property edge.

- 10.5.3 Locate low water use landscape zones on the perimeter of property designed to blend with adjacent offsite open space.
- 10.5.4 Blend on-site perimeter landscapes with offsite tree and shrub masses within the public ROW. Grass and ground plane landscape treatments shall also harmonize with the streetscape design, and transition gradually to the internal on-site landscape.
- 10.6 Landscape Screening/Bufferyards
 - 10.6.1 Refer to the Millennium General Development Plan (GDP) and City of Loveland Site Performance Standards and Guidelines for detailed bufferyard performance standards.

11.0 Grading and Drainage

- II.I General
 - II.I.I Develop grading and drainage designs that minimize runoff and utilize storm drainage systems to meet basic engineering requirements.
 - II.I.2 Improve the quality of storm water before it degrades natural systems.
 - II.I.3 Site drainage shall be compatible with adjacent property drainage and in accordance with the overall master drainage plan for Centerra.
 - II.I.4 Storm drainage shall not run on an adjacent property at rates higher than historic rates prior to construction of the project, unless otherwise approved by the DRC and the City of Loveland.
 - 11.1.5 Minimize excess runoff from the site and provide positive drainage away from all foundations and buildings.
 - II.I.6 Direct water from parking lots, roof drains and other areas into landscape areas that could benefit from additional water and/or improve the quality of the storm water.

- 11.1.7 Convey drainage along dedicated streets, private drives and swales along property lines, or in open space corridors. Sheet flow and surface drain where possible.
- 11.1.8 Grade surface drain systems and detention ponds in irregular shapes, in an aesthetically pleasing character. Vary side slopes.
- 11.1.9 Place drainage structures that occur in sidewalks and bike paths flush with the surface. Grate patterns shall not have openings greater than 3/8".
- 11.1.10 Surface storm water or irrigation shall not be discharged across sidewalks; and there should be no point discharges into curbs to prevent traffic-impeding surges into the street.



fig. I la Water Quality Enhancement Examples (Source: Urban Storm Drainage Criteria Manual, vol. 3)







- 11.1.11 Utilize Urban Drainage Best Management Practice as a guide for all storm drainage systems.
- 11.1.12 No plain concrete drainage pans are allowed in landscaped areas. If hardened drainage swales must be used, they shall be designed to complement and enhance the adjacent area rather than detract from its appearance. No hardened surface is preferred in order to decrease run-off, increase infiltration, and improve water quality.
- II.I.I3 Site building to minimize cut & fill.
- 11.1.14 There shall be no grading beyond the limits of each property except as agreed upon by adjacent owners and the DRC.
- 11.1.15 Maximum slopes 3:1. Maximum 4:1 slopes for areas that require mowing.



12.0 Existing Vegetation and Preservation

- 12.1 General
 - 12.1.1 Grading shall not occur within the buffer zone areas that are determined to have good quality existing natural vegetation as determined by a qualified biologist/ecologist.
 - 12.1.2 When development occurs adjacent to natural areas, limits of construction shall be identified and approved by the DRC. A temporary barrier fence shall be installed and maintained for the duration of the construction period.
 - 12.1.3 Grading and site design shall protect existing trees to the greatest extent possible. Existing trees that cannot remain shall be moved to another location on-site, moved to another location within Centerra, or replaced in-kind with additional tree plantings according to the formula that follows:

Tree Removed	Replace With
24" or larger caliper tree	(3) 4" min. caliper trees
12" to 24" caliper tree	(2) 4" min. caliper trees
12" to 24" caliper tree	(I) 4" min. caliper tree
0" to 6" caliper tree	(1) 3" min. caliper tree

- 12.1.4 Vegetation that is an undesirable species as determined by the DRC or the City of Loveland shall not be protected.
- 12.1.5 Vegetation that is seriously diseased or near the end of its lifespan may be removed at the discretion of the DRC.
- 12.1.6 In selected open space areas, dead or diseased trees may be preserved in order to provide wildlife habitat. Trees or branches that pose a safety hazard shall be removed.
- 12.1.7 Existing good quality trees and shrubs within areas that can be developed (excluding river setbacks/buffer zones, floodways and wetland areas) may be used to satisfy the landscaping requirements. All required grading plans shall accurately identify the locations, species, size, condition and proposed disposition of all existing vegetation.



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Design Guidelines

12.1.8 Existing trees that will remain and their root systems shall receive adequate water to ensure survival, and shall be protected from damage, soil contamination and compaction with the drip line during construction through the use of barricades or fencing.

13.0 Parks, Open Space and Natural Areas

13.1 Parks

- 13.1.1 Design parks to serve the active and passive needs of people on-site and on nearby properties.
- 13.1.2 Amenities such as picnic shelters, playgrounds, amphitheaters, gardens, etc. should be appropriate to the project.
- 13.1.3 Irrigated turf grass should dominate parks subject to human activity.
- 13.1.4 Parks in residential areas:
 - a) Provide more than 50% street frontage.
 - b) At the discretion of the DRC, visibility and access from public trails or public properties (e.g., schools, civic buildings, etc.) may be an alternative to the street frontage requirement.
 - c) Types and locations of parks will be based upon accessibility to all residents; needs according to the City of Loveland Standards; and classification according to who the park serves (e.g., Community Park, Neighborhood Park, Pocket Park, etc.).
- 13.1.5 Parks in commercial and mixed-use areas:
 - a) Provide more than 25% street frontage.
 - b) At the discretion of the DRC, visibility and access from public trails maybe an alternative to the street frontage requirements.
- 13.1.6 Provide natural area transitions in parks where parks abut natural open space areas.

13.2 Open Space

- 13.2.1 Provide open space as a transition between development parcels and natural areas.
- 13.2.2 Provide open space as trail corridors, drainage areas, and as relief from the built environment.
- 13.2.3 Plan open space areas with native or regionally adapted plant materials, primarily unirrigated after being established.
- 13.2.4 Trees and shrubs that are not expected to receive enough water through natural precipitation may be irrigated.
- 13.2.5 Temporary irrigation systems for the establishment of grasses will be allowed for up to three (3) years.
- 13.2.6 Coordinate open space with the design of storm water conveyance and water quality systems.
- 13.3 Natural Areas
 - 13.3.1 Refer to Sensitive Areas reports on file with Centerra for sites that include or are adjacent to the existing reservoirs, mapped wetlands, and identified sensitive areas.
 - 13.3.2 Sensitive Areas and Buffer Zones around the reservoir will be owned and maintained by the High Plains Environmental Center.
 - 13.3.3 Refer to Millennium General Development Plan (GDP) for location of sensitive areas and buffer zones.
 - 13.3.4 Identified Natural Areas and their buffer zones will be protected from disturbance unless the following conditions exist.
 - a) The buffer zone would benefit from enhancements to mitigate adjacent development activities.
 - b) Restoration of previously degraded natural landscapes or incompatible existing vegetation is needed.
 - c) Need for public safety improvements.



fig. 13c Natural Areas / Open Space / Detention





- d) Utilities cannot be reasonably located elsewhere.
- e) Trails and other passive public uses that provide recreational or educational opportunities are compatible with the level of sensitivity of the natural resource.
- 13.3.5 Landscaping and other enhancements to natural areas and their buffer shall follow the recommendation of a qualified biologist/ecologist approved by the DRC.

14.0 Streetscape Design

14.1 General

14.1.1 Projects that include streetscapes that are not provided by the Master Developer shall be in conformance with the intent of the Landscape Master Plan and be guided by the following sections.

14.2 Interstate-25 (I-25)

- 14.2.1 The I-25 Right-of-Way (R.O.W.) will be primarily unirrigated grasses with occasional bands of shrubs/trees that meander just inside the R.O.W. to the private property and back, to avoid a straight line treatment at the edge of the R.O.W. (see fig. 14a).
- 14.2.2 The 80' landscape buffer adjacent to the R.O.W. will be dominated by sculptural landforms, supported by irrigated and unirrigated grasses, tree groupings, and banks of ornamental grasses, shrubs, and perennials (fig. 14a).
- 14.2.3 The combined I-25 R.O.W. and 80' landscape buffer shall be designed as a unified concept.
- 14.2.4 A Type C buffer yard, as defined in the Millennium GDP shall be provided continuously along I-25, unless otherwise approved by the DRC and the City of Loveland.
- 14.2.5 Visual impacts of buildings shall be softened.

- 14.2.6 Views to parking areas shall be screened.
- 14.2.7 All property owners will be expected to participate in maintenance agreements developed between Centerra, CDOT, and the City of Loveland for areas within and adjacent to the I-25 R.O.W

14.3 US 34

- 14.3.1 The US 34 Right-of-Way (R.O.W.) will be largely unirrigated grasses, with occasional bands of shrubs/trees that meander just inside the R.O.W. to the private property and back, to avoid a straight line treatment at the edge of the R.O.W. (fig. 14b).
- 14.3.2 The 80' landscape buffer adjacent to the R.O.W. will be dominated by informal berms, and unirrigated grasses. These will be supported by tree groupings and bands of ornamental grasses, shrubs, and perennials (fig. 14b).
- 14.3.3 The combined US 34 R.O.W. and 80' landscape buffer shall be designed as a unified grouping.
- 14.3.4 A Type C buffer yard, as defined by the Millennium GDP shall be provided continuously along US 34, unless otherwise approved by the DRC and the City of Loveland.
- 14.3.5 Visual impacts of buildings shall be softened.
- 14.3.6 Views to parking areas shall be screened.
- 14.3.7 All property owners will be expected to participate in maintenance agreements developed between Centerra, CDOT, and the City of Loveland for areas within and adjacent to the US 34 R.O.W.
- 14.4 Major Streets
 - 14.4.1 Landscape of major streets (arterials and collectors are dependent on specific location relative to The Landscape Master Plan. (fig. 14c). Use of orchards at major intersections, crop patterns/





agricultural grid, and windrows are to be strategically located. Consult with the DRC for specific implementation concepts.

- 14.4.2 Minimum setbacks for building and parking along Arterial Streets shall be 40' in all cases, and should be landscpaed in a manner consitent with the Landscape Master Plan for the location.
- 14.4.3 Minimum setbacks for building and parking along Collector Streets shall be 25' in all cases, and shall

be landscaped in a manner consistent with the landscape Master Plan for the Location.

14.4.4 Refer to the Landscape Master Plan for specific direction on design intent.

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The following plant list has been established and approved by the Centerra Design Review Committee (DRC) for the Centerra Master Planned Community. Any substitutions or variances from the following list must be submitted to the DRC for review and approval.

SHRUBS

Preferred Species	Do not over water	Abbreviations for Recommended District/Area:
	9	UC = Urban Core
Allowed Species	Protect from sun and wind	R = Residential
		I = Industrial
* Native*	Moisture Rating (Low Moisture – High Moisture)	P = Parks
♥ Pollinator**	Sun Exposure Rating (No Sun – Full Sun)	A = All districts/areas (excluding natural areas)
· · •		

* A Native Plant is defined as those native to the Rocky Mountain Inter-Mountain Region. **A Pollinator is defined as those that provide food and/or reproductive resources for pollinating animals, such as honeybees, native bees, butterflies, moths, beetles, flies and hummingbirds.

Scientific Name Common Name		e Common Name Flower Color Blooming Season			Spread	Sun/Shade Tolerance	Moisture Needs	
SHRUBS								
Abronia fragrans	Snowball Sand Verbena	White	6-7	4-24"	4-24"	**	• •	R, P
Agave americana	Century Plant	Greenish Yellow	Late Spring, Early Summer	6'-12'	6-10'	***	⊘→♦	May not
Alnus incana ssp. tenuifolia	Thinleaf Alder	Purple	Early Spring	15-40'	15-40'	***	• • •	Host pla catkins t
Amelanchier alnifolia	Saskatoon Serviceberry	White	Mid Spring	4'-15'	6'-8'	````````````````````````````````````	۵.	*
Amelanchier canadensis	Shadblow Serviceberry	White	Mid Spring	25'-30'	15'-20'	````````````````````````````````````	• •	High hal
Amelanchier utahensis Utah Serviceberry		White	Mid Spring, Late Spring	12'	12'	***	۵	High hal
Amorpha canescens	Lead Plant	Blue, Purple	Late Spring, Early Summer	3'-6'	6'	````````````````````````````````````	۵	Possible
Arctostaphylos uva-ursi	<i>os uva-ursi</i> Kinnikinnick Insignificant Mid Spring, Late Spring, Early Summer 6"-12"		15'	````````````````````````````````````	۵	Prefers th		
Aronia arbutifolia	<i>utifolia</i> Red Chokeberry White Early Spring, Mid Spring, Mid-Summer, 8'		6'	``*`*`*	• •	M A		
Aronia melanocarpa	Black Chokeberry	White	Early Spring, Mid Spring, Late Spring, Early Summer, Mid-Summer	8'	6'	****	٠.	A 🔊
Artemisia cana	Silver Sagebrush	Insignificant	Summer, Early Fall	1'-3'	3'	***	⊘ → ♦	Silver fol

Notes
C ot be reliably hardy, requires sandy/gritty soil
lant, Spreads - more appropriate for parks, More tree-like; through winter
A A
abitat value for pollinators and birds; Protect from wind
A abitat value for pollinators and birds
A e replacement for Russian Sage; host plant
the winter shade of pines; Requires excellent drainage
DA
oliage; Drought tolerant; Water sparingly the 1 st year, and move irrigation.

SHRUBS	(Continued)
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LEGEND	
Preferred Species	Do not over water
Allowed Species	Protect from sun and wind
* Native*	Moisture Rating (Low Moisture – High Moistu
Pollinator **	Sun Exposure Rating (No Sun – Full Sun)

Scientific Name	Common Name Flower Blooming Season		Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	
SHRUBS		,			•			•
Artemisia filifolia	Sand Sagebrush	Insignificant	Late Summer, Early Fall, Mid Fall, Late Fall, Early Winter	5'	3'	***	⊘→	Silver fo
Artemisia tridentata	Big Sagebrush	Insignificant	Early Summer	6'-12'	6'-8'	***	⊘→●	Silver fo
Atriplex canescens	Four-winged Saltbush	Insignificant	Early Spring-Late Fall	6'-12'	3-6'	**	⊘→●	Interest remove
Buddleja davidii	Butterfly Bush	Insignificant	Early Summer – Early Fall	6'-12'	4'-15'	***	• •	A; Must
Caryopteris x clandonensis 'blue mist'	Blue Mist Spirea	Powder Blue	Late Summer - Mid Fall	2'-3'	2'-3'	***	• •	A; Hone in sprin
Cercocarpus intricatus	Littleleaf Mountain Mahogany	Mountain Mahogany Insignificant Early Spring, Mid Spring, 6' 5'		5'	**•**	⊘→♦	Bark an shelter;	
Cercocarpus montanus	Mountain Mahogany	Yellow Green	Early Summer	8'	6'	****	⊘→●	A Open h
Cercocarpus ledifolius	Curl-leaf Mountain Mahogany Insignificant Early-Mid Spring 10'-2		10'-25'	10'-20'	***	$\oslash \rightarrow \blacklozenge$	A Open h	
Chaenomeles japonica	Japanese Quince	Red Mid Spring		3'	6'	**→***	• •	Flowers
Chamaebatiaria millefolium Fernbush W		White	White Mid-Summer, Late Summer		6'	***	⊘ → ♦	Especia landsca
Chrysothamnus nauseosus	auseosus Rubber Rabbitbrush Yellow Late Summer 4-6' 4-6'		4-6'	***	⊘→♦	Syn. Eri		
Chrysothamnus nauseosus ssp. nauseosus	Dwarf Blue Rabbitbrush	Yellow	Fall	4' 4'		***	⊘→♦	Syn. Eri
Chrysothamnus viscidiflorus	Yellow Rabbitbrush	Yellow	Late Summer, Early Fall, Mid Fall	5'	5'	***	⊘→●	Syn. Eri
Cornus alba	Tatarian Dogwood	Yellow Green	Late Spring, Early Summer	8'	6'	★→★★★	• •	A 🍂
Cornus alternifolia	Alternate leaf Dogwood	Cream	Late Spring, Early Summer	25'	20'		• •	A 😻
Cornus racemosa	Grey Dogwood	White	Late Spring, Early Summer	15'	15'	★ ★→★★★	۵ ۵	🚺 👬 A

CENTERRA APPROVED PLANT LIST (Last Revised December 20, 2019)

	Abbreviations for Recommended District/Area:
	UC = Urban Core
	R = Residential
ure)	I = Industrial
	P = Parks
	A = All districts/areas (excluding natural areas)

Notes

iage; Water sparingly the 1st year, and then remove irrigation.

