Water-Efficient Landscape Design

A model landscape ordinance for Colorado's communities utilizing a water conservation-oriented planning approach

Provided by the Colorado Department of Local Affairs, Office of Smart Growth

Across Colorado, local communities are developing responsible public policy initiatives that address concerns over drought and availability of local water resources. One water conservation approach endorsed by a number of communities involves landscaping with drought tolerant grasses, plants and shrubs – a practice known as "xeriscaping."

The Office of Smart Growth in the Colorado Department of Local Affairs (DOLA) has funded a new *Water-Efficient Landscape Design* model ordinance and best practices manual to assist local communities in their efforts to encourage the use of drought-tolerant landscaping. This model landscaping ordinance and best practices manual were developed as part of a DOLA Colorado Heritage Planning Grant to the municipalities of Lafayette and Erie.

Water-Efficient Landscape Design is meant to serve as an alternative or supplement to the landscape design section of the *Model Land Use Code for Colorado's Small Communities*, another project funded with a grant from the Office of Smart Growth. (For information on obtaining a copy of the *Model Land Use Code*, please see the office's website below). This model landscaping ordinance was produced in conjunction with the development of the City of Lafayette's landscape design code. As a result, the standards contained in the ordinance reflect a "Front Range" context that may not be appropriate for all jurisdictions. We recommend communities seek input from citizens, landscape architects and master gardeners to customize the ordinance language to fit their own climatological context and master plan goals and policies.

The companion document to the model landscape ordinance is the *WaterWise Landscaping Best Practices Manual*. This best practices manual can also be found on the Office of Smart Growth website.

The *Water-Efficient Landscape Design* model ordinance and *WaterWise Landscaping Best Practices Manual* were developed with the assistance of Design Studios West Inc., James M. Knopf, The Restoration Group, HydroSystems/KDI Inc., and Gregory White.

For more information on these and other planning and land use publications, visit the Office of Smart Growth website at www.dola.state.co.us/smartgrowth or call 303.866.4552.

Water-Efficient Landscape Design

Section 1. Purpose and Intent. The purpose of this ordinance is to protect and enhance the community's environmental, economic, recreational, and aesthetic resources by promoting efficient use of water in the community's public and private landscapes, reducing water waste, and establishing procedures for the design, installation and maintenance of water-efficient landscapes throughout the jurisdiction.

To preserve *Town/City's* special character, and integrate and enhance new development by promoting quality landscape design that:

1. Reinforces the identity of the community and each neighborhood;
2. Provides tree-lined streets in urban areas;
3. Anchors new buildings in the landscape;
4. Provides tree canopies within paved areas; and
5. Is environmentally sensitive by preserving existing trees, using water conservation techniques, planting native species (when appropriate), and enhancing valuable habitat.

Section 2. Applicability. This section shall apply to new or renovated landscapes that require development review permits.

Section 3. Definitions. The words used in this ordinance have the meaning set forth below:

"application rate" means the depth of water applied to a given area, usually measured in inches per hour.

"applied water" means the portion of water supplied by the irrigation system to the landscape.

"automatic controller" means a mechanical or solid state timer, capable of operating valve stations to set the days and length of time of a water application.

"backflow prevention device" means a safety device used to prevent pollution or contamination of the water supply due to the reverse flow of water from the irrigation system.

"check valve" means a valve located under a sprinkler head to hold water in the system so it minimizes drainage from the lower elevation sprinkler heads.

"emitter" means drip irrigation fittings that deliver water slowly from the system to the soil.

"established landscape" means the point at which plants in the landscape have developed roots into the soil adjacent to the root ball.

"establishment period" means the first year after installing the plant in the landscape.

"evapotranspiration" means the quantity of water evaporated from adjacent soil surfaces and transpired by plants during a specific time.

"flow rate" means the rate at which water flows through pipes and valves (gallons per minute or cubic feet per second).

"hydrozone" means a portion of the landscaped area having plants with similar water needs that are served by a valve or set of valves with the same schedule. A hydrozone may be irrigated or non-irrigated. For example, a naturalized area planted with native vegetation that will not need supplemental irrigation once established is a non-irrigated hydrozone.

"infiltration rate" means the rate of water entry into the soil expressed as a depth of water per unit of time (inches per hour).

"irrigation efficiency" means the measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices. The minimum irrigation efficiency for purposes of this ordinance is 0.625. Greater irrigation efficiency can be expected from well designed and maintained systems.

"landscaped area" means the entire parcel less the building footprint, driveways, non-irrigated portions of parking lots, hardscapes- such as decks and patios, and other non-porous areas. Water features are included in the calculation of the landscaped area. Areas dedicated to edible plants, such as orchards or vegetable gardens are not included.

“Landscaping and/or landscape improvements” means plantings of grass, shrubs, trees or similar living plants, with minimal use of other ground surface treatment such as decorative rock, bark, or stone. These inert materials are allowed to be used in conjunction with live material in planting beds, but do not count toward the calculations of required landscaping and/or landscaping improvements.

"lateral line" means the water delivery pipeline that supplies water to the emitters or sprinklers from the valve.

"mulch" means any material such as leaves, bark, straw, gravel or other materials left loose and applied to the soil surface for the beneficial purpose of reducing evaporation .

"operating pressure" means the pressure at which a system of sprinklers is designed to operate, usually indicated at the base of a sprinkler.

"overhead sprinkler irrigation systems" means those with high flow rates (pop-ups, impulse sprinklers, rotors, etc.)

"overspray" means the water that is delivered beyond the landscaped area, wetting pavements, walks, structures, or other non-landscaped areas.

"recreational area" means areas of active play or recreation such as sports fields, school yards, picnic grounds, or other areas with intense foot traffic.

"recycled water," "reclaimed water," or "treated sewage effluent water" means treated or recycled waste water of a quality suitable for nonpotable uses such as landscape irrigation; not intended for human consumption.

"run off" means water which is not absorbed by the soil or landscape to which it is applied and flows from the area. For example, run off may result from water that is applied at too great a rate (application rate exceeds infiltration rate) or when there is a severe slope.

“sight distance triangle” is the area on each side of a street or driveway intersection, measured from the intersecting point of the extended flow lines of the streets or street and driveway, to the points 50 feet back from that intersecting point, that is intended to remain free of obstructions that may impair a drivers safe sight distance to oncoming traffic.

"sprinkler head" means a device that sprays water through a nozzle.

"static water pressure" means the pipeline or municipal water supply pressure when water is not flowing.

"station" means an area served by one valve or by a set of valves that operate simultaneously, sometimes referred to as a “zone”.

"turf" means a surface layer of earth containing mowed grass with its roots. Annual bluegrass, Kentucky bluegrass, Perennial ryegrass, Red fescue, and Tall fescue are cool-season grasses. Bermudagrass, Kikuyugrass, Seashore paspalum, St. Augustinegrass, Zoysiagrass, Blue Grama and Buffalo grass are warm-season grasses.

"valve" means a device used to control the flow of water in the irrigation system.

"water conservation concept statement" means a one-page checklist and a narrative summary of the project.

“zone” an area served by one valve, sometimes referred to as a “station”

Section 4. Landscape Design.

To exist as a nation, to prosper as a state, and to live as a people, we must have trees.

- Theodore Roosevelt

A. General Provisions. All land development applications shall be accompanied by an appropriate landscape plan. Building permit applications for individual single-family residences will not require landscape plans. However, all new or renovated landscaping within the community shall comply with the intent of these regulations.

Trees can transform a street more easily than any other physical improvement. Moreover, for many people, trees are the most important single characteristic of a good street.

- ***Great Streets,*** Alan B. Jacobs

1. Street Trees. Landscape improvements in urban settings shall create an orderly, irrigated, managed landscape. All urban neighborhoods shall have tree-lined streets. Street trees shall include a mix of species and be aligned in straight rows. Street trees shall be placed within the right-of-way tree lawn. Spacing of trees shall allow for their mature spread. Trees installed along streets that will be widened in the future shall take into account plans for future widening of streets so that established trees will not be disturbed during future construction.

2. Site Landscape Design. Landscape improvements shall be an integral part of the overall site design for each property. Landscape improvements shall be designed to complement and enhance the character of neighborhoods and shall follow these guidelines:

a. Landscaped areas shall be configured to *maximize their interconnectivity* within the site, to natural areas and to landscaped areas in adjacent developments. Small, isolated islands of landscaping should be avoided except as required in parking lots and for screening along roadways.

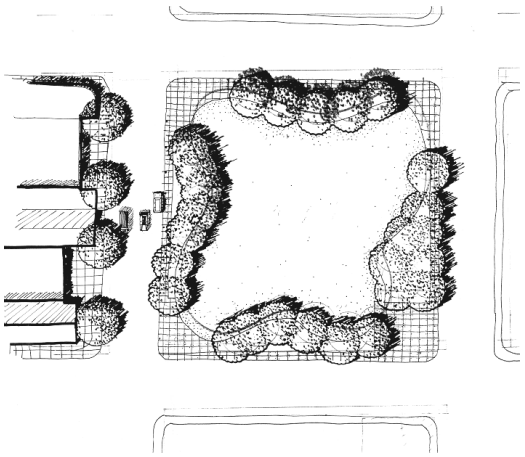
b. Enhance functional open space through the *creation of outdoor rooms* appropriate to the location and purpose of the open space within the development. This can be accomplished through a combination of plantings, fencing and berms and by using natural features on the site.

c. Landscape improvements in all developments shall be *consistent with the character* of the proposed development and the surrounding area to reinforce neighborhood identity.

d. Landscape design shall *enhance natural features, drainage ways and environmental resources*.

e. All landscape improvements shall be designed for mature landscapes and shall provide appropriate *visibility for cars and pedestrians.*

f. Preserve and *frame views* both into and out of the neighborhood.



Use plantings and berms to create outdoor rooms in common open space areas.

Figure 1

g. Incorporate the elements of *gateway, path and destination* into the design of landscapes. Gateways are entries that provide transitions from one space to another. Pathways are routes that lead to a destination. Destinations are focal points that can include anything from a garden bench at the end of a path to a civic building at the end of a street.

h. Landscaping shall be no more than thirty (30) inches high when located in a sight distance triangle of street intersections.

3. Water-efficiency in Landscape Design. Landscape improvements shall be designed with water-efficiency as a goal. Landscape water-efficiency shall be *measured by an annual water budget* to facilitate water conservation; These guidelines shall apply to the design of all regulated landscapes:

a. Landscapes shall use the following *xeriscape design principles* to facilitate water conservation:

i. Well-planned planting schemes;

ii. Appropriate turf selection to minimize the use of bluegrass;

iii. Use of mulch to maintain soil moisture and reduce evaporation;

iv. Zoning of plant materials according to their microclimatic needs and water requirements;

v. Improvement of the soil with organic matter if needed;

vi. Efficient irrigation systems; and

vii. Proper maintenance and irrigation schedules.

b. Plants of any water need may be used in the landscape, providing the total annual water use does not exceed Water Allowance (Water Budget) for the ET Reference Location. (eg. 15 gallons/ square foot/ season in Denver metro area).

c. Plants having similar water use shall be grouped together in distinct hydrozones, which shall be shown on the Landscape Plan.

d. High hydrozones shall be separated from Low and Very Low hydrozones by Moderate hydrozones whenever possible.

e. Plants shall be selected appropriately based upon their adaptability to the climatic, geologic, and topographical conditions of the site. Protection and preservation of native species and natural areas is encouraged. The planting of trees is encouraged wherever it is consistent with the other provisions of this ordinance.

f. Strips less than 8 feet wide shall be landscaped with Low or Very Low water plants. Public street right-of-way plantings are exempt.

g. All plantable areas not covered with turf shall be covered with a minimum of four (4) inches of a suitable mulch to retain water, and inhibit weeds. Exceptions for Low and Very Low water areas shall be considered. Non-porous fabrics (like black plastic) shall not be placed under mulches.

h. Soil preparation shall be suitable for the plants. This generally means adding organic material for High and Moderate water zones, but not for Low and Very Low water zones. Soil preparation shall include scarification to 6 inches, with organic or other planting soil as specified by the landscape designer or landscape architect.

i. Recirculating water shall be used for decorative water features.

j. Artificial plants, artificial grass, and other artificial plant material are discouraged as a means of achieving water-efficient landscapes.

4. Water-efficiency in Irrigation Design. All required landscaping shall be irrigated as required for plant establishment and maintenance. Irrigation shall be appropriate to the type and scope of the improvements.

a. Use of non-treated water for irrigation is encouraged if a permanent, suitable supply is available.

b. Required landscaping in urban developments shall be irrigated with a permanent irrigation system.

c. Temporary irrigation may be used to establish native grasses and vegetation.

Irrigation system improvements shall be designed to achieve water-efficiency as a goal. Landscape water-efficiency shall be measured by an annual water budget of 15 gallons per square foot per year to facilitate water conservation. These guidelines shall apply to the irrigation system design for all regulated landscapes:

a. Plant water requirements shall be considered in irrigation design schemes

i Each valve shall irrigate a landscape with similar site, slope and soil conditions and plant material with similar watering needs.

ii Soil types, infiltration rate & slopes shall be considered in order to avoid runoff, & overspray, where water flows onto adjacent property, non-irrigated areas, walks, roadways, or structures. Proper irrigation equipment, schedules, and repeat cycles shall be used to minimizing runoff.

iii Special attention shall be given to avoid runoff from slopes, and to avoid overspray in planting areas with a width less than ten feet, like medians.

iv Turf and non-turf areas shall be irrigated on separate valves.

v Drip emitters and sprinklers shall be placed on separate valves.

vi Bubblers for trees shall be placed on a separate valve. Bubbler selected shall not exceed 1.5 gallons per minute (gpm) for each device.

vii Hand watering shall be considered for Low and Very Low hydrozones.

b. Hydraulic principles shall be employed when designing the irrigation system.

i. Separate landscape water meters shall be installed for all regulated landscapes.

ii. The irrigation system shall be designed to provide peak season irrigation within a six night, six hour per night watering period (this provides a 36 hour watering window to ensure reasonable tap sizes and flexibility of watering times during extremely hot weather).

iii. The tap size shall be based on the water demand of the site and shall take into consideration the areas of each plant type (i.e., turf, native seed, perennials and annuals and shrubs), the evapotranspiration for the site, the water demand of each plant type at peak season, and the water window.

iv. The maximum flow rate required for the site shall be based on the tap size:

¾" meter	15 gallons per minute
1" meter	25 gpm
1.5" meter	50 gpm
2" meter	80 gpm

v. The mainline system shall be designed such that velocities within the mainline piping do not exceed five feet per second.

vi. A reduced pressure backflow preventer shall be used on all systems. Where the irrigation point of connection is from the domestic water service, the irrigation tap and backflow preventer shall be installed after the water meter but before any backflow or pressure-reducing valve for the building.

vii. A pressure-reducing valve shall be used when the static water pressure exceeds the pressure needed by the system by 15 pounds per square inch (psi). Pressure reducing valves can be installed within the project, on the mainline or at the valve, if elevation changes require it.

viii. Turf and grass area irrigation shall be designed using the following principles:

- No single zone shall mix head types, such as rotors and pop-up spray heads on the same zone.

- Sprinklers shall be spaced for "head-to-head" coverage, where the spray pattern from one head will reach to the next head. (Another way to describe this is that all sprinkler heads shall be spaced at a maximum of 50% of design performance diameter of the sprinkler.) Spacing shall be reduced below 50% of design performance diameter when conditions demand.

- No overhead sprinkler irrigation systems shall be installed in strips less than 8 feet wide. Public street right-of-way landscaping shall be exempt.

- Small areas (25 ft wide or less) shall be irrigated with fixed nozzle pop-up spray heads with matched precipitation nozzles. Nozzles shall be sized to provide head to head coverage. Heads shall pop-up a minimum of 4" in turf areas. Heads can be specified with pressure reducing features, where needed.

- Large areas (wider than 25 ft) shall be irrigated with gear driven rotor heads with a minimum precipitation rate of 0.45" per hour for a full circle head. Heads shall pop-up a minimum of 4" in turf areas.