D_A

oliage; Water sparingly the 1st year, and then remove on.

DA

ting seed pods; Water sparingly the 1st year, and then e irrigation.

t be deadheaded to maintain looks; cut back in winter

eybee forage; will re-seed in irrigated areas; Often cut back

d seeds provide nice texture; semi-evergreen provides open habit

abit; Appealing, curly seeds

abit; Appealing seeds

appear before foliage.

🕈 🔘 UC, I, P

lly attractive to bumblebees; Suitable for conventional oes; Semi-evergreen

A *cameria*; extremely high habitat value

A *cameria*; extremely high habitat value

A *cameria*; extremely high habitat value



LEGEND	
Preferred Species	Do not over water
Allowed Species	Protect from sun and wind
* Native*	Moisture Rating (Low Moisture – High Moistu
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)

SHRUBS (Continued)

Scientific Name	Common Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	Notes
SHRUBS								
Cornus sericea	Redosier / Red Twig Dogwood	White	Spring to Summer	6-8'	6-8'	****		Red stems provide winter interest
Corylopsis glabrescens	Winterhazel	Light Yellow	Early Spring	15'	8'	****	۵.	UC, R
Corylus americana	American Hazelnut	Tan	Early Spring, Mid Spring	15'	13'	<u>****</u>	۸ ۸	UC, R
Cotoneaster adpressus	Creeping Cotoneaster	White	Late Spring, Early Summer	2'	6'	****	۵	A; Red berries
Cotoneaster apiculatus	Cranberry Cotoneaster	Light Pink	Late Spring, Early Summer	2'	6'	*****	۵	A; Stiff arching branches, red berries
Cotoneaster dammeri	Bearberry Cotoneaster	White	Late Spring	2'	6'	★ ★ → ★ ★ ★	۸ ۸	A; Red berries
Cotoneaster hessei	Cotoneaster	Light Red	Late Spring	18"	5'	★ ★→★★★	۸ ۸	A; Red berries
Cotoneaster multiflorus	Many-flowered Cotoneaster	White	Early Summer, Mid-Summer	12"	4'	****	•	A; Red berries
Crataegus erythropoda	Shiny-leaved Hawthorn	White	Spring	10-20'	8-15'	`**`***	۵.	
Crataegus phaenopyrum	Washington Hawthorn	White	Early Summer	20'-25'	20'	***	۵.	A A
Ephedra americana	Jointfir	Light Yellow	Late Spring, Early Summer	4'	3'	***	⊘→♦	A; Semi-evergreen
Ephedra viridis	Mormon Tea	Insignificant	Early Spring	4'-6'	4'-6'	***	۵	
Euonymus alatus	Burning Bush	Insignificant	Late Spring	15'-20'	8'-12'	*****	۸ ۸	U; Bright red foliage
Euonymus kiautschovicus 'Manhattan'	Manhattan Euonymus	Insignificant	Mid-Summer	4'-5'	5'-6'	*	• •	U Evergreen; Spreading habit broadleaf for full shade
Fallugia paradoxa	Apache Plume	White	Late Spring – Early Winter	3'-5'	3'-5'	**	٢	Appealing seed heads; Flowers attract honeybees and native bees
Forestiera neomexicana	New Mexico Privet	Insignificant	Mid Spring – Late Spring	8'-12'	6'-8'	***	۵	
Juniperus horizontalis	Creeping Juniper	N/A	N/A	18"	8'	***	•	A; Evergreen
Juniperous x media 'pfitzeriana compacta'	Compact Pfitzer Juniper	N/A	N/A	18"	5'	***	•	A; Evergreen; Blue green foliage, irregularly round habit
Juniperus x media 'sea green'	Seagreen Juniper	N/A	N/A	5'-6'	6'-8'	***	⊘→♦	A; Evergreen
Juniperus sabina	Juniper	N/A	N/A	4'-6'	5'-10'	***	۸ ۸	A; Evergreen
Juniperus squamata	Singleseed Juniper	N/A	N/A	16'	3'	````````````````````````````````````	۵	R Evergreen; Use in protected areas
Ligustrum vulgare	European Privet	White	Early Summer, Mid-Summer	3'	4'	<u>****</u>	•	UC; Use for hedge applications only; Low habitat value
Malus sargentii	Sargent Crabapple	White	Mid Spring, Late Spring	8'	15'	****		A Benefits birds
Mahonia aquifolium	Compact Oregon Grape Holly	Yellow	Spring	6'	6'	````````````````````````````````````	۵	Early blooms for pollinators, berries for birds; Foliage interest

	Abbreviations for Recommended District/Area:
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ire)	P = Parks
	A = All districts/areas (excluding natural areas)

LEGEND		
Preferred Species	Do not over water	Abbreviations for Recommended District/Area:
	•	UC = Urban Core
Allowed Species	Protect from sun and wind	R = Residential
		I = Industrial
* Native*	Moisture Rating (Low Moisture – High Moisture)	P = Parks
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)	A = All districts/areas (excluding natural areas)

SHRUBS (Continued)

Scientific Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs		
SHRUBS		- I			•			
Mahonia repens	Creeping Grape Holly	Yellow	Late Spring, Early Summer	1'-2'	3'	**	• •	Early bl
Perovskia atriplicifolia	Russian Sage	Lavender	Late Summer, Fall	3'-5'	2'-4'	***	⊘→♦	Conside
Philadelphus coronarius	Mock Orange	White	Late Spring, Early Summer	10'	10'	****	• •	P
Philadelphus lewisii	Mock Orange	White	Late Spring, Early Summer	7'	6'	***	۵	Preferre
Philadelphus microphyllus	Little-leaf Mockorange	White	Late Spring, Early Summer	4'-6'	4'-6'	****	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	
Physocarpus monogynus	Mountain Ninebark	White	Spring	4'	4'	***	۵	
Physocarpus opulifolius	Ninebark	Light Pink, White	Late Spring, Early Summer	6'	4'	***	۵	
Physocarpus opulifolius 'nanus'	Dwarf Ninebark	White	Late Spring, Early Summer	1'-2'	2'-3'	*****	▲ →	
Picea pungens 'Thume'	Colorado Blue Spruce	N/A	N/A	8'	4'	***	•	A; Ever
Pinus sylvestris 'Repens'	Creeping Scot's Pine	N/A	N/A	50"	30"	****	۵	A; Ever
Potentilla fruticosa	Potentilla	Yellow	Summer	2'-3'	2'-3'	***	۵	₩ A;
Prunus besseyi	Western Sand Cherry	White	Spring	3'	6'	***	⊘ → ♦	Attracti
Prunus maackii	Amur Chokecherry	White	Late Spring	20'-30'	18'-25'	****	• •	Golden
Prunus virginiana melanocarpa Western Chokecherry		White	Spring	20'	12'	````````````````````````````````````	۵	Attracti wide rat
Purshia mexicana	Mexican Cliffrose	Light Yellow	Mid Spring, Late Spring, Early Summer	6'	4'	***	⊘→	¥ (
Purshia tridentata Antelope Bitterbrush Yellow Late Spring, Early Summ		Late Spring, Early Summer	8"	8"	***	• •	Scrubla	
Pyracantha angustifolia 'gnome'	Gnome Firethorn	White	Late Spring	4'-6'	4'-8'	****	$\bigstar \rightarrow \bigstar \blacklozenge$	I, P; La
Quercus gambelii	Gambel Oak	Insignificant		8'-20'	6'-12'	***	۵	Host pl
Rhamnus smithii	Smith's Buckthorn	Yellow Green	Late Spring, Early Summer	10'	10'	***	•	P, R, I

CENTERRA APPROVED PLANT LIST (Last Revised December 20, 2019)

Notes

Ж А А

ooms for pollinators, berries for birds; Foliage interest

er subbing with a native species (i.e. leadplant); honeybee forage

Fragrant

A; Fragrant A; Fragrant of species of mock orange

A; Fragrant

Й А

A 🎝

ÅΑ

green; Any cultivars are appropriate

green; Any cultivars are appropriate

; Any cultivators are appropriate

ve and reliable for many sites; great native bee plant

exfoliating bark

Г Р

ve and reliable for many sites; high habitat value for birds and nge of pollinators; Can spread like crazy

D_{P, R}

P, R

nd shrub; Plant in well drained area

rge, persistent orange berries; Wicked thorns

P N

ant; Plant on gravel berm; Must have excellent drainage



LEGEND	
Preferred Species	Do not over water
Allowed Species	Protect from sun and wind
* Native*	Moisture Rating (Low Moisture – High Moisture)
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)

SHRUBS (Continued)

Scientific Name Common Name Flow			Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	
SHRUBS								
Rhus aromatica 'gro-low'	Grow Low Sumac	Insignificant	Late Spring	1'-2'	6'-8'	*****	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	Brillian
Rhus glabra	Smooth Sumac	Insignificant	Early Summer	9'-15'	9'-15'	****	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	Brillian
Rhus trilobata Three-leaf Sumac		Insignificant	Mid Spring, Late Spring	6'	6'	***	⊘ → ♦	High ha
Ribes alpinum	Alpine Currant	Yellow Green	Mid Spring	6'	6'	<u>***</u>	۵	A A
Ribes americanum	American Black Currant	Yellow	Spring	2-4'	2-4'	★ ★ ★ ★	۵.	Р ,
Ribes aureum	<i>m</i> Golden Currant Yellow Orange Mid Spring, Late Spring		3'-7'	2'-6'	****	• •	High ha	
Ribes cereum	Wax Currant	Light Pink	Mid Spring	4'	4'	***	۵	
Ribes odoratum 'Crandall'	s odoratum 'Crandall' Clove Currant Yel		Mid Spring	5'	10'	````````````````````````````````````	۵	Great fa
Rosa glauca	Redleaf Rose	Pink	Late Spring, Early Summer	8'	5'	***	۵	Red-pu
Rosa	All shrub roses, including: Hybrid Rugosa Rose Floribunda Rose Explorer Series	Light Pink	Late Spring, Early Summer, Mid-Summer, Late Summer, Early Fall, Mid Fall	7'	7'	***		P, R; Lo
Rosa 'Nearly Wild'	Floribunda Rose	ibunda Rose Pink Late Spring, Early Summer, Early Fall, Mid Fall		4'	4'	***	• •	P, R; Lo
Salix irrorata	rorata Bluestem Willow Insignificant Spring		Spring	12'	8'	****	• •	P, R, St
Salix purpurea 'nana'	InsignificantInsignificantSpring		Spring	3'-5'	3'-5'	***	$\blacklozenge \blacklozenge \rightarrow \blacklozenge \blacklozenge \blacklozenge$	P, R, St
Sambucus ebulus	Dwarf Elderberry White Mid-Summer, Late Summer 4' 4'		***	• •	May be			
Shepherdia argentea	Buffaloberry	Yellow	Early Spring	8'-12'	8'-12'	````````````````````````````````````	⊘→	Edible f
Sibiraea laevigata	Siberian Spirea	White	Early Summer	5'	8'	****	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	P, R, S
Spiraea fritschiana	Korean Spirea	White	Early Summer, Mid-Summer	3'	4'	***	• •	UC, P,

	Abbreviations for Recommended District/Area:
	UC = Urban Core
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ire)	P = Parks
	A = All districts/areas (excluding natural areas)

Notes

fall foliage

fall foliage

A abitat value, especially for native bees; Use in masses; Brilliant

R

P P

abitat value, esp. for migrating hummingbirds and bumblebee ; Will sucker; Red autumn foliage is amazing

A N

P, R all color; Good for birds

R. UC

rple foliage provides nice contrast

ow habitat value for pollinators; Provides habitat for birds

ow habitat value for pollinators; Provides habitat for birds

reetscape

reetscape

e rangy in small yards; Bird plant

🗱 🕲 _{Р, І}

fruit; Silver foliage; Provides habitat for birds

treetscape

Streetscape



LEGEND	
Preferred Species	Do not over water
Allowed Species	Protect from sun and wind
* Native*	Moisture Rating (Low Moisture – High Moistur
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)

SHRUBS (Continued)

Scientific Name	Common Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	Notes
SHRUBS	HRUBS							
Spiraea japonica	Japanese Spiraea	Pink	Late Spring, Early Summer, Mid-Summer	3'	3'	** *		UC, P, Streetscape
Spiraea myrtilloides	Myrtle Spirea	White	Early Summer, Mid- Summer	8'	4'	** *	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	UC, P, Streetscape
Spiraea prunifolia	Bridal Wreath Spirea	White	Mid Spring, Late Spring	8'	8'	** *	• •	UC, P, Streetscape; Invasive in eastern U.S.
Spiraea trilobata	Three-lobed Spirea	White	Late Spring, Early Summer	4'	4'	** *	• •	UC, P, Streetscape
Symphoricarpos occidentalis	Snowberry	White	Mid-Summer	3'-6'	3'-6'	** **	• •	Great plant for birds
Symphoricarpos orbiculatus	Red Coralberry	White, Green	Mid Spring, Early Summer	3'-6'	3'-6'	* →* *	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	A
Syringa meyeri 'palibin'	Dwarf Korean lilac	Pale pink	Mid Spring, Late Spring	4-5'	5-7'	***	۵.	💓 A; Fragrant
Syringa vulgaris	Common Lilac	Purple - White	Late Spring	20'	12'	***	۵	Susceptible to powdery mildew; Fragrant
Viburnum carlesii	Koreanspice Viburnum	White	Early Spring, Mid Spring	5'	6'			A; Fragrant
Viburnum dentatum	Southern Arrowwood	White	Late Spring, Early Summer	8'	8'	- ₩-→₩-₩-₩-		P, UC; Uniform branching habit
Viburnum lantana	Wayfaringtree	White	Late Spring	10'	8'		۲	P, UC, I
Viburnum lentago	Nannyberry	White	Late Spring	15'	8'	<u>**→* * *</u>	۲	P, UC, I; Upright arching branches
Viburnum trilobum 'Compactum'	American Cranberrybush	White	Mid Spring	5'	5'	* →* * *	۲	P, UC, R; Fruit bearing
Viburnum x burkwoodii	Burkwood Viburnum	White	Mid Spring	8'	8'	★ → ★ ★	• •	P, UC, R
Yucca glauca	Soap Weed	White	Summer	2-3'	2-3'	***	⊘→●	

	Abbreviations for Recommended District/Area:
	UC = Urban Core
	R = Residential
	I = Industrial
ire)	P = Parks
	A = All districts/areas (excluding natural areas)



PERENNIALS & GRASSES

LEGEND		
Preferred Species	Do not over water	Abbreviations for Recommended District/Area:
Allowed Species	▲ Protect from sun and wind	UC = Urban Core R = Residential
1		I = Industrial
* Native*	Moisture Rating (Low Moisture – High Moisture)	P = Parks
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)	A = All districts/areas (excluding natural areas)

Scientific Name	Common Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	Notes
FORBS								
Achillea lanulosa	Woolly Yarrow	White	Summer	18"	18"	***	۵	A; Forage for wide range of small pollinators
Achillea millefolium	Common Yarrow	White	Early Summer, Mid- Summer, Late Summer, Early Fall	2'	3'	***	۵	A; Can be aggressive; Any cultivar is okay
Adenolinum (linum) lewisii	Blue Flax	Blue	Summer	12"	12"	***	۵	* A Short-lived, but re-seeds; gives a "wild" or "natural" effect
Agastache cana	Double Bubblemint	Pink	Summer-Fall	3'	2'	***	۵	A; High habitat value for long-tongued pollinators
Agastache foeniculum	Anise Hyssop	Blue	Summer-Fall	3'	2'	***	۵	A; Especially attractive to bumble bees
Agastache rupestris	Sunset Hyssop	Orange	Late Summer, Fall	1'-2'	1'-1.5'	```````````````````````````````````	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	A; High habitat value for long-tongued pollinators
Aguilegia caerulea	Rocky Mountain Columbine	Blue, White	Mid to Late Spring	1'-2'	1'-2'	⋇⋇∍⋇⋇ ⋇		A; Colorado State flower
Ajuga reptans 'Mahogany'	Bugleweed	Blue	Late Spring, Early Summer	6"	6"	*	۵ ۵	W R; Ground cover; Spreads aggressively
Alchemilla mollis	Lady's Mantle	Yellow Green	Early Summer	2'	2'	*	۵.	A; Tidy and attractive in the right setting
Amsonia jonesii	Jones' Bluestar	Light blue	Mid Spring, Late Spring, Early Summer	2'	2'	***	۵	
Anthemis marschalliana	Filigree Daisy	Yellow	Late Spring, Early Summer, Mid-Summer	4"	12"	***		N R; Tidy border plant; Prefer Engelmann Daisy
Aquilegia chrysantha	Golden Columbine	Yellow	Late spring	3'	2'	````````````````````````````````````	۵	A; Long blooming
Armeria maritima	Sea Thrift	Pink	Mid Spring, Late Spring, Early Summer	12"	12"	***	• •	▶ P, R; Tidy border plant
Artemisia frigida	Fringed Sagebrush	Yellow	Summer	2'	2'	***	⊘→♦	A; Silver foliage
Artemisia ludoviciana	Prairie Sage	Yellow	Summer	40"	36"	***	⊘→●	A Silver foliage; Can spread to become groundcover
Artemisia schmidtiana	Wormwood	White	Early Summer	18"	24"	***	۵	A
Artemisia versicolor 'seafoam'	Seafoam Artemisia	Yellow	Mid-Summer	6"-12"	18"-24"	***	•	A; Low water; Grey foliage
Asclepias incamata	Swamp Milkweed	White/Pink	Summer	36-72"	24"	***	• •	A; Superior milkweed choice for landscaping; Monarch host; High habitat value
Asclepias tuberosa	Butterfly Weed	Orange	Summer	12"	12"	***	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	R, P, Streetscape; Monarch host; High habitat value
Aster alpinus 'Goliath'	Goliath Alpine Aster	Light Blue	Mid Spring, Late Spring, Early Summer	12"	18"	** *	•	X A; High habitat value for pollinators and birds

CENTERRA APPROVED PLANT LIST (Last Revised December 20, 2019)



LEGEND	
Preferred Species	Do not over water
Allowed Species	Protect from sun and wind
* Native*	Moisture Rating (Low Moisture – High Moistur
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)

Scientific Name	Common Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	
FORBS								-
Aster ascendens	Western Aster	Light Purple	Late Spring, Early Summer, Mid-Summer	24"	24"	***	٠	Syn. Syr birds; G
Aster ericoides	Many-flowered Aster	White	Late Summer	18-24"	24"	***	٠.	
Aster falcatus	Rough White Aster	White	Late Summer	24-48"	24"	***	• •	
Aster hesperius	Western Aster; Violet Aster	Pink	Late Summer	36-60"	20"	***		
Aster x frikartii 'monch'	Monch Aster	Lavender	Late Summer, Fall	2'-3'	1'-1.5'	**** *		A A
Aster porteri	Porter's Aster	White	Late Summer	18-24"	24"	***	۵	
Aubrieta deltoidea	Purple Rockcress	Purple	Mid Spring, Late Spring, Early Summer	6"	12"	***	۵	N R,
Baptisia australis	Blue Wild Indigo	Blue	Late Spring, Early Summer	4'	3'	** *	۵	Attractiv
Bergenia cordifolia	Heartleaf Bergenia	Pink	Late Spring	1'-1.5'	1'-1.5'	★★→★★	• •	A; Large
Berlandiera lyrata	Chocolate Flower	Yellow	Late Spring, Early Summer, Mid-Summer, Late Summer, Early Fall, Mid Fall	24"	18"	***	۵	*
Callirhoe involucrata	Poppy Mallow	Red violet	Summer	6"	18"	***	۵	Easy car
Calylophus serrulata	Calyophus	Yellow	5-9	8-12"	15"	★★→★★	۵	
Campanula cochlearifolia	Earleaf Bellflower	Violet	Late Spring, Early Summer, Mid-Summer	6"	12"	****		A
Campanula persicifolia	Willow Bell	Blue	Early Summer, Mid- Summer	3'	18"	***		A
Campanula rotundifolia	Bluebell Bellflower	Light Blue	Early Summer, Mid- Summer, Late Summer, Early Fall	10"	8"	**	۵	* A
Centranthus ruber	Red Valerian	Pink	Late Spring	3'	2'	***	٠	Indestru
Cerastium tomentosum	Snow-in-Summer	White	Early Summer	.5'-1'	.75'-1'	***	⊘→	A 🏹

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ire)	P = Parks
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Notes

A mphyotrichum ascendens; High habitat value for pollinators and Good for buffers

A; High habitat value for pollinators and birds

A; High habitat value for pollinators and birds

A; High habitat value for pollinators and birds

; High habitat value for pollinators and birds

A; High habitat value for pollinators and birds

Р

ve to bumblebees; Long lived; Shrub like perennial

evergreen leaves

🕈 A; Fragrant

A e; Host for fritillary butterflies; Spreading plant

A

Streetscape

ctible, benefits from timely deadheading

ggressive; Silver foliage

PERENNIALS & GRASSES (Continued)

LEGEND		
Preferred Species	Do not over water	Abbreviations for Recommended District/Area:
		UC = Urban Core
Allowed Species	Protect from sun and wind	R = Residential
		I = Industrial
* Native*	Moisture Rating (Low Moisture – High Moisture)	P = Parks
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)	A = All districts/areas (excluding natural areas)
· · ·		

Scientific Name	Common Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	
FORBS		1						
Ceratostigma plumbaginoides	Plumbago	Blue	Mid-Summer, Late Summer, Early Fall	12"	24"	*→** *	۵	P , 1
Clematis	Clematis	White - Purple	Early Summer, Late Summer, Mid-Summer	6'	Vine	***		R; Will n
Convallaria majalis	Lily of the Valley	White	Early Spring	12"	15"		٠.	R; Under
Coreopsis verticillata	Coreopsis	Yellow	Summer	1.5'-2'	1.5'-2'	***	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	A 🏹
Crambe maritima	Curly Leaf Sea Kale	White	Late Spring, Early Summer	6'	4'	***		P; Use as
Dalea purpurea	Purple Prairie Clover	Rose, Purple	Summer	1'-3'	1'-1.5'	***	• •	
Delosperma cooperi	Hardy Ice Plant	Red purple	Summer, Early Fall	.25'5'	1'-2'	***	⊘ → ♦	₩ A;
Dianthus 'Bath's Pink'	Cheddar Pink	Pink	Late Spring	10"	10"	***	• •	P, 1
Digitalis lanata	Grecian Foxglove	Cream	Early Summer, Mid- Summer	24"	18"	** *		A A
Digitalis obscura	Sunset Foxglove	Yellow	Late Spring Early Summer	24"	20"	****		A;
Echinacea purpurea	Eastern Purple Coneflower	Light Purple	Early Summer, Mid- Summer, Late Summer	3'	2'	***	• •	P, I High hat
Echinacea tennesseensis	Small Tennessee Purple Coneflower	Purple	Early Summer, Mid- Summer, Late Summer	30"	24"	***	۵	X A;
Engelmannia peristenia	Englemann Daisy	Yellow	Late Spring Early Summer	24"	30"	***	۵	A Plant Sel
Erigeron speciosus	Aspen Daisy	Lavender	Summer	24"	24"	***	٢	N A;
Eriogonum umbellatum	Sulfur Flower	Yellow	7-8	6-18"	24"	***	۵	P, 1
Euonymus fortunei 'Coloratus'	Purpleleaf Wintercreeper	White	Mid Spring	.5'75'	1'-3'	** **	• •	A ; E
Gaillardia aristata	Blanket Flower	Red/ Yellow	Summer, Fall	24"	24"	***	٢	Long blo
Galium odoratum	Sweet Woodruff	White	Mid to Late Spring	.5'-1'	.75'-1.5'	**		A; Aggree
Gaura lindheimeri	Beeblossom	White/Pink	Early Summer, Mid- Summer, Late Summer, Early Fall, Mid Fall	3'	2'	**** *	٠	W P, F
Geranium cultivars		Pale Pink - Violet	Summer	2'	2'	***	• •	A P, F
Glandularia wrightii		Pink	Early Summer	3"	6"	***	•	• A; I

Notes

R, Streetscape; Late blooming perennial

need support

erstory plant; Fragrant

s contrast foliage; Huge plant

A

Semi-evergreen

R, UC; Semi-evergreen

Preferred foxglove selection – Plant Select

R

bitat value: Low maintenance; A favorite of rabbits

High habitat value; Low maintenance; A favorite of rabbits

lect; Preferred over Anthemis

May spread aggressively

R, UC; Semi-evergreen; Persistent seed heads

Evergreen

A

ooming period, especially when deadheaded; Tolerates heat essive spreader

R, UC; Excellent long blooming perennial

R, UC

Likes sandy soil



LEGEND		
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* Native*	Moisture Rating (Low Moisture – High Moisture)	P = Parks
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)	A = All districts/areas (excluding natural areas)

Scientific Name	Common Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	
FORBS								
Gutierrezia sarothrae	Snakeweed	Yellow	Late Summer, Early Fall, Mid Fall	3'	3'	**	⊘→●	
Helianthemum grandiflorum ssp. grandiflorum	Rockrose	Yellow	Late Spring, Early Summer	12"	24"	***	۵	₩ P, 1
Helianthus annuus	Annual Sunflower	Yellow	Summer	10'	3'	***	۵	should be maintena
Helianthus maximiliani	Maximilian sunflower	Yellow	Early Fall	3'-10'	2'-4'	***	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	
Hemerocallis ssp.	Daylily	Varies	Summer	1'-3'	1'-3'	````````````````````````````````````	۵	for tough
Hesperaloe parviflora	Red Yucca	Pink	Summer	3'	3'	***	⊘→	High hat
Heuchera pulchella	Sandia Mountain Coral Bells	Pink	Late Spring, Early Summer	6"	12"	***	٢	P, R, UC
Heuchera sanguinea	Coral Bells	Pink, Red	Late Spring, Early Summer	1'-1.5'	.75'-1'	★★→★★ ★	٠.	P, R, UC
Hosta sagae	Hosta	Light Purple	Mid-Summer, Late Summer	3'	3'	*	٠.	A; Work
Hyssopus officinalis	Common Hyssop	Violet	Early Summer, Mid- Summer, Late Summer, Early Fall	10"	10"	***	۵	X A; A
Iris x germanica	Bearded Iris	Blue-Purple	Late Spring	2'-3'	1'-2'	***	٠.	А
Iris missouriensis	Blue flag Iris	Blue-Purple	Spring	24"		***	۸ ۸	A; Early
Kniphofia caulescens	Torch Lily	Coral Red, Yellow	Mid-Summer	2'-4'	1'-2'	***	۵.	A 💦
Kniphofia uvaria	Red Hot Poker	Red	Late Spring, Early Summer	24"	24"	***	٢	P , F
Lavandula angustifolia	English Lavender	Purple	Late Spring, Early Summer, Mid-Summer	18"	18"	***	۲	Fragrant; winter
Leucojum aestivum	Summer Snowflake	White	Early Spring, Mid Spring, Late Spring, Late Winter	2'	1'	**		R, P; Bul
Liatris ligulistylus		Magenta	Mid-Summer, Late Summer	2'	1'	***	• •	*
Liatris punctata	Dotted Gayfeather	Pink, Purple	Late Summer, Fall	1-3'	1-3'	***	• •	wildflowd
Liatris pycnostachya	Prairie Blazing Star	Light Purple	Mid-Summer, Late Summer	5'	18"	***	• •	X A;

Notes

A; Shrub like

R; Attractive all season long

; High habitat value; even if not included in design, there e allowance to keep them in the landscape; included in ince guidelines; will re-seed

A

UC, Streetscapes; Low habitat value – restrained use, but great locations

DA

bitat value for pollinators, esp. hummingbirds; Habit provides

C; Best used in sheltered contexts, understory

C; Best used in sheltered contexts, understory

horse in shady sites; Low habitat value

Agastache spp. are preferred

bloom - nectar and pollen for bees; aquatic shelter

R, UC; Favorite of hummingbirds, but can be finicky

JC, Streetscape

Superb honeybee forage; May rot out in heavy soils over

lbs in spring

A; Superb plant for butterfly habitats

A; Superb plant for butterfly habitats; Also good for er seeding in natural areas

Superb plant for butterfly habitats



LEGEND	
Preferred Species	Do not over water
Allowed Species	Protect from sun and wind
* Native*	Moisture Rating (Low Moisture – High Moistu
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)

Scientific Name	Common Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	
FORBS	·							
Liatris spicata	Prairie Gayfeather	Magenta	Mid-Summer, Late Summer	24"	24"	***	۵	A; 1
Linum perenne	Perennial Flax	Light Blue	Early Summer	24"	24"	***	۵	A; .
Lonicera spp.	Vining Honeysuckles		Early Summer, Mid- Summer, Late Summer	Vine	Vine	***	۵	A 😻
Lupinus argenteus	Silvery Lupine	Purple	Summer	2'	2'	***	۵	Availabili great fora
Lupinus neomexicanus	New Mexico Lupine	Light Blue	Late Spring, Early Summer	24"	24"	***	۵	A; A
Lychnis chalcedonica	Maltesecross	Red	Late Spring, Early Summer, Mid-Summer	4'	18"	***		W R; S
Lysimachia nummularia	Creeping Jenny	Yellow	Late Spring, Early Summer	4"	18"	`````````````````````	• •	R ; N
Machaeranthera bigelovii	Sante Fe Aster	Blue	Fall	1'-3'	1'-2'	***	۵	X A; V
Mirabilis multiflora	Four O'Clock	Red-violet	Summer	3'	4'	***	⊘→♦	Attractive
Monarda fistulosa	Wild Bergamot	Pink	Summer	36"	24"	***	۵	High hat
Oenethera caespitosa	White Stemless Evening Primrose	White	Early Summer, Mid- Summer, Late Summer	12"	18"	***	⊘→♦	
Oenothera macrocarpa	Evening Primrose	Yellow	Summer	12"	24"	***	⊘→	P ,
Opuntia basilarus	Beavertail Cactus	Red, Pink, Purple	Late Winter, Spring, Early Summer	1'-3'	2'-3'	***	•	
Origanum libanoticum	Hopflower Oregano	Lavender	Late Summer, Early Fall	18"	24"	**	۵.	• A;
Paeonia suffruticosa	Mountain Peony	White	Mid Spring, Late Spring	5'	5'	***	۵ ۵	P ,
Paxistima canbyi	Canby's Mountain Lover	White	Mid Spring	12"	12"	*	۵.	• A;
Penstemon albidus	White Penstemon	White	Mid Spring, Late Spring, Early Summer	12-16"	12"	***	۵	
Penstemon angustiflius	Narrow-leaved Penstemon	White	Mid Spring, Late Spring, Early Summer	12-24"	12"	***	⊘→♦	
Penstemon barbatus	Scarlet Bugler	Red	Summer	36"	18"	***	٢	

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ıre)	I = Industrial
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Notes

Plant for butterfly habitats; Least preferred Liatris

Also see Adenolinum (linum) lewisii

lity will be an issue, great once established; Host for blues and age for larger bees

Availability will be an issue

Silver Foliage

May spread aggressively

Will self-seed, short lived

A

e mounding habit; Attractive to hawk moths and gbirds; Requires excellent drainage

A

bitat value when in bloom for bumblebees, hummingbirds and es; Very hardy

A

, R, Streetscapes; Often called O. missouriensis

.