- Check valves shall be included in heads or valves where low-head drainage will occur due to elevation changes. See irrigation head catalogs for elevation change tolerances.

ix. Shrub bed areas with plant material one gallon in size or larger shall be irrigated with a drip or subsurface system.

x. Perennial and annual beds shall be spray irrigated with 12" pop-up spray heads with a maximum spacing of 10' on center.

xi. Booster pumps shall be installed on systems where supply pressure does not meet minimum recommended pressure of the irrigation system, based on hydraulic calculations.

xii. Where the water supplied will be from secondary or other non-potable water sources, the use of non-potable color indicators shall be used on the equipment. This includes purple handles on quick coupler valves and gate valve, caps for irrigation heads, valve box lids and marker tape buried above the mainline.

xiii. All systems shall be equipped with an automatic rain shut-off device.

xiv. All wire connections shall be made with watertight connectors and contained in a valve box.

c. Irrigation control systems shall be employed that offer flexibility in programming.

i. All irrigation systems shall include an electric automatic controller with multiple programs and multiple repeat and rest cycle capabilities and a flexible calendar program.

ii. All controllers shall be capable of temporarily shutting down the system by utilizing internal/external options such as rain and wind sensors.

iii. The controller shall have the ability to adjust run times based on a percentage of maximum ET (evapotranspiration) rate.

iv. Each zone/valve shall have its own station on the controller. The exception is drip valves, which can be doubled on the controller.

d. Installation of irrigation systems shall be per plan and accurate.

i. Irrigation system shall be installed per plans.

ii. The irrigation system shall be monitored during installation, especially to verify mainline and lateral line depth, spacing of irrigation heads and construction of valve clusters and quick coupler components.

iii. Mainline shall be tested to ensure its ability to maintain required pressure for 2 hours.

iv. Before acceptance, each zone shall be operated and each valve box opened to verify accurate installation.

e. "As-built" drawings of irrigation system shall be provided after installation with dimensions shown for irrigation components.

i. The "as-built" drawings shall show all points of connection, including tap size, line size and static water pressure of service. Dimensions that will be used to locate components shall be shown on plans. Components to be located include meters, backflow preventers, all valves, including quick coupler, control, gate, and manual drain valves, and controller locations.

ii. The drawings shall also show zone number, valve size and gallons per minute.

f. Systems shall be operated to maximize irrigation water efficiency.

i. Irrigation shall be scheduled to operate between 10 PM and 8 AM to reduce water loss from wind and evaporation and to take advantage of the better water pressure.

ii. The target efficiency for rotor heads shall be 70%, and 60% for spray heads.

iii. Valves shall be scheduled for multiple repeat cycles to reduce runoff, especially on slopes and with soils with slow infiltration rates.

iv. All zone run times shall be determined based on the precipitation rate of the heads on that zone. The run times shall be adjusted seasonally and at least once a month to accommodate the ET rate.

v. Systems shall be winterized in the fall using a compressor to remove water in the lines and components. System shall be reopened and adjusted for proper operation in the spring.

vi. After each mowing, each zone shall be operated for a very short period of time to verify the heads are operating as designed and no damage has occurred.

vii. When repairs are made, the new components installed shall match exactly those damaged and removed.

viii. Run times for zones shall be adjusted based on exposure (north and east vs. south and west), slope and soil types to reduce overwatering.

g. *Irrigation schedules* satisfying the following conditions shall be submitted as part of the Landscape Documentation Package.

i. An annual irrigation program with monthly irrigation schedules shall be required for (1) the plant establishment period, (2) for the established landscape, and (3) for any temporarily irrigated areas.

ii. For timer-based controllers include run time (in minutes per cycle), suggested number of cycles per day, and frequency of irrigation for each station; and provide the amount of applied water (in hundred

cubic feet, gallons, or in whatever billing units the local water supplier uses) recommended on a monthly and annual basis.

iii. For ET based controllers include essential details of the specific controller involved.

iv. Water Features shall be considered as High water zones. The total amount of water for irrigation, plus water needed for any water features, shall be combined in the total water budget.

v. Recreational areas (like sports turf) designated in the landscape design plan shall be highlighted and the irrigation schedule shall indicate if any additional water is needed above the Maximum Water Allowance. The total project water use must still remain at or under 15 gallons/SF/year.

vi. Whenever possible, irrigation scheduling shall incorporate the use of evapotranspiration data such as that from the Northern Colorado Water Conservancy District.

5. Environmental Considerations.

a. All landscapes shall strive to *maximize the use of native species*. Where native material is not appropriate for the intended use or appearance, plant species that are regionally adapted and noninvasive may be used.

b. Landscapes shall consist of a variety of species to *enhance biodiversity*. No one species may make up more than twenty-five (25) percent of the total non-grass plant materials on the site.

c. Buildings and parking areas shall be located to *preserve and promote the health of existing trees, environmental resources and natural drainage ways.* No healthy tree shall be removed without good cause. This requirement is not intended to prevent the removal of unhealthy trees in conjunction with site development.

d. Trees shall be located to *provide summer shade and limit winter shade* on walks and streets.

e. A combination of plantings, berms, walls and fences shall be used as appropriate to *buffer sensitive habitat.*

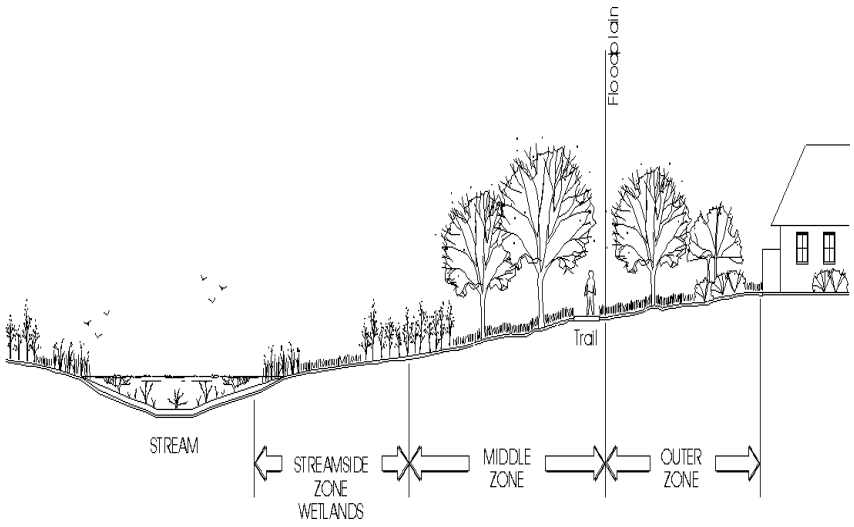


Figure 2
Use buffers to protect the physical integrity of riparian ecosystems. Try to preserve vegetation and trees in streamside zone and middle zone. Encourage grass and landscaping in outer zone to filter runoff from backyards, parking areas, roads, etc.

f. Plants shall be selected to blend with the native vegetation for projects at the interface between urban areas and natural open space (non-irrigated). Locally recognized invasive introduced plants shall be unacceptable. Plants with low fuel volume and/or low flammability shall be emphasized.

g. All areas disturbed by construction shall be reseeded to *prevent erosion*. Native, noninvasive grasses shall be used for revegetation where practical. Weed control is the responsibility of the landowner on all reseeded areas and all preservation areas.

6. <u>New buildings and paved areas.</u> Anchor structures in the landscape through the use of trees, shrubs and groundcover. The size and intensity of plantings shall be appropriate to the size and context of the improvements.

a. Integrate adjacent land uses of different intensities through a combination of berming, plantings and fencing. Use opaque screening only when necessary to mitigate the impact of noise, light, unattractive aesthetics and traffic. A fence shall not be the only screening material used.

A combination of berming, planting and fencing to integrate land uses.

Figure 3

b. Use landscaping to provide a transition from developed, managed landscape to more natural vegetation.

c. Provide a tree canopy by installing shade trees within and adjacent to paved areas.

7. Plant Materials

a. The minimum planting sizes on all required landscaping shall be two (2) inch caliper deciduous trees, one and one-half (1½) inch caliper ornamental trees, six (6) foot tall evergreen trees and five (5) gallon shrubs.

b. Required plant materials shall be grown in a recognized nursery in accordance with proper horticultural practice. Plants shall be healthy, well-branched vigorous stock with a growth habit normal to the species and variety and free of diseases, insects and injuries.

c. All plants shall conform to American Nursery Association specifications for measurements, grading, branching, quality, ball and burlapping.

d. All plant schedule listings of proposed plant material shall include the respective hydrozone category for that plant reflecting the water requirements of that plant. Plant Lists with hydrozone categories are included in the Appendix.

9. Guarantee of Installation. Required landscape improvements shall be installed prior to issuance of a Certificate of Occupancy (C.O.) for all structures. If weather conditions prevent installation, the developer shall post a financial guarantee for the improvements. This guarantee shall be released upon completion of the installation of the landscaping.

10. Maintenance. In order to provide for the ongoing health and appearance of landscape improvements, all required landscaping for regulated landscapes shall be maintained and replaced by the landowner/occupant as necessary. All property owners/occupants shall be responsible for maintenance of landscaping within the portion of the public right-of-way between the back of the curb or street pavement and the adjacent property.

    a. A regular *maintenance schedule* satisfying the following conditions shall be submitted as part of the Landscape Documentation Package:

        i. Landscapes shall be maintained to ensure water efficiency. A regular maintenance schedule shall include but not be limited to checking, adjusting, and repairing irrigation equipment; resetting the automatic controller; aerating and de-thatching turf areas (only if needed); replenishing mulch; fertilizing; pruning, and weeding in all landscaped areas.

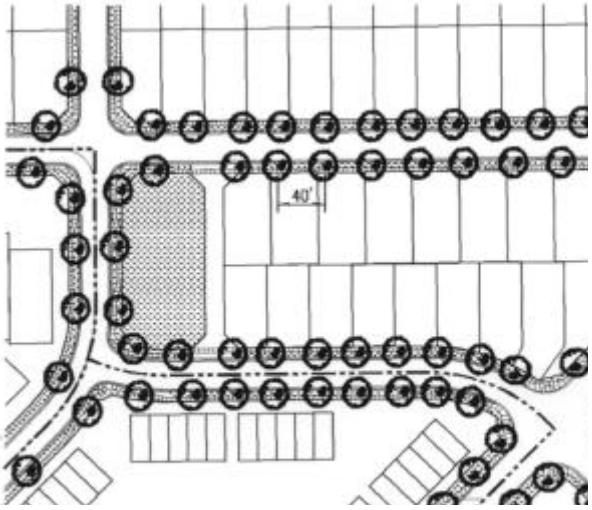
        ii. Whenever possible, repair of irrigation equipment shall be done with the originally specified materials or their equivalents.

B. Landscaping Minimum Requirements

1. Landscaping within the Right-of-Way and Required Common Open Space. The developer or assigns shall provide:

    a. *Street trees* – one (1) deciduous or ornamental tree for every forty (40) linear feet of block frontage or portion thereof. Street trees shall be planted within the tree lawn portion of the right-of-way with adequate spacing to allow for the mature spread of the trees. Within zones E-1, E-2, A-1 and A-2, street trees shall be planted in irregular clusters within front yard setbacks. [a]

[a] References to zones refer to the *Model Land Use Code for Colorado's Small Communities*



Provide one tree for every 40' of block frontage or portion thereof. Space trees to account for mature spread.

Figure 4

a. *Groundcover* – live groundcover shall be provided as appropriate to the use and function of the area, including grass, trees, flowers, or shrubs. In commercial areas this area may be paved if it functions as pedestrian access to storefronts and is integrated into the overall design of the other improvements on the site.

b. *Irrigation* - The developer shall install an automatic irrigation system for all landscaping within public street rights-of-way.

c. *Landscaping for required common open space* – such as pocket parks and trails. Landscaping shall be appropriate to the use and function of the area and include trees, shrubs, groundcover, irrigation (where necessary) and paving.

d. *A mechanism for long-term maintenance* of common open space and arterial and collector street right-of-way landscaping – such as a homeowners' association and covenants.

5. Small Lot Single Family Residential (R-1 Zoning Districts) Development Landscaping Standards.[b]

a. In addition to landscaping the right-of-way tree lawn, the developer or assigns shall provide:

[b] Again, references to zones refer to the *Model Land Use Code for Colorado's Small Communities*

i. Front yard setback of each home. There shall be a minimum of forty-five (45) percent live materials between the front of the house and the curb unless otherwise approved by the Town.

ii. *Five (5) shrubs* – for the front yard setback of each home.

b. The homeowner shall:

i. Install remainder of yard – and is encouraged to plant additional trees, shrubs and flowers using xeriscape principles and the general provisions set forth in this Section.

ii. Maintain the yard and landscaping within the adjacent road right-of-way – in accordance with *Town/City* regulations.

6. Multi-Family, Mixed Use and R1-A District Residential Landscaping Standards:

a. In addition to right-of-way landscaping, the developer or assigns shall provide:

i. *Site trees* – a minimum of one (1) tree per one thousand (1,000) square feet of landscaped area, distributed on the site.

ii. *Shrubs* – a minimum of one (1) shrub per one hundred fifty (150) square feet of landscaped area. Group shrubs and distribute throughout the site. Trees may be substituted for up to one-half (½) of the required shrubs at the rate of one (1) tree for ten (10) shrubs.

iii. *Groundcover* – irrigated turf maintained to appropriate standards for active recreation in areas that will function for active recreation. Where appropriate, use native grass for areas that will not function as active recreation areas. Native grass must be weed free and maintained at an appropriate height according to species. There shall be a minimum of fifteen (15) percent live materials between the front of the house and the curb unless approved by the *Town/City*.

b. *Landscape setback to parking lots* – thirty (30) feet from arterials or twenty-five (25) feet from other streets. The purpose of the setback is to provide a buffer between street parking areas. This setback may be reduced to fifteen (15) feet if used in combination with a three to four (3-4) foot masonry or stone decorative wall. Signage may be included in this setback.

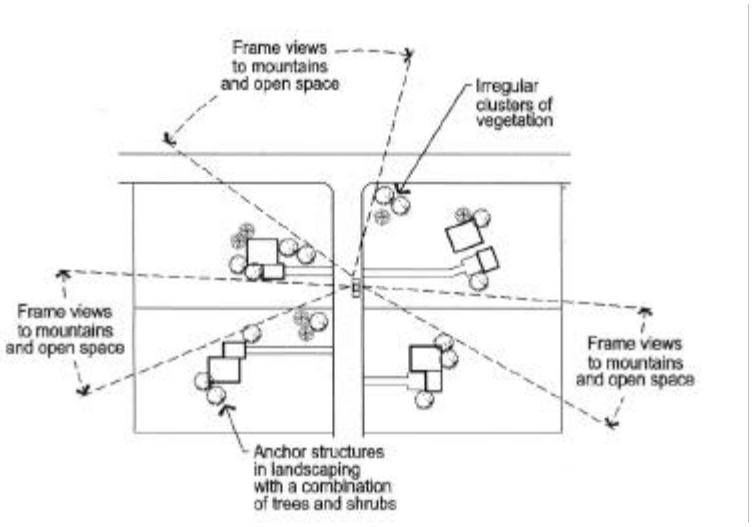


Figure 5

7. Large Lot Single-Family Residential (E-1, E-2, A-1, A-2 Zoning Districts) Development Landscaping Standards. Landscaping shall be designed to keep natural resource areas in their natural state as much as possible and should be in character with surrounding properties.

a. The developer or assigns shall provide:

i. Front yard - There shall be a minimum of sixty (60) percent live materials between the front of the house and the edge of roadway unless approved by the *Town/City*.

ii. *Ten (10) shrubs* – for the front yard setback of each home.

b. The homeowner shall:

i. Install remainder of yard – and is encouraged to plant additional trees, shrubs and flowers using xeriscape principles and the general provisions set forth in this Section.

c. Maintain the yard and landscaping within the adjacent road right-of-way – in accordance with *Town/City* regulations.