Attractive habit even after bloom has stopped

R: Tree peonies are high maintenance

Plant Select

A; High habitat value for pollinators

A; High habitat value for pollinators

A; High habitat value for pollinators



LEGEND		
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Pollinator**	Sun Exposure Rating (No Sun – Full Sun)	A = All districts/areas (excluding natural areas)

Scientific Name	Common Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	
FORBS								
Penstemon eatonii	Firecracker Beardtongue	Red	Early Summer	24"	18"	***	۵	
Penstemon grandiflorus	Large Beardtongue	Red	Summer	36"	12"	***	۵	
Penstemon linariodes v coloradoensis	Blue-mat Penstemon	Blue	Late Spring, Early Summer	.5'-1'	.5'-1'	***	•	A N
Penstemon x mexicalli 'Pike's Peak'	Pike's Peak Penstemon	Purple	Early Summer, Mid- Summer, Late Summer	1'-1.5'	.5'-1'	***	۵	A A
Penstemon x mexicalli 'Red Rocks'	Red Rocks Penstemon	Pink	Early Summer, Mid- Summer, Late Summer	1'-1.5'	.5'-1'	***	۵	A 😻
Penstemon pinifolius	Pine-leaf Beardtongue	Magenta	Summer	8"	15"	***	۵	
Penstemon pseudospectabilis	Desert Beardtongue	Magenta	Late Spring, Early Summer, Mid-Summer, Late Summer	32"	24"	***	۵	*
Penstemon secundiflorus	One-sided Penstemon	Pink/ Purple	Summer	24"	24"	***	۲	
Penstemon strictus	Beardtongue, Rocky Mountain Penstemon	Purple	Late spring	24"	24"	**	۵	
Penstemon virens	Greenleaf Penstemon	Blue-Purple	Summer	12"	12"	***	⊘→	
Penstemon virgatus	Tall One-Sided Penstemon	Pink	Early Summer	12"	18"	**	⊘→	
Phlomis cashmeriana	Cashmere Sage	Light Pink	Early Summer	3'	2'	**** *	۵	P, R;
Phlomis russeliana	Jerusalem Sage	Light Yellow	Late Spring, Early Summer, Mid-Summer	3'	2'	***	۵	P , R
Phlox carolina	Thickleaf Phlox	Pink	Mid-Summer, Late Summer, Early Fall, Mid Fall	36"	30"	***	۵ ۵	A A
Phlox divaricata	Wild Blue Phlox	Light Pink, Light Blue	Mid Spring, Late Spring	18"	40"	** **		A K
Phlox maculata	Wild Sweetwilliam	Magenta	Late Summer, Early Fall, Mid Fall	18"	2'	***	• •	N A
Phlox subulata	Moss Phlox	Magenta, Violet	Mid Spring, Late Spring, Early Summer	6"	18"	**	• •	A A
Polemonium caeruleum	Jacob's Ladder	Yellow	Mid Spring, Late Spring	24"	18"	*	۵.	A 🔊

Notes
A; High habitat value for pollinators
A; High habitat value for pollinators
A; High habitat value for pollinators
A. High habitat value for pollipators
r, righ habitat value for polimators
A; High habitat value for pollinators
Nice texture; Moderate habitat value

PERENNIALS & GRASSES (Continued)

LEGEND		
Preferred Species	Do not over water	Abbreviations for Recommended District/Area:
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Allowed Species	Protect from sun and wind	R = Residential
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Native*	Moisture Rating (Low Moisture – High Moisture)	P = Parks
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)	A = All districts/areas (excluding natural areas)

Scientific Name	Common Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade	Moisture	Notes
FORBS						TOICIAIICE	Inceus	
Primula denticulata	Primrose	Pink, Blue, Purple, White	Early Spring, Mid Spring	6"	12"	*	۵.	A A
Pycnanthemum virginianum	Virginia Mountainmint	White	Mid-Summer, Late Summer	24"	36"	***	• •	₩ , P , R
Ratibida columnifera	Prairie Coneflower	Yellow	Summer	18"	12"	***	⊘→	A; Very tough plant
Ratibida pinnata	Pinnate Prairie Coneflower	Yellow	Early Summer, Mid- Summer, Late Summer, Early Fall	5'	18"	***	⊘→	NK A
Rudbeckia hirta	Blackeyed Susan	Gold	Summer	3'	1'	***		P, R, UC, Streetscapes
Rudbeckia maxima	Great Coneflower	Yellow	Early Summer, Mid- Summer	7'	18"	***	۵	P P
Rudbeckia triloba	Brown-Eyed Susan	Yellow	Mid-Summer, Late Summer, Early Fall, Mid Fall	3'	3'	***		W P, R, UC, Streetscapes
Salvia azurea var. grandiflora	Pitcher Sage	Blue	Mid-Summer, Late Summer, Early Fall, Mid Fall	4'	3'	***	۵	Hot/ late season forage for many bees, butterflies, hummingbirds
Salvia daghestanica	Dwarf Silver-leaf Sage	Blue	Late Spring, Early Summer	12"	12"	***	۵	R, UC; Texture on silver foliage
Salvia greggii 'Farman's Red'	Salvia 'Furman's Red'	Red	Spring, Summer, Fall	2'-3'	2'-3'	***	•	A; Loves hot weather
Salvia nemerosa 'may night'	Salvia 'May Night'	Dark Blue	Late Spring – Early Summer	1.5'-2'	1'-1.5'	***		₩ A; Can spread into natural areas; Deadhead
Salvia pachyphylla	Mojave Sage	Purple	Summer	2'-3'	2'-3'	***	۵	I, R, UC; Low survival rate; Consider bare root planting; Hates organic matter and water
Salvia officinalis	Sage	Light Purple	Early Summer	24"	24"	***	٢	R, UC; Fragrant foliage
Saponaria ocymoides	Rock Soapwort	Pink	Late Spring, Early Summer	9"	30"	***	٢	P, R, UC
Sedum 'Autumn Joy'	Autumn Joy Sedum	Pink	Late Summer	1.5'-2'	2'	***	۵	₩ A; Butterfly host plant
Santolina chamaecyparissus	Gray Santolina	Yellow	Mid-Summer	1.5'-2'	1.5'-2'	***	٢	A A
Sphaeralcea munroana	Tall Globernallow	Pink, Orange	Late Spring, Early Summer	1'-2'	.5'-1'	***	۵	
Sphaeralcea coccinea	Globe Mallow	Red, Orange	Spring, Summer, Early Fall	1'-1.5'	1'	***	٢	A; Wildflower for natural areas

LEG	END									
Pref	erred Species	۲	Do not over water			Abbreviations for Recommended District/Area:				
Allo	wed Species		Protect from sun a	nd wind		$\bigcup_{n \in \mathbb{N}} UC = Urban Core$				
1110	wed opecies					R = Residential				
.	Native		Moisture Rating (L	ow Moisture – H	ligh Moisture)	- I = Industrial				
			0.		0	P = Parks				
	Pollinator**	*	Sun Exposure Ratin	ng (No Sun – Ful	ll Sun)	A = All districts/areas (excluding natural areas)				
l	Height	Spread	Sun/Shade Tolerance	Moisture Needs		Notes				
			1 1		4					
Fall	4'-5'	2'-5'	***	$\bigcirc \rightarrow \blacklozenge$						
ing	1"	12"	***	٢	P, R, UC					
-	3"	12"	***	۵	P, R, UC					
mer,	12"	12"	***	٢	P, R, UC					
	24"	18"	**	٢	* P, R					
	6"	18"	***	۵	* * * A; N	Not long-lived; Low priority				
mer,	18"	18"	***	۵	, Streetscapes					
ing,	3"	18"	**	۵	💓 P, R, UC	, Streetscapes				
ng	1"	18"	***	۵	P, R, UC	, Streetscapes				
	3"	18"	***	•	P, R, UC	, Streetscapes				
ng	2"	18"	**	•	P , R, UC	, Streetscapes				
0	2'-3'	2'-2.5'	***	• •	► P, R, UC	, Streetscapes				
ng, - er,	6"	8"	````````````````````````````````````	•	P; Self-set	eds				
mer, 1id	6"	18"	***	۵	😻 A; Syn. E	pilobium canum				
	12"	12"	***	⊘→♦	* * P					
	1.5'-2.5'	1.5'-2'	***	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$						
	12"	12'	***	٢						
	12"	12"	***		A; Very :	attractive in landscape				

			Pre	eferred Species	۲	Do not over water		Abbreviations for Recommended District/Area:
			All	lowed Species	A	Protect from sun a	nd wind	R = Residential
CENIER	RA APPROVED P	PLANT LIST	*	* Native* Moisture Rating (Low Moisture – High				I = IndustrialP = Parks
PERENNIALS & GRASSI	ES (Continued)		P	Pollinator**	*	Sun Exposure Rati	ng (No Sun – Fu	A = All districts/areas (excluding natural areas)
Scientific Name	Common Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	Notes
FORBS								
Stanleya pinnata	Princes Plume	Yellow	Spring, Summer, Early Fall	4'-5'	2'-5'	***	⊘→♦	
Thymus neiceffii	Juniper Leaf Thyme	Magenta	Early Spring, Mid Spring	1"	12"	***		₩ P, R, UC
Thymus serpyllum	Creeping Thyme	Dark Pink	Early Summer, Mid- Summer	3"	12"	***	۵	P, R, UC
Thymus vulgaris	Common Thyme	Light Purple	Late Spring, Early Summer, Mid-Summer	12"	12"	***	۲	₩ P, R, UC
Tradescantia occidentalis	Spiderwort	Purple	Summer	24"	18"	**	۵	* P, R
Verbena bipinnatifida wrightii	Wild Verbena	Purple	Summer	6"	18"	***	۲	A; Not long-lived; Low priority
Veronica austriaca	Broadleaf Speedwell	Blue	Late Spring, Early Summer, Mid-Summer	18"	18"	***	۵	P, R, UC, Streetscapes
Veronica filiformis	Creeping Speedwell	Light Blue	Early Spring, Mid Spring, Late Spring	3"	18"	**	۵	W P, R, UC, Streetscapes
Veronica liwanensis	Speedwell	Blue	Mid Spring, Late Spring	1"	18"	***	•	P, R, UC, Streetscapes
Veronica pectinata	Wooly Speedwell	Blue	Mid Spring	3"	18"	***	•	P, R, UC, Streetscapes
Veronica repens	Creeping Speedwell	White, Cream	Mid Spring, Late Spring	2"	18"	**		P, R, UC, Streetscapes
Veronica spicata	Veronica	Blue	Summer	2'-3'	2'-2.5'	***	• •	P, R, UC, Streetscapes
Viola corsica	Corsican Violet	Violet, Purple	Mid Spring, Late Spring, Early Summer, Mid- Summer, Late Summer, Early Fall, Mid Fall	6"	8"	****	۵	₽; Self-seeds
Zauschneria latifolia var. arizonica	Hardy Hummingbird Trumpet	Dark Orange	Late Spring, Early Summer, Mid-Summer, Late Summer, Early Fall, Mid Fall	6"	18"	***	•	X A; Syn. Epilobium canum
Zinnia grandiflora	Plains Zinnia	Yellow	Summer	12"	12"	***	⊘→●	
GRASSES								
Bouteloua curtipendula	Side Oats Gramma	Insignificant	Summer	1.5'-2.5'	1.5'-2'	***	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	
Bouteloua gracilis	Blue Grama	Insignificant	Summer	12"	12'	***	۲	
Bouteloua gracilis 'Blonde Ambition'	Blonde Ambition Blue Grama	Golden	Summer	12"	12"	***		A; Very attractive in landscape

PERENNIALS & GRASSES (Continued)

LEGEND		
Preferred Species	Do not over water	Abbreviations for Recommended District/Area:
		UC = Urban Core
Allowed Species	Protect from sun and wind	R = Residential
		I = Industrial
* Native*	Moisture Rating (Low Moisture – High Moisture)	P = Parks
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)	A = All districts/areas (excluding natural areas)

Scientific Name	Common Name	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	
GRASSES					•		,	
Buchloe dactyloides	Buffalograss	Insignificant	Summer	6"	12"	***	٠	A; Tur
Calamagrostis acutiflora 'Karl Foerster'	Feather Reed Grass	Insignificant	Late Spring, Summer, Fall, Winter	3'-5'	1.5'-2.5'	***	$\blacklozenge \blacklozenge \rightarrow \blacklozenge \blacklozenge \blacklozenge$	A; Often cut
Festuca glauca 'Elijah Blue'	Blue Fescue	Green Purple	Summer	.75'-1'	.5'75'	***	⊘→♦♦	А
Miscanthus sinensis 'Morning light'	Maiden Grass	Insignificant	Fall, Winter	4'-6'	2.5'-4'	<u>**</u> **	••	A; Use native Aggressive
Miscanthus sinensis 'Purpurascens'	Purple Maiden Grass	Insignificant	Fall, Winter	3'-4'	2'-3'	***	• •	A; Use native
Muhlenbergia reverchonii Undaunted	Undaunted Ruby Muhly Grass	Pink	Fall	30"	30"	***	۵	A; Glows pin
Panicum virgatum 'shenandoah'	Red Switch Grass	Insignificant	August, Fall, Winter	3'-4'	3'-4'	````````````````````````````````````	$\blacklozenge ~ \blacklozenge \rightarrow \blacklozenge ~ \blacklozenge ~ \blacklozenge$	X A
Orzyopsis hymenoides	Indian Ricegrass	Insignificant	Summer	36"	18"	***	•	* * A
Panicum virgatum	Switchgrass	Insignificant	Summer	36"	24"	***	•	A; Any
Schizachyrium scoparium	Little Bluestem	Insignificant	Fall	4'	30"	***	•	
Sorghastrum avenaceum (nutans)	Indian Grass	Insignificant	Summer	5'	4'	***	•	
Sporobolus heterolepis	Prairie Dropseed	Insignificant	Summer, Fall	2'-3'	2'-3'	***	$\blacklozenge \rightarrow \blacklozenge \blacklozenge$	

IN OTES
Turf option
n cut back in Spring
atives when possible – not for use adjacent to native areas; ve
atives when possible; Fall color
s pink in the sunlight
A
; Any cultivar
A
₹A

TREES

LEGEND	
Preferred Species	Do not over water
Allowed Species	Protect from sun and wind
* Native*	Moisture Rating (Low Moisture – High Moistu
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)

Scientific Name	Common Name	Туре		_	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	Notes
TREES		Ornamental	Coniferous	Deciduous							
Acer grandidentatum	Big-Tooth Maple			x	Yellow Green	Late Spring	10'-30'	20'-30'	****	••	* P, I, UC
Acer platanoides	Norway Maple			x	Yellow Green	Early Spring	50'	50'	****	••	I, P; Potential to be invasive
Acer rubrum	Red Maple			x	Red	Early Spring, Mid Spring	70'	50'	****	$\blacklozenge \blacklozenge \rightarrow \blacklozenge \blacklozenge \blacklozenge$	А
Acer tataricum 'HotWings'	Hot Wings Maple	x			Light Green	Mid Spring	20'	20'	****	• •	A; Showy seeds, compact size
<i>Acer x freemanii '</i> Autumn Blaze'	Autumn Blaze maple			x	N/A	N/A	35'	25'	***	• •	A; Fall color, hardy
Aesculus glabra	Ohio Buckeye			x	Light Yellow	Late Spring, Early Summer	40'	40'	````````````````````````````````````	••	P, R; Fragrant flowers; Fall color; Has been invasive in other states
Aesculus hippocastanum	European Horse Chestnut			x	Light Pink	Late Spring	75'	65'	** *	••	A; Has been invasive in other states
Amelanchier x grandiflora 'Autumn Brilliance'	Autumn Brilliance Serviceberry			х	White	Mid Spring	15'-25'	15'-25'	** ***	••	₩¥ A
Carpinus betulus 'Fastigiata'	European Hornbeam			x	Yellow Green	Early Spring	30'-40'	20'-30'	**** *	••	А
Celtis occidentalis	Common Hackberry Western			x	Green	Mid Spring, Late Spring	60'	50'	***	•	* I, P (in small groupings); Attractive when large, high bird habitat value and butterfly host
Cercis canadensis	Redbud	x		x	Pink	Early Spring, Mid Spring	30'	30'	*	••	P; Understory tree; Needs protection; Small scale ornamental; Early nectar source
Cercis 'Hearts of Gold'	Eastern Redbud	x		x	Light Red	Early Spring, Mid Spring	25'	25'	*	••	P; Understory tree; Needs protection; Small scale ornamental; Early nectar source
Cupressus arizonica	Arizona Cypress		x		Insignificant	Spring	30'-40'	15'-25'	***	•	
Crataegus crus-galli 'Inermis'	'Inermis' Cockspur Hawthorn			x	White	Late Spring, Early Summer	25'	20'	***	۵	W P, R, UC; High habitat value, early blooms and fall berries
Crataegus x mordenensis 'Toba'	Toba Hawthorn			x	Pink	Mid Spring, Late Spring	25'	20'	***	٢	X A; High habitat value, early blooms and fall berries
Gleditsia triacanthos f. inermis 'Imperial'	Imperial Honeylocust			x	Yellow Green	Early Spring, Mid Spring	50'	40'	***	•	I, P, Streetscapes; High priority; Not messy; Light shade; Tough

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 LEGEND

 Preferred Species

 Allowed Species

 Allowed Species

 Allowed Species

 Moisture Rating (Low Moisture – High Moisture

Sun Exposure Rating (No Sun – Full Sun)

Pollinator**

TREES (Continued)

Scientific Name	Common Name		Туре	;	Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	
TREES		Ornamental	Coniferous	Deciduous							
Gleditsia triacanthos f. inermis 'Skyline'	Skyline Honeylocust			x	Yellow Green	Early Spring, Mid Spring	35-45'	25-35'	***	۵	V I, I
Gymnocladus dioica	Kentucky Coffee Tree	x		x	Greenish White	Late Spring, Early Summer	60'-80'	40'-55'	***	• •	А
Juniperus chinensis	Chinese Juniper		x		N/A	N/A	20'	6'	***	٢	A; Staple
Juniperus scopulorum	Rocky Mountain Juniper		x		N/A	N/A	30'	12'	**	۲	* A;
Juniperus virginiana 'cupressifolio'	Hillspire Juniper			x	N/A	N/A	15'-30'	5'-15'	***	• •	А
Koelreuteria paniculata	Golden Rain Tree	x		x	Yellow	Early Summer, Mid- Summer	30'	30'	***	۵	¥ P,
Magnolia stellata	Star Magnolia	x		x	White	Early Spring	20'	15'	<u>**</u> *	٠.	by frost
Malus 'Adams' or other cultivars	Flowering Crabapple	x		x	Pink	Mid Spring	20'	15'	**		₩ P,
Malus floribunda	Japanese Crabapple	x		x	Light Pink	Early Spring, Mid Spring, Late Spring	20'	30'	**		₩ A;
Phellodendron amurense	Amur Cork Tree			x	Yellow Green	Late Summer, Early Fall	20'	30'	***	۵.	A; Habit
Picea abies	Norway Spruce		x		N/A	N/A	60'	30'	***	• •	A; Shelte
Picea engelmannii	Engelmann Spruce		x		N/A	N/A	100'	15'	***		*(to
Picea glauca	White Spruce		х		N/A	N/A	60'	20'	***	۵.	А
Picea pungens	Colorado Spruce		x		N/A	N/A	60'	20'	***		* (to
Pinus flexilis 'Vanderwolf's pyramid'	Limberpine			x	N/A	N/A	20'-30'	10'-15'	***	• •	*(to
Pinus heldreichii	Bosnian Pine		x		N/A	N/A	70'	40'	***	۵.	A; Shelte
Pinus edulis	Pinion Pine			x	Yellow	Spring	20'-30'	10'-20'	***	۵	* A;
Pinus nigra	Austrian pine			x	N/A	N/A	40'-60'	10'-40'	***		А
Pinus ponderosa	Ponderosa Pine			x	N/A	N/A	60'-125'	25'-30'	***		* A;
Populus x acuminata	Lanceleaf Cottonwood				Green, Brown	Spring	40'-60'	30'-40'	***		*
Populus angustifolia	Narrowleaf Cottonwood				White	Spring	30'-50'	20'-30'	***	۵.	P ,

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Notes

P, Streetscapes

e plantings throughout; Provides shelter; Resilient

Staple plantings throughout; Provides shelter; Resilient

Streetscapes; Tolerant of alkalinity

A; A novelty in protected spot; Blooms are often damaged

R, Streetscape; Honeybee forage; Spring interest

Fragrant flowers

tat value for birds, butterflies; Is invasive in NE US er; Attracts birds; Invasive in northern US

high elevations) A; Shelter; Winter interest

high elevations) A; High habitat value; Easily available

high elevations) A er; Winter interest

Will die from over watering; Keep out of Kentucky Bluegrass

Keep out of Kentucky Bluegrass

P, I; Spreads aggressively I; Spreads aggressively



LEGEND	
Preferred Species	Do not over water
Allowed Species	Protect from sun and wind
* Native*	Moisture Rating (Low Moisture – High Moistu
Pollinator**	Sun Exposure Rating (No Sun – Full Sun)

TREES (Continued)

Scientific Name	Common Name	Туре		Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	Notes	
TREES		Ornamental	Coniferous	Deciduous							
Populus sargentii	Plains Cottonwood				Yellow	Late Winter, Early Spring	60'-80'	50'-60'	***	••	******; A
Prunus cerasifera	Cherry Plum	х		x	Light Pink	Early Spring, Mid Spring	25'	20'	***	••	X A; Early bloomer; Fruit for birds
Prunus maackii	Manchurian Cherry	x		x	White	Mid Spring, Late Spring	30'	25'	````````````````````````````````````	••	A; Early bloomer; Fruit for birds
Prunus padus	Bird Cherry	x		x	White	Mid Spring, Late Spring	30'	30'	**	••	A; Early bloomer; Fruit for birds
Prunus sargentii	Sargent Cherry	x		x	Pink	Mid Spring	25'	15'	***	••	A; Especially hardy, slightly later blooming
Prunus virginiana 'Shubert'	Canada Red Chokecherry	x		x	White	Spring	30'	25'	***	۵	₩ A; Dark foliage provides nice contrast
Ptelea trifoliata	Common Hoptree			x	Light Green	Early Summer	20'	20'	*	•	P, R, Streetscapes; Not easy to find
Pyrus salicifolia 'Pendula'	Willowleaf Pear	x		x	White	Mid Spring	25'	15'	** *	••	A; Tolerant of clay and may drought-tolerant once established
Pyrus ussuriensis	Chinese Pear	х		x	White	Mid Spring	40'	40'	***	• •	А
Quercus alba	White Oak			x	N/A	N/A	70'	50'	***	۸ ۸	А
Quercus bicolor	Swamp White Oak			x	Yellow Green	Mid Spring	60'	60'	★★→★★	• •	А
Quercus rubra	Northern Red Oak			x	Yellow Green	Late Spring	80'	75'	***	• •	А
Quercus imbricaria	Shingle Oak			x	Yellow Green	Mid Spring	70'	60'	***	• •	А
Quercus macrocarpa	Bur Oak			x	Yellow Green	Mid Spring	80'	80'	***	•	Å A
Quercus muehlenbergii	Chinkapin Oak			x	Yellow Green	Mid Spring	50'	50'	***	•	A
Quercus palustris	Pin Oak			х	Yellow Green	Mid Spring	70'	60'	***	$\blacklozenge \blacklozenge \rightarrow \blacklozenge \blacklozenge \blacklozenge$	A
Quercus robur	English Oak			х	Yellow Green	Mid Spring	60'	40'	***	• •	A
Quercus robur 'Fastigiata' SKYROCKET	Fastigiate English Oak			x	Yellow Green	Mid Spring, Late Spring	60'	20'	***	• •	Α
Quercus rubra	Red Oak			x	Yellow Green	Late Spring	60'	60'	***	• •	A
Quercus shumardii	Shumard Oak			x	Yellow Green	Mid Spring	50'	40'	***	•	A
Sophora japonica	Japanese Pagoda Tree	x		x	Cream	Mid-Summer, Late Summer	50'	45'	***	• •	Α
Styphnolobium japonicum	Pagoda Tree	x		x	White	Mid-Summer, Late Summer	75'	75'	***** *	••	Α
Syringa pekinensis 'Morton'	Peking Lilac	х		x	White	Early Summer	20'	15'	***		A A
Tilia cordata	Littleleaf Linden			х	Light Yellow	Early Summer	40'	35'	***	6 6	💥 A; Fragrant

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 LEGEND

 Preferred Species
 Do not over water

 Allowed Species
 Protect from sun and wind

 Native*

 Moisture Rating (Low Moisture – High Moisture)

 Pollinator**

 Sun Exposure Rating (No Sun – Full Sun)

TREES (Continued)

Scientific Name	Common Name		Туре		Flower Color	Blooming Season	Height	Spread	Sun/Shade Tolerance	Moisture Needs	
TREES		Ornamental	Coniferous	Deciduous							
Syringa reticulata	Japanese Tree Lilac	x		x	Cream	Late Spring Early Summer	25'	20'	★★→★★	۵	N A;
Tilia americana	American Basswood			x	Light Yellow	Early Summer	50'	40'	***		pyramid
Tilia amurensis	Linden			x	Light Yellow	Late Spring	75'	50'	** *	۵	X A;
Tilia cordata	Littleleaf Linden			x	Light Yellow	Early Summer	40'	35'	***	۵.	₩ A;
Tilia tomentosa	Silver Linden			x	Yellow Green	Late Spring, Early Summer	60'	45'	***	۵.	₩ A;
Tilia x flavescens 'Glenleven'	Glenleven Linden			x	Yellow Green	Late Spring, Early Summer	75'	50'	★★→★★ ★	• • •	• A;
Ulmus 'Frontier'	Frontier Elm			x	Insignificant	Mid Fall	35'	25'	***	• •	А
Ulmus 'Heritage'	Heritage elm				Insignificant		40'	30'	***	• •	А
Ulmus 'Morton' Accolade	Accolade Elm			x	Insignificant	Early Spring, Mid Spring	70'	40'	***	• •	А

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Notes

High value ornamental providing fragrance in late spring

Streetscapes; Reliable summer honeybee forage; Fragrant; Nice al habit

Adapts to many soils; Good urban tree; Fragrant

Fragrant

Fragrant

Fragrant

CENTERRA DO NOT PLANT LIST

SPECIES NOT TO BE PLANTED IN CENTERRA

Scientific Name	Common Name	Notes
TREES		
Acer palmatum	Japanese Maple	This is very hard to grow
Acer saccharum	Sugar Maple	Chlorosis
Acer tataricum	Tatarian maple	Chlorosis, "Hot Wings" is allowed
Acer triflorum	Three-flowered Maple	
Betula x plettkei 'Golden Treasure'	Dwarf Birch	
Cornus kousa	Chinese Dogwood	Borderline hardy
Cornus mas	Cornelian Cherry Dogwood	Borderline hardy
Juniperus virginiana	Eastern Red Cedar	Invasive
Pinus aristata	Bristlecone Pine	Novelty; maintenance picky
Pinus contorta	Lodgepole Pine	Novelty; maintenance picky
Populus tremuloides	Quaking Aspen	
Prunus sibirica	Siberian Apricot	Do not recommend - fruit
Prunus ssp.	Plum	Do not recommend - fruit
Robinia pseudoacacia	Black Locust	Suckers, thorny, borer damage
Thuja occidentalis	Arborvitae	
Ulmus americana	American Elm	
Ulmus parvifolia	Chinese Elm	Probably not hardy
Zelkova serrata	Japanese Zelkova	
Zelkova serrata 'Green Vase'	Green Vase Zelkova	
Zelkova serrata 'Musashino'	Musahino Zelkova	
Zelkova serrata 'Village Green'	Japanese Zelkova	
SHRUBS		
Buddleja alternifolia	Fountain Butterflybush	Invasive potential
Buxus 'Green Gem'	Green Gem Boxwood	Sun and windburn
Erica carnea	Winter Heath	Will not survive
Genista tinctoria	Dyer's Broom	Possible invasive
Genista tinctoria 'Royal Gold'	'Royal Gold' Broom	
FORBS		
Aegopodium podagraria	Bishop's Goutweed	Do not recommend; invasive potential
Aquilegia alpina	Alpine Columbine	Will not survive
Astragalus adsurgens	Prairie Milkvetch	
Astragalus agrestis	Field Milkvetch	
Astragalus ceramicus	Painted Milkvetch	
Astragalus crassicarpus	Ground Plum	
Astragalus gracilis	Slender Milkvetch	
Astragalus missouriensis	Missouri Milkvetch	

SPECIES NOT TO BE PLANTED IN CENTERRA (CONTINUED)

Scientific Name	Common Name	Notes
FORBS		
Astragalus mollissimus	Wooly Milkvetch	
Astragalus pectinatus	Narrowleaf Milkvetch	
Chamaemelum nobile	Roman Chamomile	
Dicentra eximia	Bleeding Heart	Won't thrive in this climate
Epimedium x rubrum	Bishop's Hat	Won't thrive in this climate
Euphorbia polychroma	Cushion Spurge	Other nonnative spurges can be invasive
Gypsophila paniculata	Baby's Breath	Invasive
Gypsophila repens	Creeping Baby's Breath	
Lavandula	Lavender	French and Spanish spp. not hardy
Leucanthemum x superbum	Shasta Daisy	Potentially invasive
Lupinus pusillus	Annual Lupine	Concern about invasive
Nepeta cataria	Catnip	Weed, Catnip escapes frequently into natural areas and has become a weed.
Parthenium integrifolium	Wild Quinine	
Persicaria polymorpha	Knotweed	Invasive potential, 3 species of knotweed listed on CO noxious weed list - this one is not
Persicaria virginiana	Jumpseed	Invasive potential
GRASSES (NOT TO BE USED IN SEED M	IXES)	
Agropyron desertorum, A cristatum	Crested Wheatgrass	
Agropyron intermedium	Intermediate Wheatgrass	
Agropyron repens (Elytrigia repens or Elymus repens)	Quackgrass	
Agrostis stolonifera, A.alba, A. gigantea, A. palustris	Creeping Bentgrass	
Alopecurus pratensis	Meadow Foxtail	
Bromopsis inermis (Bromus inermis)	Smooth Brome or Hungarian Brome Grass	
Dactylis glomerata	Orchardgrass	
Festuca arundinacea (Lolium arundinaceum)	Tall Fescue (adjacent to wetlands)	
Festuca ovina var. ovina	Hard Fescue or Sheep Fescue	
Festuca pratensis	Meadow Fescue	
Phalaris arundinacea (Phalarioides arundinacea)	Reed Canary Grass	
Phleum pratense	Timothy	
Poa compressa	Canada Bluegrass	
Poa pratensis	Kentucky Bluegrass (adjacent to wetlands)	
Saccharum (erianthus) ravennae	Hardy Pampas Grass	

CENTERRA APPROVED PLANT LIST (Last Revised December 20, 2019)

CENTERRA SEEDING, MULCHING AND SOIL PREPARATION SPECIFICATIONS

1.0 SOIL PREPERATION

1.1 Soil Amendments

A. Fertilizer

Phosphorous fertilizer is typically deficient in Colorado soils. Because phosphorous is a promoter of root growth it is extremely beneficial to new seedlings. Phosphorous is also immobile in clay soils, so it needs to be applied previous to tillage work so it will be incorporated into the root zone.