8. Business/Commercial and Industrial Development Landscaping Standards.

a. Landscape improvements shall be designed to enhance the overall appearance of the development and integrate the project with adjacent land uses and into the surrounding neighborhood. All improvements shall consider the people who will use the site, travel through or by the site and adjacent land uses. A minimum of fifteen (15) percent of the site (gross) shall be landscaped area, exclusive of street rights-of-way, building

footprints, or hard surfaced or landscaped areas of parking lots and driveways.

b. The developer or assigns shall provide:

i. *Site trees* – plant a minimum of one (1) tree per one thousand (1,000) square feet of landscaped area, distributed on the site.

ii. *Shrubs* – plant a minimum of one (1) shrub per one hundred fifty (150) square feet of landscaped area. Group shrubs and distribute throughout the site. Trees may be substituted for up to one-half (½) of the required shrubs at the rate of one (1) tree for ten (10) shrubs.

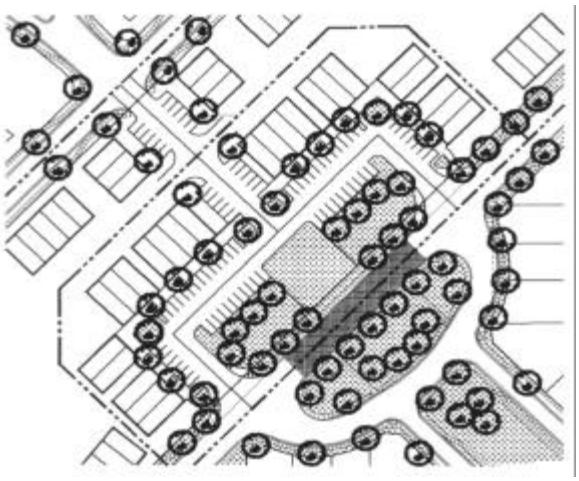
iii. *Groundcover* – establish irrigated grass turf maintained to appropriate standards for active recreation in areas that will function for active recreation. Where appropriate, use native grass for areas that will not function as active recreation areas. Native grass must be weed free and maintained at an appropriate height for each species. There shall be a minimum of sixty (60) percent live materials between the building and the street unless approved by the *Town/City*.

iv. *Landscape setback to parking lots* – thirty (30) feet from arterials or twenty-five (25) feet from other streets. The purpose of the setback is to provide a buffer between street parking areas. This setback may be reduced to fifteen (15) feet if used in combination with a three to four (3-4) foot masonry or stone decorative wall.

v. *Screen loading areas* – screen loading areas (including vehicle being loaded), service and storage areas visible from the public right-of-way or adjacent property with an opaque screen that is an integral part of the building architecture or by landscaping. Chain link fencing with slats, tires or building materials are not acceptable screening materials.

vi. *Compatibility* – integrate activities on the subject property with adjacent land uses by utilizing a combination of landscaping, building orientation and appropriate architectural elements.

c. The building owner or occupant shall maintain the yard and landscaping within the adjacent road right-of-way in accordance with *Town/City* regulations.



Create pedestrian-friendly commercial areas by:

- providing open areas for gathering places
- creating a tree canopy between on-street parking and store fronts to provide a separation between cars and sidewalks
- landscaping parking lots

Figure 6

9. <u>*State Highway* Corridor Landscaping Standards</u>. The developer or assigns shall provide:

a. *Landscape setback to parking lots* – provide a fifty (50) foot landscape setback from the highway. The purpose of the setback is to provide a buffer between the street and parking areas.

b. *Shrubs* – a minimum of one (1) shrub per one hundred fifty (150) square feet of landscaped setback. Group shrubs and distribute throughout the landscape setback. Trees may be substituted for up to one-half (½) of the required shrubs at the rate of one (1) tree for ten (10) shrubs.

10. <u>Downtown Landscaping Standards.</u> Downtown landscaping is intended to provide an attractive environment for people to walk and shop. Refer to Section 2.26 Design Vocabulary[c] – Streetscape (of the Model Land Use Code for Colorado's Small Communities) for illustrations of attractive landscaping in downtown areas around Colorado.

a. The developer or assigns shall provide:

i. *Streetscape* – a combination of window boxes, planters, trees, benches, etc. as appropriate to enhance building entries and the streetscape.

11. <u>Parking Lot Landscaping Standards.</u> Parking lot landscaping is intended break up large expanses of pavement, create shade, buffer views of parking lots from adjacent streets and development and enhance the overall appearance of each project.

a. *Applicability* – All parking lots with ten (10) spaces or more shall be subject to these requirements.

[c] See the *Model Land Use Code for Colorado's Small Communities*

b. The developer or assigns shall provide:

i. *Site trees* – a minimum of one (1) tree per five (5) parking spaces. Group trees together in islands which are a minimum of ten (10) feet wide. Use the landscaping to break up large expanses of pavement and to create a tree canopy for summer shade. See Figure 2-24.

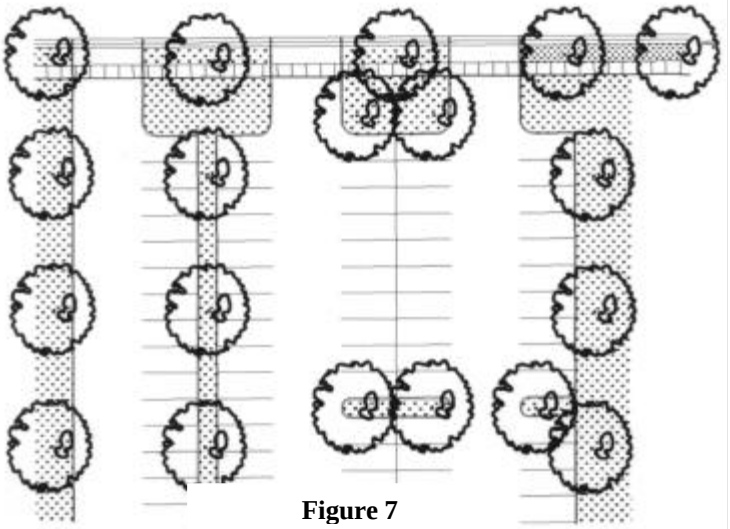


Figure 7

ii. *Shrubs* – a minimum of one (1) shrub per one hundred fifty (150) square feet of landscaped area. Group plantings in landscape islands.

iii. *Groundcover* – limit areas of irrigated turf. Grass is discouraged in areas less than ten (10) feet wide. Install a grass buffer (native grass where possible) around the perimeter to filter runoff and improve water quality.

iv. *Landscape setback to parking lots* – thirty (30) feet from arterials or twenty-five (25) feet from other streets. The purpose of the setback is to provide a buffer between the street and parking areas and to screen the parking from the street. This setback may be reduced to fifteen (15) if used in combination with a three to four (3-4) foot articulated masonry or stone decorative wall with trees and shrubs on both the street and parking lot sides of the wall to soften its appearance. Signage may be included in this setback.

v. *Provide a mechanism for long-term maintenance of landscaping* – all landscaping within and adjacent to parking lots shall be owned

and maintained by the landowner or occupant.

C. Storm Drainage Facilities.

1. Intent. To promote innovative and effective land and water management techniques that protect and enhance water quality.

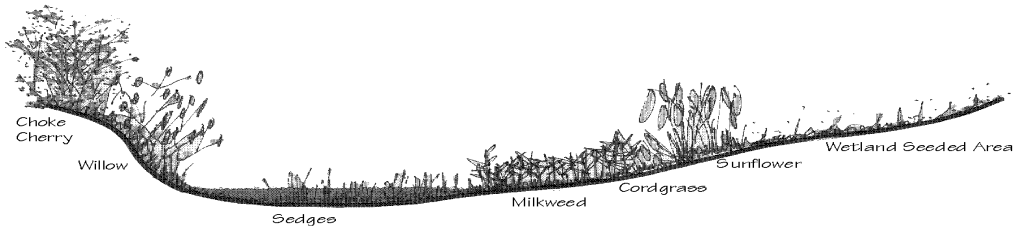
2. General Provisions.

c. Landscaping associated with storm drainage facilities shall be integrated into the overall design of the project.

d. It shall enhance the overall appearance of the project, prevent erosion and improve water quality of storm water runoff whenever possible.

e. Storm drainage facilities may function as open space for active recreation, trail corridors or habitat enhancement areas if they are designed appropriately and approved by the *Board of Trustees/City Council.*

f. The use of planting strips and shallow, landscaped depressions in parking lots and along roads is encouraged to help trap and remove pollutants from storm water runoff.