All areas shall be fertilized with 18-46-0 at 150 lbs/acre or an equivalent fertilizer that will provide no less than 27 lbs/acre of nitrogen and 69 lbs/acre of phosphorous. Empty fertilizer bags or weight ticket shall remain available for inspection.

B. Compost

All irrigated turf grass areas shall receive compost at the rate of 3 cubic yards per 1000 sq ft. Native grass areas shall receive compost at 2 cubic yards per 1000 sq ft. Weight tickets shall be available for inspection.

The compost shall be Biocomp Class 1 compost from A-1 Organics, or approved equivalent.

In wetland or moist meadow areas no compost will be required. The goal here is to keep nutrients out of the wetland areas to discourage rampant growth of cattails.

1.2 Tillage

Tillage is one of the most important steps that is often overlooked. All areas shall be thoroughly tilled to a depth of 6 - 8 inches after the soil amendments have been applied. This can be accomplished with rototilling machinery, or in larger areas, agricultural machinery such as chisel plows and/or discs. After tillage is complete, no dark areas resulting from the compost application shall be observed.

1.3 Fine Grading

After tillage is complete all areas shall be fine graded.

Grading for turf areas will require more detail than native areas. Turf areas shall be smooth, even and 1"below adjacent sidewalks and curbs.

The grade for native areas can be left somewhat rougher or less detailed, because these areas will be managed with a larger class of machinery, i.e. tractors and brush hog type rotary mowers.

2.0 SEED MIXES

2.1 Seed Selection Process

Seed mix selection must be reviewed and approved by DRC Member and High Plain Environmental Center Executive Director Jim Tolstrup.

There are three steps in the seed selection review process:

1) During the design phases

2) The seed mix bags must be signed off on by Jim Tolstrup before spreading the seed.

3) At the time of compliance inspection

2.2 Turf Seeding

A. Tall Fescue Turf Areas

These areas shall be seeded with Sharp Bros Seed Dura Turf Lawn Mix, or equivalent at the rate of 8 lbs/1000 sq ft:

Turf type tall fescue	80%
Kentucky bluegrass, turf quality	10%
Ryegrass, turf quality	10%

B. Kentucky Bluegrass Turf Areas

These areas shall be seeded with Sharp Bros Seed Premium Lawn Mix, or equivalent, at 3 lbs/1000 sq ft.

2.3 Native Grass Seeding

A. Native Grass Turf Areas - "Enhanced" short native grass that can be left un-mowed adjacent to formal landscaped areas

These areas shall be seeded with the following mix seeded at 2 lbs. PLS/1000 sq. ft. or 86 lbs./acre.

Buffalo grass, Cody or Bowie	40%
Blue grama, Alma or Bad River	20%

Sideoats gra Slender Whe

Slender wh Western wh Green need Canada wile Beardless w Annual rye Blue grama Sideoats gra Little bluest Yellow Ind Tomahawk Big bluester Switchgrass Alkali sacat

Total

season grasses:

Big Bluester Yellow Ind Switchgrass

These added to the Wet Meadow mix totals 20 pounds/acre.

These areas will likely be broadcast seeded and not suitable to drill seeding because of their size and/or they may be wet. To facilitate broadcasting the seed more evenly, rice hulls should be added to bulk up the mix.

ama, Vaughn or El Ren	0
neatgrass	

20% 20%

B. Upland Native Areas - for open space areas

	<u>Lbs. PLS/acre</u>	Seed Box Designation
eatgrass	3	smooth
heatgrass, Rosana	3	smooth
lle grass, Lodorm	1	smooth
drye, Mandan	1	smooth
vildrye, Shoshone	.5	smooth
	2	smooth
, Bad River	.5	fluffy
ama, Vaughn	1.5	fluffy
tem, Camper	1.5	fluffy
iangrass	1	fluffy
or Neb 54		
m, Pawnee	1	fluffy
s, Blackwell	.5	fine
on	.25	fine

16.75 pounds pure live seed per acre

C. Wetland or Wet Meadow Areas - for wet pond bottoms

These areas shall be seeded with High Plains Wet Meadow Mix by Western Native Seed or equivalent at the rate of 10 lbs./acre In addition to the wetlands mix above add the following tall warm

	Lbs. PLS/acre
m, Kaw or Pawnee	5
lian grass, Tomahawk or Neb 54	4
s, Blackwell	1

CENTERRA SEEDING, MULCHING AND SOIL PREPARATION SPECIFICATIONS

2.4 Erosion Control or Overlot Areas - for temporary soil stabilization

These areas shall be drill seeded with the following mix:

Lbs PLS/acre

Slender wheatgrass	5
Western wheatgrass, Rosana	3
Canada wildrye, Mandan	3

Total 11 pounds Pure Live Seed/acre

3.0 SEED APPLICATION

3.1 Seed Drill

Native seeding must be completed with a native grass drill that has 3 seed boxes that are capable of metering and applying fine seed, fluffy seed and smooth seed. These three types of seed are designated on the seed mixes. Examples are smooth seed –

wheatgrasses, fluffy seed - yellow Indian grass, and fine seed - alkali sacaton.

For the turf grasses or other mixes, small areas can be hand broadcast or a brillion drill or other appropriate drill should be used.

3.2 Seed Tags

Native seed mixes must be ordered so that fluffy seed, fine seed and smooth seed are bagged separately and can be placed in the appropriate seed box for application. Tags for all mixes including the native seed, must be provided for inspection prior to any seed being planted.

4.0 MULCH

4.1 Hydromulch

Native seed areas and turf grass areas shall be mulched with virgin woodfiber hydromulch with steam separated fibers. Recycled paper hydromulch or ground wood chip hydromulch are not acceptable. The rate of application shall be 2500 lbs/acre.

4.2 Straw Mulch

Overlot areas or temporary erosion control seeding shall be mulched with weed free certified straw at a rate of 2 tons/acre, crimped 3 - 4 inches into the soil surface.

5.0 SITE CLEANUP

Hydromulch overspray must be cleaned off all sidewalks, fences, light poles switch cabinets and landscape material. When straw mulching is complete all twine or bale wrap material must be picked up and removed.

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Irrigation Design and Construction Criteria

Centerra is intended to be developed in a manner which is responsive to many environmental considerations, one of the most important being water conservation. This concern for water conservation must be reflected in efficient application and effective management of landscape irrigation.

Efficient irrigation is first made possible through proper evaluation of project requirements and appropriate irrigation design, utilizing current technology and methods for determining the most effective irrigation approach. It is also vital for water conservation to incorporate proper management tools within the irrigation system design, to maximize the ability to fine tune water applications specific for individual landscape water requirements.

All projects shall obtain the recommendation of a Geotechnical engineer to provide recommendations regarding interface of irrigation systems and building foundation systems.

1.0 Irrigation Design Criteria For Water Supply And Distribution

I.I Policy

Irrigation Design shall be submitted with Landscape Plans to DRC for approval. Zone precipitation rates and irrigation zone run times must be included on the Irrigation Plans. Irrigation run times shall be based upon providing 1-1/2 inches of water per week. All irrigation improvements shall allow for the option of utilizing non-potable water as provided by a separate entity of Centerra. All systems shall be capable of applying peak water requirements during optimum night time period with no daytime watering allowed, except during establishment or as approved by the DRC. As-Builts Irrigation Plans shall be submitted upon completion of construction.

I.2 Criteria

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1.2.1 Water Demand Analysis - Complete the worksheet for each designed landscape and submit

with landscape and irrigation plans to the DRC for review (see fig. 1a).

- 1.2.2 Irrigation Water Supply/Point of Connection
 - a) Provide tapped connection to the City of Loveland potable water system and extend service line to road right-of-way.
 - b) Provide either a turbine type or compound water meter downstream of tapped connection for total volume water use readings.
 - c) Provide FEBCO 825 YA reduced pressure assembly with a downstream blowout.
 - d) A solenoid operated master valve is required equipment for tenant sites as added protection against continuous water discharge in the event of a mainline break. Master valve is to be connected immediately downstream of water meter, or backflow preventer for potable water systems, and make control wire connection to tenant control system.
 - e) A Data Industrial Flow Meter, or approved equal, is to be installed after the master valve per manufacturer's recommended volumetric flow for various pipe sizes. Two additional blue control wires, 14 gauge or larger, shall be run to the irrigation controller.
 - f) Provide curb ball stop valve and a 3/4-inch brass blow out assembly for winterization purposes (not inverted).
 - g) A tee off of main building supply is acceptable with back flow preventer identified above.

1.2.3 Distribution Piping System (Mainline Pipe)

- a) Determine routing of distribution piping system so as to not conflict with common area irrigation, tree locations, and paved surfaces. Maintain a minimum distance from any structures of ten (10) feet, or greater if required by soil engineer recommendations.
- b) Size distribution piping system to allow peak demand flows as determined by the Water Demand Analysis worksheet. Do not exceed velocities of 5 F.P.S. Allow for simultaneous controller or remote control valve operation as necessary.
- c) Provide quick coupling valves at point of connec-

tion and dead ends of piping runs (minimum) to facilitate expelling water from distribution piping system for winterization of system. In addition, quick coupling valves shall be located at every 300 feet of continuos mainline runs.

2.0 Irrigation Design Criteria for Control System

2.1 Policy

- 2.1.1 All common area irrigation shall be integrated and compatible with Centerra central control system, which is capable of communicating with all field satellite units via radio, as well as assessing and downloading environmental data from on-site weather station. Communication method shall be in compliance with control system manufacturer's instructions and current Centerra's master plan.
- 2.1.2 All irrigation control systems on individual building sites are to utilize current technology compatible with Centerra's central control system, and capable of addressing individual landscape water requirements and appropriate scheduling needs to maximize water conservation potential.

2.2 Criteria

- 2.2.1 Common Area Control Systems
 - a) All field satellite control units shall be Toro Sentinel, with keypad operation and data flow interface housed in locking stainless steel enclosure. No wall mount units are acceptable.
 - b) Field satellite units are to be located in discreet positions within right-of-way, screened from road view but readily accessible from front and top to maintenance personnel. Locate behind signage and/or berming whenever possible.
 - c) Ground field units to maximum level recommended by manufacturer, with output surge boards and protected switches.

2.2.2 Individual Building Site Control Systems

- a) All individual building site controllers shall be Toro Sentinel field satellites with keypad operation and data flow interface. Controller must be located at an outside location, approved by the Centerra DRC.
- b) Controllers shall be sized and configured as needed in order to not exceed the maximum instantaneous flow calculated on the Water Demand Analysis Worksheet and to not exceed the maximum watering window of 9 hours. Design drawings must contain a note indicating that the controllers are to operate valves either sequentially or simultaneously as necessary to complete the required water application in the appropriate "window", without exceeding the maximum tap and system flow rates.

3.0 Irrigation Design Criteria For Planting Areas

3.1 Policy

The Centerra site's exposure to wind and interest in water conservation necessitate the use of drip irrigation for plant material whenever possible. Plant material irrigated with overhead spray should be minimized. Tree and shrub planting in low water or non-irrigated grass areas are to be supplemented with a permanent drip irrigation system.

- 3.2 Tree Planting
 - a) Provide drip emitters equally spaced around root ball edge, a maximum of 18 inches on center.
 - b) Use 1.0 GPH emitters on 2-inch caliper and smaller deciduous trees, and 8 feet and smaller evergreen trees. Use 2.0 GPH emitters on deciduous trees greater than 2-inch caliper size and evergreen trees over 8 feet.
 - c) Zone trees separately based on exposure to wind, building shade, and paving reflection.
 - d) Do not permanently drip irrigate material located



in regularly watered and mowed cool season turf grass areas. Supplement trees with drip irrigation if located in areas of low water (warm season grass) or no water (native grass).

- e) All drip and emitter tubing to be buried a minimum of 8 inches below finish grade in grass areas, and under landscape fabric and mulch in planting beds.
- f) Provide quick coupling valves as necessary to reach all drip irrigated plant material with maximum 300-foot hose.
- 3.3 Shrub Planting
 - a) Provide drip irrigation to all plant material one (I) gallon and larger in size, or plant material spaced 18 inches on center or greater.
 - b) Use one (I) GPH emitters on all shrub material, 2 per plant unless one (I) gallon or smaller spaced less than 24 inches on center.
 - c) Zone shrubs separately based on hydrozone (low, medium, high water req.), exposure to wind, building shade, and paving reflection.
 - d) All drip and emitter tubing to be buried below landscape mulch.
- 3.4 Groundcover, Annual, Perennial Planting
 - a) All groundcover spaced 18 inches or greater to be drip irrigated. Perennial plantings to be reviewed by species for capability of being drip irrigated.
 - b) All annuals as well as appropriate perennials and groundcover are to be spray irrigated with 6-inch or 12-inch pop-up spray heads. Low precipitation nozzles are allowable if bed width is 5 feet or less, except in street medians which have a 10' minimum dimension for plantings.
 - c) Zone annual areas separate from groundcover and perennials.
 - d) Zone separately based on hydrozone, building shade, and paving reflection.
 - e) No direct spray on signage, structures, or paved surfaces is allowable.

4.0 Irrigation Design Criteria for Turfgrass Areas

4.1 Policy

Turf grass irrigation is the largest consumptive water use element of landscape irrigation at Centerra. As such, it is essential to utilize the most sophisticated design techniques and methods practical to maximize application efficiency. The design goal for all overhead turf grass irrigation is to create a uniform water distribution pattern, taking into account wind velocity, landforms, and tree obstructions.

4.2 Criteria

- 4.2.1 Turfgrass Species
 - a) Areas of turf grass species mix must be irrigated separately through valve zoning from pure species or species blends, e.g.: blue rye fescue mix to be separate from a bluegrass blend.
 - b) Areas of turf grass, which are intended to receive differing maintenance and/or varying mowing heights, are to be separated through valve zoning, to allow for different water applications and scheduling even though turf grass type is identical.
- 4.2.2 Design Approach
 - a) Roadways are to be bordered with pop-up spray heads or low trajectory pop-up rotors equipped with built in check valves to prevent low head drain down along roadways.
 - b) No public sidewalk is to be overthrown or receive direct overspray. Only walkways less than 5' wide, which meander through open space areas, may be overthrown.
 - c) Care is to be taken to avoid any direct or wind blown spray onto any roadways, parking lots, hardscape surfaces, or structures.
 Wind sensor technology will be utilized with the central control system to adjust watering schedules during periods of high wind. Additionally, low trajectory nozzles and subsur-

- face irrigation shall be used as necessary.
- d) Large turf areas may be irrigated with rotors.
- e) Native grass may be irrigated with long throw impact heads.
- f) Design irrigation to adequately address landforms through zoning and head placement, to allow tops of berming and areas of slope to receive individualized water applications and scheduling.
- g) Illustrate location of evergreen and large deciduous trees on irrigation design drawings. Select irrigation equipment, space heads, and zone accordingly to allow uniform water distribution in and around obstructive plant material.
- h) Design laterals to allow for zoning according to varying exposure, topography, building shade, and paving reflection.
- i) All head spacing to be adjusted for constant 10 MPH wind condition.
- j) Provide adjustable pressure regulating control valves or individual pressure regulation valve downstream of control valve, on all zones that should be reduced by 20 PSI or more to allow heads on that zone to operate at the manufacturer's recommended operating pressure. For spray sprinkler laterals, a pressure compensating device integral to the sprinkler head is acceptable.
- k) Laterals shall be designed so that all heads on that zone shall operate within a 10% pressure differential. Provide sprinkler head check valves with pressure reducing capability on all sprinklers to reduce low head drainage.
- I) All piping is to be PVC.
- m) Drip zones serving multiple beds shall be zone controlled using ball valves to isolate individual planting beds.

5.0 System Management Guidelines

5.1 It is the Owner's responsibility to supply all construction documents in their entirety, including the plans, specifications, details, these notes, and the Contractor-drawn "as-built" plans, to any future Owner, maintenance company, or Homeowner's Association.

- 5.2 The purpose of this irrigation system is to provide water to supplement natural precipitation, such that the plant life is sufficiently maintained. The amount of water applied shall be the minimum amount necessary to result in plant life of acceptable health and vigor. The irrigation application shall be in accordance with the local historical evapotranspiration (ET) rate curve and modified in response to recent ET rates. Although during periods of extreme ET the amount of water applied will need to be greater than the historical ET value, at no time shall it exceed the historical ET by more that 30%. ET data will be available from an on-site weather station, which will download weather data to the irrigation central control system.
- 5.3 Soil moisture conditions shall be routinely monitored by a qualified individual with a suitable soil sampling tube and auger. This shall be performed in order to determine if acceptable moisture conditions, as defined above, are being maintained. The irrigation schedule shall be adjusted accordingly, depending upon the results of this monitoring.
- 5.4 Short, multiple irrigation cycles shall be utilized as necessary to minimize ponding and runoff.
- 5.5 At no time shall water be applied to cause soil saturation. Over-watering can result in death of plants and soil expansion, causing possible damage to pavement and foundations. A qualified structural engineer shall be retained by the owner of the system on at least an annual basis to inspect roadway pavement and building structures for damage due to excessive soil moisture.
- 5.6 Inspections of the irrigation system shall be made on a daily basis to observe and provide repairs or remedies to the following unacceptable problems:
 - 5.6.1 Over-spray on sidewalks, streets, paved areas, fences, walls, buildings, or other structures.
 - 5.6.2 Drainage or run-off across sidewalks, streets, or paved areas.

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- 5.6.3 Irrigation ponding on any landscape surface, sidewalk, street, or paved area.
- 5.6.4 Damaged, leaking, or improperly operating sprinklers, pipe, valves, controllers, or other irrigation equipment.
- 5.7 Only gualified Landscape Contractors and Landscape Maintenance individual shall provide or make repairs to the irrigation system.
- 5.8 At all times, the Landscape Contractor or Maintenance Contractor shall assign a gualified individual or individuals to inspect and monitor the irrigation system. Owner's Representatives shall be supplied with 24 hour emergency phone numbers for use in reporting broken or damaged irrigation equipment.
- 5.9 All irrigation equipment requires routine and methodical maintenance, cleaning, adjustment, parts inspection and replacement. It is the responsibility of the Landscape Contractor or landscape maintenance company to provide these services on a regular and continual basis.
- 5.10 The responsibility of ensuring that the above system management guidelines are properly observed is that of the Owner. The Irrigation Consultant has been retained to prepare construction documents only and does not provide post-construction reviews nor review of on-site maintenance. The Irrigation Consultant does not assume responsibility nor liability for ongoing maintenance of the irrigation system.

6.0 Operational Manual

6.1 Description of Equipment

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6.1.1 Impact Rotor Sprinklers

Impact rotors have a pop-up height of approximately 5 inches, and are used to irrigate medium to large turf areas or to irrigate turf along sidewalks. They have plastic cases with plastic internal assemblies. These sprinklers are either part circle with an infinitely adjustable arc, or full circle. The model series of sprinkler installed on this project have a radius of throw of approximately 40 feet.

All impact sprinklers operate in the same basic fashion. Water enters the bottom of the sprinkler through the bearing nipple, proceeds up through the body and exits out the nozzle. When the water hits the arm, it is propelled out away from the sprinkler. This action causes the arm to pivot away from the water stream, creating tension on the arm spring. When the spring tension is stronger than the force against it, the arm moves quickly toward the water stream and "impacts" against the body. This "impact" causes the sprinkler to turn in a consistent manner throughout the sprinklers set arc of rotation.

6.1.2 Closed Case Rotor Sprinklers

A distinguishing mark of a closed case rotor is that it's housing (case) is closed to the elements of dirt, sand, grass and other debris. Another distinction is it's small exposed top diameter. These design features make it the rotor of choice in turf areas used for recreational purposes, and eliminates maintenance required due to entrapped debris in the case.

6.1.3 Pop-up Spray Sprinklers

These sprinklers include a range in pop-up heights, with the 4-inch and 12-inch being utilized on this project. The 4-inch pop-ups are utilized in turf areas with widths generally less than 25 feet. They are also useful in irrigating slightly larger turf areas that are not conducive to rotor sprinklers due to being more oddly-shaped, such as with curved boundaries. The I2-inch pop-ups are used in the same sort of geometries but in planting beds rather than turf areas, where the additional height is necessary for the spray to clear plant material. The matched precipitation spray nozzles are available in set arcs of between

60 degrees and 360 degrees and with radii of throw of 10, 12, and 15 feet (at a pressure of 30 psi). The radius of throw is adjustable down to approximately 75% of the full radius.

6.1.4 Pressure Compensating Drip Emitters

These emitters are used to irrigate shrubs and trees in planting beds, and have the advantage of delivering a fairly uniform flow rate over a large operating pressure range.

6.1.5 Remote Control Valves

Remote control valves (RCV's) are installed on the mainline as a means of controlling the distribution and timing of irrigation to individual laterals. The valves covered in this section will be electrically operated. All remote control valves can be separated into two different types. The difference between the two is how the water enters the upper chamber. This chamber is the area between the cover and the top side of the diaphragm. Once the water has entered the upper chamber there are only two paths for it to escape, the manual bleed, or the solenoid exhaust port.

In a reverse flow valve the water can enter the upper chamber in several ways. Through an external tube that runs from the pressure side to the upper chamber, or through holes in the outer edge of the diaphragm, or through ports machined in the valve body. In a forward flow valve the water enters the upper chamber through a port in the center of the diaphragm. This port will normally be filtered. It is important that the filter is kept clean.

In normal operation, water enters the valve on the pressure side (usually the side opposite the solenoid). The water will then enter and fill the upper chamber through the path provided in the valve. When operating properly, this water is trapped in the upper chamber. The valve will only open once the force above the diaphragm

has been relieved. This can happen in either of two ways, the solenoid has been energized by the controller, or the manual bleed has been activated.

6.1.6 Quick Coupling Valves

Quick coupling valves are installed on the irrigation mainline for incidental watering purposes. The quick coupling valves are activated by inserting a special lug key into the valve. The key can be equipped with a hose swivel ell for manual watering or for use with a sprinkler. Quick coupling valves equipped with a hose swivel ell are very useful in the establishment of plant materials. This particular quick coupling valve is one piece, bronze construction, with a yellow rubber cover.

6.1.7 Gate Valves

Gate valves are installed on the irrigation system mainline, and are used to isolate certain sections of a mainline for ease of repair and maintenance. The isolation gate valves are sized to match the mainline pipe. Gate valves are bronze, with threaded connections on 2-inch and smaller valves. The 3-inch and larger valves have a resilient seat and cast iron body with flanged or mechanical joints.

6.1.8 Pressure Reducing Valves

Pressure reducing valves (PRV's) are used to reduce irrigation system pressure downstream of the installed location in order to minimize equipment wear and malfunction, and pipe fitting failure. The use of pressure reducing valves on this project will be limited to area which would have City water pressures exceeding 80 PSI at the meter. Regularly scheduled maintenance and freeze protection is required for these valves to insure reliable operation and system protection.



6.1.9 Irrigation Control System

The irrigation controller is the time clock for the irrigation system. The controller actuates the solenoid valves for the specific time and duration a sprinkler or drip lateral operates. All scheduling of valves and setting of the time clock may be accomplished at the field controller. The water budgeting feature on these controllers may be used to reduce or increase by a percentage factor the irrigation times for all stations for seasonal controller adjustment. The overall effect of using the water budgeting feature is to reduce water waste, and still provide adequate irrigation water to properly maintain the landscape.

6.1.10 Central Control System

The irrigation controller is the time clock for the irrigation system. The controller actuates the solenoid valves for the specific time and duration a sprinkler or drip lateral operates. With the addition of a centralized control system the irrigation supervisor has the ability to reduce irrigation times on cool days, increase the time on warm days, and delete irrigations on rain or high wind days, all from a central location. The overall effect of using the central irrigation controller is to reduce water waste, and still provide adequate irrigation water to properly maintain the landscape. Refer to the manufacturer's maintenance manual for further information on this equipment.

6.1.11 Mainline and Lateral Pipe

All of the mainline pipe is solvent weld or gasketed Class 200 PVC. The lateral pipe is solvent weld Class 200 PVC. Concrete thrust blocks have been poured at all fittings, sizes 3-inch and larger and at all gasketed fittings.

7.0 General Operation

7.1 System Start-up and Shut-down

Considering the fact that the climate in Loveland

is cold enough to necessitate winterization of the irrigation system, there will be an annual spring start-up and autumn shut-down requirement This will consist of expelling water from the entire system, including the inlet and outlet riser to the backflow prevention assembly, as well as insuring that the mainline piping and any other components between the City water meter and the backflow preventer are protected.

Additionally, in the event of mainline pipe or component repair, the following general information is provided.

For the repair of any one section of mainline or a mainline component, the irrigation system should be shut down at the first available upstream valve. This would be either at an isolation gate valve or at the point-of-connection for that mainline. After the repair is completed, the valve should be opened gradually, in order to minimize the possibility of water hammer. Furthermore, in order to bleed air from the system, a nearby downstream quick coupling valve or a sprinkler lateral should be opened/activated while the valve is gradually opened. After a sufficient amount of water has passed through the system to purge entrapped air, the quick coupling valve or sprinkler lateral may be closed.

7.2 Scheduling

Irrigation scheduling is defined as the management process of determining and implementing the timing and duration of irrigation applications. The key information required for scheduling irrigations is evapotranspiration rates through the growing season. Evapotranspiration (ET) is the amount of water transpired from plant material and evaporated from the plant and soil surfaces.

An ET rate curve is a graphical representation of the ET as it varies throughout the "average" growing season. An on-site weather station will download ET data on a daily basis to the central software. In addition to monitoring the health of plant material and relating the depth of irrigations to the evapotranspiration, a valuable irrigation scheduling tool is a soil probe. A soil probe is a metal tube of approximately one inch in diameter and varying length that is pushed or driven into the soil in order to extract a soil core sample. It is a simple, quick, and inexpensive means of determining the soil moisture content at various depths within the soil. Used in this way it is a helpful, supplemental method of monitoring irrigation applications and effectiveness.

Soil moisture sensors can be an effective adjunct for a centrally-controlled irrigation system. These sensors are installed in representative locations in the landscape and are useful in terminating an irrigation cycle when a pre-set moisture level is reached. In this way, if previous irrigation or rainfall has been sufficient to meet the landscape's water requirements, the moisture sensor will shut down irrigation until such a time that the soil has dried out sufficiently to drop below the pre-set level.

8.0 Routine General Monitoring

8.1 Need for General Monitoring

The visual appearance and the very life of the landscape plant material is dependent upon the proper functioning of the irrigation system. For that reason it is imperative that the irrigation system be routinely monitored. The visual appearance of the landscape plant material can provide valuable feedback about the functioning of the irrigation system. There are three general factors that contribute to the need for this monitoring:

- 8.1.1 The ever-changing water needs of the plant material, dependent upon seasonal variations and life cycle variations.
- 8.1.2 Variable weather conditions, and its effect upon the water needs of the landscape.

8.1.3 The condition of the irrigation system itself.

8.2 What to Look for in General Monitoring

There are several key areas to look for when engaging in general monitoring of the landscape and irrigation system. Some of these necessitate watching the irrigation system operate, while others can be observed without the system operating. The key areas are:

- 8.2.1 Adequate and uniform coverage for all areas. This involves watching for dry spots, stressed plant material, and over or under-adjusted radii and arcs of throw for sprinklers.
- 8.2.2 Excessively wet areas, possibly indicating pipe breakage.
- 8.2.3 Broken or stuck sprinkler heads.
- 8.2.4 Overspray onto walkways, roads, buildings, parked cars, or other hardscapes.
- 8.3 Scheduled Routine Inspections

On a pre-established and routine basis, the irrigation system should be inspected in a more thorough manner than that possible with the general monitoring described above. This inspection process involves sequencing through all of the controller stations to verify proper operation of the controller, valves, sprinklers and drip emitters. With the size of this system, it would probably be desirable, to break this inspection process up into more numerous inspections of portions of the system spread out during the year. As a suggestion, these portions of the system could be defined by the point-of-connection.

When a problem is observed it should be corrected as soon as possible. The Adjustment, Maintenance and Troubleshooting of Equipment section that follows is intended to aid in the correction of problems observed through general monitoring.

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9.0 Adjustment, Maintenance And Troubleshooting Of Equipment

9.1 Impact Rotor Sprinklers

9.1.1 Adjustment

When an impact sprinkler has a radius of throw adjustment, it is typically accomplished with an adjusting pin that is held in place by means of a compression spring. Turning the pin in a clockwise direction will increase the breakup of the stream and shorten the distance of throw.