Develop storm drainage systems as landscape amenities which can enhance the overall project.

Figure 8

3. Applicability. All storm drainage facilities shall be appropriately landscaped.

4. Minimum Requirements.

g. All facilities shall be seeded to grass appropriate to the function of the area. Areas to be used for active recreation shall be seeded to a turf-type grass and irrigated with a permanent irrigation system. Areas to be maintained for habitat enhancement shall be seeded to native grasses and wildflowers. Developer is responsible for establishment of a complete, weed free stand of grass. Trail corridors may be seeded to native grasses if appropriately integrated with adjacent improvements.

h. Maximum side slope on drainage facilities shall be 4:1, minimum slope of

the bottom of a drainage facility shall be one-half (½) percent.

i. Landscape improvements shall be designed to enhance the function of the facility. Areas designed for recreation shall include clusters of trees to provide shade, located so they do not impair the function of the facility.

j. Habitat and water quality enhancement including wetland plantings in low wet areas is encouraged.

5. Ownership and Maintenance.

k. All drainage facilities shall be owned and maintained by the landowner or occupant unless otherwise approved by the *Town/City*.

D. Submittal Standards for Landscape Packages. All land development applications will be accompanied by the appropriate landscape package (a "Y" indicates a need to submit):

TYPE OF APPLICATION	CONCEPTUAL LANDSCAPE PACKAGE	PRELIMINARY LANDSCAPE PACKAGE	FINAL LANDSCAPE PACKAGE
Sketch Plan	Y		
Preliminary Plat/PUD		Y	
Final Plat/PUD			Y
Conditional Use Review			Y
Site Improvement Plan	Y	Y	Y

1. Conceptual Landscape Package. (submit with sketch plan) Intent: to illustrate the overall design concept for landscaping and depict how it relates to the overall development.

a. Describe the general landscape design intent and the water conservation concept statement of the proposed landscape improvements.

b. This information should be included on the sketch plan map or combined with the conceptual open space plan if it can be clearly illustrated and the scale is not greater than 1"=200'.

Information required in the landscape package is listed in the table that follows.

2. Preliminary Landscape Package. (submit with preliminary plat) Intent: to illustrate the master landscape plan for the development.

a. Describe the general landscape design intent and the water conservation concept statement and how the proposal is consistent with the purpose and intent of these regulations.

b. Landscaping should be included on the preliminary open space and ecological characterization plan if it can be clearly illustrated and the scale is not greater than 1" = 100'.

c. Information required on the plan is listed in the table that follows.

3. Final Landscape Package. (submit with final plat, conditional use review, site improvement plan) Intent: to ensure each phase of the final landscape plan is consistent with the master landscape plan for the development and to illustrate the specific landscaping details for each phase.

a. Describe the design intention and how the proposal is consistent with the preliminary landscape package.

b. The final landscape package must be on a separate page from the final plat map and should be included with the final open space and ecological characterization plan if it can be clearly illustrated. The scale shall not greater than 1"=50'.

c. Information required in the package is listed in the table that follows (a "Y" indicates a need to submit):

1. Cover Sheet			
Information Required	*Concept*	*Preliminary*	*Final*
Project Title	Y	Y	Y
Preparation date and issue/revision/date table	Y	Y	Y
Name, Address, Phone, Fax and email of Preparer	Y	Y	Y
Name, Address, Phone, Fax and email of Owner	Y	Y	Y
Site Vicinity and Location Map	Y	Y	Y
Sheet Index	Y	Y	Y
General Landscape Design Intent Statement including the general character and location of proposed landscaping and open space and how it meets the purpose of these regulations	Y	Y	Y
WaterWise Intent Statement	Y	Y	Y
Water Budget Worksheet	Y	Y	Y
Soils Analysis and Proposed Soils Amendments* *(see note at end of chart)*			Y*
Signature block for Landscape Package Approval			Y
Signature block for Certification of Substantial Completion			Y

2. Grading and Drainage Plan Sheet			
Information Required	*Concept*	*Preliminary*	*Final*
Scale, north arrow, site boundary including adjacent property lines and public street names	Y	Y	Y
Existing and proposed adjacent uses.	Y	Y	Y
Existing and proposed private driveways, parking lots, service areas walkways, and other paved areas.	Y	Y	Y
Existing and proposed buildings and structures general location	Y		
Existing natural features including but not limited to rock outcroppings, wetlands or wildlife habitat, trees, shrubs and other vegetation that are to be removed or preserved and method of preservation.		Y	Y

2. Grading and Drainage Plan Sheet			
Information Required	*Concept*	*Preliminary*	*Final*
Existing and proposed 100-year flood limits.		Y	Y
Existing and proposed utilities and easements			Y
Existing and proposed pools, ponds, water features, fences, and retaining walls.		Y	Y
Limits of proposed site disturbance		Y	Y
Existing and proposed contours at a two foot (2') (min.) contour interval.		Y	Y
Existing and proposed drainage features such as culverts, drain inlets, swales, stormwater detention areas, with drainage patterns indicated by flow line arrows.		Y	Y
Existing and proposed buildings and structure finish floor elevation.			Y
Spot elevations as required to determine high points and low points, positive drainage of paved surfaces, wall heights and other vertical control.			Y

3. Landscape Plan Sheet			
Information Required	*Concept*	*Preliminary*	*Final*
Base plan consisting of information included on the Grading and Drainage Plan.	Y	Y	Y
Limits of proposed site disturbance and a calculation of the total landscaped area.	Y	Y	Y
General landscape improvements with planting symbols clearly drawn to indicate location, and general plant category (deciduous tree, evergreen tree, deciduous shrub, evergreen shrub, groundcovers, etc.).	Y	Y	
Legend of plant category symbols keyed to general plant material schedule indicating quantities of each plant category and a listing of plant species included in each category. Plant species shall be labeled and grouped by their respective hydrozone rating (High, Moderate, Low, or Very Low).		Y	
Typical detail drawings at 1"=20' to illustrate perimeter treatment, buffering, typical front yard, and any special treatment areas on the site		Y	

All hydrozone boundaries and total area within each hydrozone with each hydrozone clearly labeled High, Moderate, Low, or Very Low.		Y	Y
3. Landscape Plan Sheet			
Information Required	*Concept*	*Preliminary*	*Final*
Detailed landscape improvements with planting symbols clearly drawn to indicate each plant (deciduous tree, evergreen tree, deciduous shrub, evergreen shrub, groundcovers, etc.).			Y
Detailed plant material schedule with abbreviation identification key, quantity of each plant, botanical name, common name, hydrozone rating (High, Moderate, Low, or Very Low), plant/container size, spacing and notes.			Y
Define areas to be considered open space and if they will be public or private. Indicate how open space will be maintained including: erosion control, revegetation, and weed management both during and after construction.			Y
Plant installation, mulching, tree staking, and any other applicable planting and installation details.			Y
Soil preparation details including instructions to scarify planting pit bottom and sides and surface ground planes to promote root penetration in compacted soils			Y
Protection of existing plant and other site features to remain.			Y

4. Irrigation Plan Sheet			
Information Required	*Concept*	*Preliminary*	*Final*
The irrigation plan shall be prepared using the Landscape Plan as a base sheet.			Y
Irrigation systems shall be designed to be consistent with Landscape Plan hydrozones.			Y
Accurate and clear identification of location and size of separate water meters for the landscape.			Y
Accurate and clear identification of the location, type, and size of all components of the irrigation system, including automatic controllers, main and lateral lines, valves, sprinkler heads, moisture sensing devices, rain switches, quick couplers, and backflow prevention devices.			Y

Accurate and clear identification of static water pressure at the point of connection to the public water supply.			Y
Accurate and clear identification of flow rate (gallons per minute), application rate (inches per hour), and design operating pressure (psi) for each station.			Y
Irrigation system equipment and installation details			Y
Monthly Irrigation Schedules for: ▪ Plant Establishment Period ▪ Established Landscape ▪ Any Temporarily Irrigated Landscape			Y
Irrigation System Audit Schedule (dates for Audits every 5 years following construction)			Y

*In circumstances where it is difficult to have a soils analysis completed by the final approval stage, the municipality may choose to sign off on the project with the condition that the soil analysis be conducted prior to building permit stage or other acceptable stage in the approval process.