Arc adjustment for part circle impact sprinklers is typically made with the collar wires. For this adjustment a screwdriver should be inserted between the ears of the collar, and the screwdriver turned in the direction desired for moving the collar. The collars are held in place by the spring tension of the wire collars and care must be taken to not twist or crimp the collars. Use a screwdriver to adjust. Do not use pliers.

9.1.2 Maintenance

Impact sprinklers are generally manufactured to operate under a wide range of pressures. However, if exceptionally high pressure is encountered, the arm spring may have to be tightened at the top, about 1/16 to 1/8 inch. This will raise the maximum operation pressure to above 100 psi. (At extremely high pressures, the normal arm spring setting may result in the arm hitting on the backstroke, causing the sprinkler to stop rotating or rotate in reverse. (Tightening the arm spring will correct the problem.)

Application of a foreign lubricant to a water lubricated impact style sprinkler is not recommended. This includes oil, WD-40, silicone, Teflon, pipe dope, etc. These foreign lubricants might make the sprinkler work right away, but it will actually cause the sprinkler to wear out faster. Foreign lubricants attract dust and debris. When lubricants are applied to the bearing wash-

ers initially, an oil base forms on the washers. This allows the sprinkler to spin freely for a short time only! Over time, dust is attracted to the washers on the bearing stack. This causes additional friction on the washers and causes them to wear out much faster. If foreign lubricants have been applied, all of the washers and seals need to be replaced. It is also a good idea to clean the brass at this time by a process called bead blasting.

9.1.3 Troubleshooting

First check for the obvious problems such as turf obstruction; dirt or debris in nozzle or case; excessive water pressure; broken arms, trips, etc.; foreign lubricants; inadequate water pressure. Other typical problems include:

- a) The sprinkler is stuck or won't return: The most common reason for this is water pressure that is too high or too low. Impact sprinklers can fail under either scenario. To determine the operating pressure, a pitot tube and a pressure gauge may be used to get a pressure reading at the head. This is done by placing the end of the pitot tube in the water stream, as close to the nozzle as possible. It is important not to place the end of the pitot tube inside of the nozzle opening. This can scratch the inner wall of the nozzle, as well as giving an inaccurate pressure reading.
- b) The sprinkler is leaking: This is normally caused by worn washers and seals. They should be replaced.
- c) The sprinkler is not throwing as far as it should: If the operating pressure has been verified to be within specified range, then the cause is probably some type of blockage, either in the nozzle or the inlet screen. Cleaning the nozzle should be done with air, water or a soft bristled object (such as a pipe cleaner). Do not use wire or a screwdriver. This can scratch the nozzle.

9.1.4 Servicing

If the Rain Bird Maxi-Paw is being serviced, note that it has a feature that allows adjustment of the arm spring based on available pressure and nozzle size. This spring should stay in the "A" position if using the 8, 10 or 12 regular nozzles, or the 10 low angle nozzle. The spring should be moved to the "B" position when using the smaller nozzles. This is especially important when used in low pressure situations. If the spring is in the wrong position the Maxi Paw will not trip properly.

9.2 Pop-up Spray Sprinklers

9.2.1 Adjustment

The necessary adjustments for pop-up spray sprinklers are minimal. Occasionally an adjustment of the radius of throw is required. That is accomplished by turning the screw in the top of the nozzle in a clockwise or counter-clockwise direction as necessary to increase or decrease the throw. Care should be taken not to adjust the throw downward by more than 25% (For example, the lower limit of a 15-foot radius nozzle is approximately II feet). If further reduction of the radius is necessary, another size in the nozzle series should be considered.

The arc of throw may also occasionally need adjustment. The arcs for each of the nozzles is fixed, but the positioning of that arc can be adjusted. That is accomplished by either rotating the sprinkler body or by rotating the pop-up stem (when it has a ratchet mechanism). If the range of arc needs to be adjusted (as opposed to the positioning of that arc), a different nozzle should be considered.

If varible arc nozzles (VAN) are used, first set the left stop. Then turn the knurled band on the nozzle to increase or decrease the angle of coverage.

9.2.2 Maintenance

The pop-up spray sprinklers have a screen that may occasionally require cleaning. This screen is accessed by simply unscrewing the nozzle from the top of the stem.

9.2.3 Troubleshooting

- a) Misting: This is a result of excessive water pressure. Reducing the pressure may be done in one of two ways. Either by using the flow control on the remote control valve, or by installing a pressure regulator before or on the valve.
- b) Inaccurate pattern: This is usually caused by some type of blockage, either in the nozzle itself or in the screen. Only water, air or a soft bristled object should be used to clean the nozzle. Use water to clean the screen.
- c) Leaking around the stem: This is usually caused by debris between the wiper seal and stem. A quick way to solve this problem is to step down lightly on the stem while the sprinkler is in operation. This causes water to flush quickly between the stem and cap, taking the debris with it. If this does not work, the cap is probably damaged and needs to be replaced.

9.3 Remote Control Valves

9.3.1 Adjustment

Typically the only adjustment required on a remote control valve is related to pressure regulation. On valves that have external pressure regulators, connect a pressure gauge to the schrader valve connection on the regulator. Adjust the regulator knob until the desired downstream pressure required for proper system operation is attained. This device will maintain the desired downstream pressure regardless of variations in supply pressure. Valves without pressure regulators can be adjusted to reduce the flow and downstream system pressure by turning down the flow control stem. However, it is not recommended to exceed a 25% reduction in pressure using this method.

9.3.2 Maintenance

Valves can be cleaned by removing the bonnet and accessing the diaphragm assembly. Remove debris that has collected in the upper chamber



or below the diaphragm. Clean the solenoid screen of grit and organic material. Some solenoids can be disassembled and cleaned internally. Clean diaphragm screen or ports, external flow tube or other filters in the valve.

9.3.3 Troubleshooting

Before assuming that there is a valve problem, check the obvious. Is the water turned on, is the controller plugged in and programmed correctly, are there isolation valves that might be turned off? Verify valve operation by using the manual bleed, this might indicate a controller or wiring problem if the valve works properly when using the manual bleed. Typical problems include:

- a) Valve will not close: There are two things that will cause this. The first cause is a physical obstruction (rocks or other debris) preventing the diaphragm from seating. When removing a physical obstruction, be sure to thoroughly inspect the diaphragm assembly and valve seat area for damage. The second reason is insufficient force being applied above the diaphragm. Probable causes:
- The solenoid plunger is missing, or stuck in the up position. Remove and inspect the solenoid.
- Diaphragm filter plugged. This will prevent water from entering the upper chamber.
- Flow control turned up too high. The diaphragm can stick in the up position under low flow/low pressure conditions.
- Constant voltage from the controller. The solenoid will usually be warm to the touch and a slight vibration can be felt if this is happening.
- Leak between the bonnet and body. Water will be visibly leaking where the body and bonnet are connected. This will again prevent sufficient force from developing in the upper chamber.
- An open manual bleed. An open external manual bleed will be very obvious.

An internal manual bleed system can be unknowingly activated if the valve is unfamiliar to the customer.

- A large hole in the diaphragm. (Forward flow valve only). Sufficient force will not build in the upper chamber. Remove the diaphragm assembly and inspect it very carefully, replace it if there are any bubbles or other signs of wear.
- The valve is installed backwards. The arrows on the valve body indicate the direction of water flow through the valve.
- b) Valve seeping: This is usually indicated by a puddle at the lowest sprinkler head. Using an automotive stethoscope may aid in determining which valve is leaking in a manifold. There are two main causes for this to happen.
 - Solenoid, or solenoid seat is damaged. Water will constantly leak past the plunger. Replace the solenoid plunger or the seat if possible.
 - Valve seat is damaged. Check the valve seat and the diaphragm seating area for pitting and small debris. Replace the diaphragm if damaged, it may be necessary to replace the valve body if the seat area is damaged.
- c) Valve will not open: There are again two main causes of this problem. The first cause is an adjustment problem, the flow control stem is tightened all the way down. The second, is that the force is not being released from the upper chamber. Probable causes:
 - Solenoid burned out. A resistance test will verify if the coil is bad (Refer to the volt ohm-meter section to learn how to perform this test). Replace if necessary.
 - A torn diaphragm (Reverse flow valve only). The hole in the diaphragm will allow more water into the upper chamber than can be bled off through the solenoid port. Inspect the diaphragm, and replace it if necessary.

- Plugged ports. The port below the solenoid and/or the port leading to the solenoid chan ber is plugged. This would again preven the water in the upper chamber from bein relieved. Clean the ports with a paper clin never drill out the ports.
- Solenoid not receiving voltage. The control ler is not sending the necessary voltage or there are wiring problems, or the win connections are faulty (Refer to the volohm-meter section to learn how to inspethe field wiring).

9.3.4 Pressure Reducing Valves

For information on the operation, maintenance and troubleshooting of the pressure reducinvalves, refer to the manufacturer's manual.

9.3.5 Irrigation Control System

This section will describe some troubleshootin procedures that will determine if the controller indeed the bad component in the irrigation system The controller is usually the first compone blamed from an irrigation system failure. Typical once the controller has been removed and taken to a repair facility, more than 25% are returned with out a defect being found in the controller.

Controller Check: Before removing the controll it is recommended that the following are checked

- a) Programming A program consists of three steps:
- Start time The time of day that the irrigation should begin.
- Run time The irrigation duration for each station.
- Days on The day that the irrigation will operate.

If any of these steps are missing, the controller w not activate the valves.

b) Auto/Off switch - This switch must be in the

id,	AUTOMATIC or ON position in order for the			
m-	controller to operate.			
nt ng ip,	c) Sensors - If the controller is equipped with a rain sensor or moisture sensor, the program will not run if they have been activated.			
ol-	9.3.6 Hybrid/Solid State Troubleshooting			
re olt ct	Hybrid and solid state controllers are designed to provide the programming versatility that is needed to better protect our water resources. The technology that is necessary to accom- plish this makes repairs by untrained persons nearly impossible. The following items should be checked before assuming that the controller is the problem:			
ng ng is	a) Visible damage - Inspect the controller for any visible signs of damage. Check the keyboard for collapsed buttons, run your finger lightly over each of the buttons, a slight "hill" should be felt at each location. If a "valley" is felt then the keyboard must be replaced. Inspect the printed circuit board for burned components,			
m. nt	this is normally caused by lightning or, other power surges.			
ly, to h-	 b) Primary power - Verify that the primary power is within acceptable limits. Contact an electri- cian if incorrect. 			
er d:	c) Transformer - Verify that the transformer output voltage is between 24 and 28 VAC, if the output voltage is zero, and the primary power is correct, then replace the trans- former.			
on	d) Circuit breaker/Fuse - Check the condi- tion of the circuit breaker or fuse. If it has blown, the most likely reason is a field wiring short. When this happens, it only interrupts			
ch	the 24 volt section of the transformer. The 12 volt section will remain active, therefore the display will show that the station is on			
er-	Press the appropriate button(s) on the keypad to turn the active station(s) off. Reset the			
vill	circuit breaker, or replace the fuse with the value specified by the manufacturer. Manually advance the controller to station #L and allow			
he	it to run for one minute. If station #1 and anow ates correctly then advance to station #2 and			

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repeat this procedure until the fuse blows. This will determine the problem station. Once the defective station has been located, disconnect the wire that operates that valve. Continue the above procedure to test the rest of the stations, as there could be more than one problem. Once this has been completed the controller will operate all of the stations that are still connected. The faulty field wiring will have to be repaired before it can be reconnected to the controller.

- e) Microprocessor lockup problems The microprocessor is the "brains" of the controller. Occasionally due to electrical problems the microprocessor will freeze all of its functions. The symptoms of this are:
- Display blank; the display does not show any information, or
- Frozen display with the display showing erratic information that cannot be cleared or changed from the keypad and the controller will not perform any of its programmed functions.

If the following steps are taken, the microprocessor will usually resume its normal functions. It will be necessary to completely power down the controller. Note: This process will delete your existing program.

- Primary power It is necessary to disconnect the controller from its primary electrical source either by unplugging it from the outlet or by turning off the appropriate circuit breaker in the electrical panel.
- Battery backup Remove the battery from the controller. The purpose of the battery is to maintain the information inside of the microprocessor in the event of a primary power failure. By removing the battery the microprocessor is allowed to reset itself to its normal condition.
- Wait Maintain this power down condition for 5 minutes to be certain the microprocessor will reset itself.

- Primary power Reconnect the primary power to the controller.
- Function check The display should now show 12:00 A.M. Set the time and day to the current setting. Using the manual controller function, turn on several stations and observe that they operate properly.

If the controller now operates properly re-enter your original program and continue to step f.

If controller still will not perform correctly it will need to be repaired by a qualified repair facility.

Battery replacement - If the controller uses an alkaline battery, it is recommended that it be replaced with a new one at this time. Reinstall the correct battery in the controller and perform a final resistance test to ensure proper operation. This procedure will normally resolve approximately 30% of the solid state "failures".

9.3.7 Central Control System

For information on the operation, maintenance, and troubleshooting of the central control system, refer to the manufacturer's manual.

Spray Zone Example Base Schedule Worksheet SPRAY ZONE EXAMPLE **BASE SCHEDULE WORKSHEET**

PROJECT NAME: JOF	IN DOE PARKS	
PROJECT LOCATION:	JOHN DOE PARK	S
CONTROLLER NO: <u>1</u>	STATION NO: 1	

ITEM	SOL
I. PLANT WATER REQUIREMENT	
A. PLANT MATERIAL	Audit or Planti
B. REFERENCE PERIOD	Judgment
C. REFERENCE ET (ET₀)	Various sourc
D. LANDSCAPE COEFFICIENT (KL)	K _s <u>0.60</u> x K _d <u>1</u>
(Optional) ALLOWABLE STRESS	K _L x K _{as} _
E. PLANT WATER REQUIREMENT (ET)	ET _o x K _L
II. IRRIGATION WATER REQUIREMENT	
F. PRECIPITATION RATE (PR)	Audit or Calcu
G. DISTRIBUTION UNIFORMITY (DU)	Audit or Estim
H. IRRIGATION WATER REQUIREMENT	ET requirement
I. TOTAL RUN TIME per PERIOD	Irrig. water rec
III. SCHEDULING REQUIREMENTS	
J. ROOT ZONE SOIL TYPE	Audit or Estim
K. AVAILABLE WATER (AW)	Table
L. ACTIVE ROOT ZONE DEPTH	Audit or Estim
M. PLANT AVAILABLE WATER (PAW)	AW x active ro
N. ALLOWABLE DEPLETION (AD)	PAW × MAD (
0. IRRIGATION DAYS PER PERIOD	Plant ET/AD
P. TOTAL RUN TIME per DAY	Total run-perio
Q. RUN TIME per CYCLE	Audit or Calcu
R. CYCLES per DAY	Total run-day/

fig. I a

DATE: 03/22/99

NO.1

REF. PERIOD MONTH OF: MAY

RCE		VALUE	UNIT or FUNCTION
g Plan		Ws	classification
		31	days
s		6.5	inches of water
<u>0</u> x K _{mc} <u>1.0</u>		0.60	plant specific multiplier
		N/A	site specific multiplier
	C×D	3.9	inches
	L		L
ation			inches per hour
te			efficiency adjustment
t	E/G		inches
uirement/PR	(H/F)x 60		minutes
-	L		
ite			classification
			inches per inch of soil
ite			inches
ot zone	KxL		inches
ee Table)			budget multiplier
	E/N		days in a period
d/irrigation	I/O		minutes
ation			minutes
un time-cycle	P/Q		repeats to avoid runoff



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