Section 5. Appendices

Appendix A. Calculating a Water Budget

A Water Budget is the target amount of water a landowner should use in a typical watering season. This target provides simple-to-achieve, realistic goals for landscape irrigation. Water Budgeting focuses less on watering time limits, and is more concerned with a user's water allotment and reducing over-watering. This form can help any user create a target Water Budget from which to work.

The information below will help guide you through the Water Budget Worksheet on the following page.

Step 1. ET Reference Location:

Because climate conditions vary throughout Colorado, the rate at which water evaporates (evaporation) and the rate at which plants use water (transpiration) varies in different areas of the state. Based on those climatic differences, it is important to identify the general Evapo-Transpiration (ET) Reference Locations in which you are located. The four largest regions can be categorized as: Denver, Colorado Springs, Grand Junction and Pueblo.

Due to variability in plant water requirements due to location of the plant on a site, a range of hydrozone categories has been shown for many plants. For purposes of calculating the water budget for each hydrozone, the lowest hydrozone category for each plant shall be used.

Step 2. Gallons of Water Needed by Plant Category:

Different plants have different water needs. A plant list that identifies the water needs of landscape plants (High, Moderate, Low, Very Low) is included in Section Three of the Best Practices Manual. The ET Rates are provided on the worksheet, and will need to be applied in the calculations in Step 4 below.

Step 3. Irrigation Areas (zones) based on Plant Water Need Category:

Both automatic irrigation systems and hand-placed yard sprinklers deliver water to plants by watering areas or "zones", and have set watering amounts determined by you, the user. If you have High water need plants within Low or Very Low water plant groupings, the entire area must be considered a High-water area and irrigated as such; however some plants may be over-watered if this occurs. The area of each watering zone can be determined by physically measuring the zone, and multiplying Length (in feet) by Width (in feet). The resulting areas (in square feet, or S.F.) can be entered in Step 4 below.

Step 4. Water-Use Calculations:

Fill in the blanks with area and water need per zone. For example, in the Denver region you might have an area of 300 S.F. in a High Water Zone that would require 20 gallons of water per S.F. After multiplying you would find that area requires 6,000 gallons of water per season.

After calculating the irrigation needs of all areas, determine your average overall water needs per season. To do this, add the total gallons needed for all zones, and divide by the total Square Footage for all zones. The average for the overall site needs to be no more than 15 gallons per S.F. per season. If your average is more than this, you might consider modifying your planting layout to create more Low/Very Low Water Zones that would balance your High/Moderate Water Zones, and reduce over-watering.

Appendix B. Water Budget Worksheet

1. ET Reference Location:

Identify the general Evapo-Transpiration (ET) Reference Location in which you are located. The four largest regions are listed below and include surrounding metropolitan areas:

__Denver __Colorado Springs __Grand Junction __Pueblo

2. Gallons of Water Needed by Plant Category:

Determine the water needs of the various plants in your design. A plant list that identifies water needs (High, Moderate, Low, Very Low) is included in Section Three of the Best Practices Manual.

Plant Water Need Category		Gallons of Water used (ET Rate)*
H =	**High water plants**	(20 gallons/SF/season -- Denver)
M =	**Moderate water plants**	(10 gallons/SF/season -- Denver)
L =	**Low water plants**	(0-3 gallons/SF/season -- Denver)
VL =	**Very Low water plants**	(no irrigation needed; typical rainfall is sufficient)

The ET Rates for regions other than Denver are not yet accurate. One might assume that the ETR for Colorado Springs is 10% less than Denver's, and those for Grand Junction and Pueblo may be as much as 25% higher than Denver's.

3. Irrigation Areas (zones) based on Plant Water Need Category:

Identify each zone requiring irrigation, and calculate the area (in square feet) of each zone. If plants are already installed and/or not grouped together by water need, pick the highest water need category included in each zone.

4. Water-Use Calculations:

HIGH WATER ZONES: _____S.F. x (_____ gals./S.F.) =_____gals / season

MODERATE WATER ZONES: _____S.F. x (_____ gals. /S.F.) =_____gals / season

LOW WATER ZONES: _____S.F. x (_____ gals./S.F.) =_____gals / season

VERY LOW WATER ZONES: _____S.F. x (_____ gals./S.F.) =_____gals / season

TOTAL gallons needed by ALL ZONES: =_____gals / season

TOTAL Square Feet (S.F.) of ALL ZONES: =_____S.F.

***AVERAGE GALS./S.F./SEASON, ALL ZONES:** Total Gals / Total SF **=_____gals / season**

**The average needs to be a maximum of 15 gals. / S.F. / season.*

Appendix C. Plant Lists with Hydrozone Categories

The Four Hydrozones – WaterWise Plant Groupings

The key to WaterWise landscaping is to arrange plants in appropriate locations and not to interplant them with others that have very different, lower water requirements. This grouping of plants into "hydrozones" is based on their water requirements, and allows them to be irrigated efficiently. The following list shows how to group plants based on their water needs.

High Water need
example: Bluegrass turf – always wet at the surface
uses 18-20 gals./ S.F./season = 3 waterings per week totaling 5 inches (in July)

Moderate Water need
example: turf-type Tall Fescue – ½ the water of Bluegrass turf
uses 10 gals./S.F./ season = ¾ inches of water, once per week

Low Water need
example: Buffalograss turf – needs rain and occasional watering
uses 0-3 gals./S.F./season = ½ inch of water per 2 weeks, optional

Very Low Water need
example: too dry for any turf grass (drier than Denver)
no irrigation required

Colorado WaterWise Plant List Summary

1. Shrubs (Deciduous, Rocky Mountain Natives)
2. Shrubs (Deciduous, Introduced to the region)
3. Trees (Deciduous, Rocky Mountain Natives)
4. Trees (Deciduous, Introduced to the region)
5. Evergreens (Coniferous Trees)
6. Evergreens (Coniferous Shrubs)
7. Evergreens (Non-coniferous)
8. Vines
9. Groundcovers (Including turf & meadow grasses)
10. Selected Perennials

The complete Plant Lists are provided in the accompanying document: WaterWise Landscaping Best Practices Manual.

Appendix D. Natural Areas and Native Plant Seed Mixes

A. Proactive Multi-Purpose Drainage Design

1. Introducing the Opportunity

The Front Range prairie is frequently characterized as a rolling grassy landscape folded into meandering wooded drainages. The natural processes that developed this landscape can support the erosion control goals of the drainage design while providing enhanced recreational open space and habitat value. Proactively planned multipurpose drainage design can deliver these goals while saving installation costs and maintenance effort by working with the natural processes.

2. Natural Landscape and Generative Processes

Expanding Front Range developments are covering upland prairies with homes and roads, but the regional landscape can still be seen in the natural drainages. The fundamental character of these drainage areas is defined by the distribution of the thickets of woody species. Wild Plum, Chokecherry, Golden Currant, Snowberry, Sandbar willow and Three-leaf sumac are scattered along the native drainages among occasional towering Plains cottonwoods and the smaller Peach-leaved willows. These species generally occupy the sub-irrigated zones intermediate between the moist central channel areas and the drier upland grasslands.

The natural processes by which woody vegetation expands into upland drainages depend upon a connection to the larger riparian systems below. (Remember: nature abhors a vacuum.) A shallow, young grassy drainage will eventually develop into a deeper, wooded channel. In natural systems normal precipitation cycles coupled with disturbance (grazing, fire, or drought), eventually will lead to erosion and deposition along the grassy channels. In development areas the process is accelerated by the installation of roads or trails, pipelines, and drainage features. Any action that weakens a grassland root system can provide an opening for change.

Seeds of woody species use either wind or wildlife to relocate into disturbed areas in drainages. Native deciduous trees such as the Plain cottonwood and Peach-leaved willow and the smaller Sandbar willows release seeds on the spring winds. When a newly exposed moist soil deposit occurs within a few miles of a well-vegetated river, stream or irrigation ditch, a few seeds from these species will blow into the site. Once a tree has taken root, it will attract birds as well as raccoons, fox, coyote, and skunks. All these animals follow the drainages in their search for food. They eat the plums, chokecherries, currants, snowberries, hawthorns, sumac or any other wild fruits. As they travel, they rest in and under small trees. Seeds are dropped in these locations as the animals move on. Droppings from animals are concentrated near existing trees. The shade and leaf litter beneath the trees provide a moist protected site favorable for establishment.

3. Choices

Engineers design channels for expected run off from the new paved surfaces (roofs and pavement) and existing or proposed vegetation. When a natural channel contains a well-

developed woody plant community, the plans may accommodate the existing vegetation conditions, allowing the woody vegetation to remain. Woody vegetation supports to goals of the drainage program by decreasing peak flows, slowing flow rates, protecting slopes channel edges from excess erosion.

New developments, lacking historic drainage channels, must make decisions related to the establishment of woody vegetation. In a short time, windblown woody species will find suitable sites in new drainages. Heavier seeded plants will eventually follow. If plans do not create channels with adequate flow capacity for the natural process of woody plant establishment, they will predetermine a maintenance program including expensive woody vegetation control. The erosion control and recreational benefits possible from woody vegetation will be diminished in the battle to prevent the inevitable. Channels can be sized to accommodate woody vegetation to improve slope stabilization. If this is done well, the maintenance program will be able to allow the natural process of woody vegetation development to occur. This requires an approach acknowledging and working with the natural processes typical of these riparian corridors.

4. Cost effectiveness

Proactive, multipurpose drainage design is more cost effective than rigorous maintenance designed to remove all woody vegetation. The woody vegetation serves the underlying purpose of slope stability and erosion control, becoming an ally to the drainage program, instead of a problem. Installation costs of woody vegetation become part of the erosion control program. Costly maintenance aimed at prevention or removal of woody vegetation is no longer necessary. Mowing requirements may mostly be eliminated as perennial vegetation becomes well established. Multipurpose corridors can become more diverse, improving in habitat and passive recreational value, over time.

5. Lower water usage

In the interest of developing a more water efficient landscape, multipurpose designed drainages within a development can provide a cool, shady wooded retreat area without requiring installation and maintenance of a supporting irrigation system. Properly selected and placed native woody species can be largely self sufficient once installed.

6. Urban Drainage and Flood Control Support

The Urban Drainage and Flood Control District (UDFCD) encourages the natural channel concept in drainage design (UDFCD's 2001 Urban Storm Drainage Criteria Manual volume 1, MD-3-9). "Open channel planning and design objectives are often best met by using natural-like vegetated channels". Guidance for planning and execution of this concept is included within the Drainage Criteria manual (vol. 2) revegetation section. Native seed mixtures for a variety of soil types as well as recommended uses and installation methods for trees and shrubs within drainage designs, are included.

7. Success

During the spring of the drought year of 2002, a number of drainage improvement projects were installed. Native woody plantings of trees and shrubs were successfully established in spite of limited or no irrigation. Marcy Gulch at Highlands Ranch, Niver

Creek in Thornton, Cottonwood Creek in Greenwood Village, and Lilly Gulch in Littleton were successfully established in spite of many days of unseasonably hot dry conditions.

B. Native Seed Mixes

1. Colorado Native Seed Mix Summary

a. Short Grass Prairie (grasses & wildflowers)
b. Mixed Grass Prairie (grasses & wildflowers)
c. Tall Grass Prairie (grasses & wildflowers)
d. Moist or Wetland Soils (grasses & wildflowers)
e. Sandy Loam Soils (grasses & wildflowers)
f. Clay Loam Soils (grasses & wildflowers)
g. Select Shrubs and Trees for natural areas

The complete Native Seed lists are provided in the accompanying document: WaterWise Landscaping Best Practices Manual.

Appendix E. CERTIFICATE OF SUBSTANTIAL COMPLETION (Sample Form)

Final field observation --a person acceptable to the (city /county of ___) shall conduct a final field observation and shall provide a certificate of substantial completion to the city or county. The certificate shall specifically indicate that plants were installed as specified, that the irrigation system was installed as designed, and that an irrigation audit has been performed, along with a list of any observed deficiencies.

Irrigation Audit --upon completing the installation of the landscaping, and the irrigation system, an irrigation audit shall be conducted by a qualified landscape irrigation auditor according to the Irrigation Association handbook, "Certified Landscape Irrigation Auditor".

The certification shall be accomplished by completing a Certificate of Substantial Completion and delivering it to the city or county, to the retail water supplier, and to the Owner of Record.

Project Site:_____ Project Number:_____
Project Location:_____

CONSERVATION CONCEPT STATEMENT
Briefly describe the planning and design concepts that are intended to accomplish water conservation.

INDEX OF ITEMS SUBMITTED (check items submitted & completed satisfactorily)

1. Landscape Documentation Packet cover sheet & statement of conservation concept
2. Calculation of an Annual Water Budget (an estimate of annual water use for each hydrozone)
3. Landscape Plan
4. Irrigation Plan
5. Landscape Maintenance Schedule
6. Landscape Irrigation Audit Schedule
7. Grading Plan
8. Soil Analysis
9, Certification of Completion (see following page)

POST-INSTALLATION INSPECTION (Check items to indicate successful completion)

_____ A. Plants installed as specified
_____ B. Irrigation system installed as designed
_____ C. Minimal run off or overspray
_____ D. Dual distribution system for recycled water (where appropriate)
_____ E. Landscape Irrigation Audit performed
_____ F. Project submittal package and a copy of this certification has been provided to owner/manager local water agency

Appendix E. CERTIFICATE OF SUBSTANTIAL COMPLETION
(Sample Form - Continued)

Comments:

” **POST INSTALLATION INSPECTION:**
I/we certify that work has been installed in accordance with the contract documents.

_____
City/county approved inspector (signature and date)

” LANDSCAPE CONTRACTOR:
I/we certify that work has been installed in accordance with the contract documents

_____
Contractor (Signature, Date, State License Number)

” **LANDSCAPE DESIGNER/LANDSCAPE ARCHITECT:**
I/we certify that based upon periodic site observations, the work has been substantially completed in accordance with the Water Efficient Landscape Ordinance and that the landscape planting and irrigation installation conform with the approved plans and specifications.

_____
Landscape Designer/Landscape Architect (Signature, Date)

” **OWNER:**
I/we certify that I/we have received all of the contract documents and that it is our responsibility to see that the project is maintained in accordance with the contract documents.

_____
Owner (Signature, Date)

Appendix F. Title: Certified Landscape Irrigation Auditor

By: The Irrigation Association Certification Board
Focus: CLIA, Certified Landscape Irrigation Auditor
http://www.irrigation.org/bookstore/bookstore.asp

This handbook was originally produced as part of the Landscape Water Management Program developed for the California Department of Water Resources, Water Conservation Office, Sacramento, CA, by California Polytechnic, ITRC, San Luis Obispo. It has been revised and edited by the Certification Board of Governors of the Irrigation Association for use in training individuals who wish to become an IA Certified Landscape Irrigation Auditor. The handbook offers step-by-step guidance for performing landscape irrigation audits and irrigation scheduling for large turf sites such as parks and golf courses.

Appendix G. Water Check Program

Water check programs are recommended at a means of evaluating irrigation system efficiency. The information below is provided as a resource for Colorado municipalities considering offering similar educational information.

Water Checks are available to residents in Salt Lake, Utah, Duchesne, Uinta, Wasatch and Juab Counties FREE of charge. Jordan Valley Water Conservancy District and its Member Agencies, Central Utah Water Conservancy District, Salt Lake Department of Public Utilities, Sandy City, Murray City have partnered together by entering into a public service contract with Utah State University Extension. These water agencies pay for the Water Checks to be performed by horticulture students who are earning internship credits over the summer. These students are valuable in educating the public in a useful, hands-on approach.

A typical Water Check lasts 60-90 minutes. During the Water Check, sprinkler output and efficiency, soil type, and hose and sprinkler pressure are calculated. The end result for the resident is a customized, water-efficient irrigation schedule.

Model Landscape Ordinance

Erie & Lafayette, Colorado

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