



SUSTAINABLE LANDSCAPE TEMPLATES MAINTENANCE MANUAL

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STATEMENT OF INTENT

- + The Sustainable Landscape Templates present a new paradigm in landscape application which is to no longer specify traditional bluegrass sod and exotic plants that demand higher water and maintenance.
- + The goals of the Sustainable Landscape Templates include:
 - Sustainable water use
 - Fire-smart, climate adaptive and pollinator friendly designs
 - Consideration of installation costs for suitability to a wide range of users
 - Consideration of maintenance practices that are attainable
- + This manual is meant to support the functionality of the water-efficient landscape and successful long-term function of the Landscape Templates.
- + Outlines basic landscaping practices
 - in consideration of the Colorado climate.
 - in conjunction with the recommended best practices of [CSU Extension](#) and [Western Best Practices](#).

ACKNOWLEDGEMENT

The Sustainable Landscape Templates team from Northern Water and Norris Design acknowledge the preceding work of the [Sonoma-Marín Saving Water Partnership](#) with much appreciation. We recognize the groundwork laid out for this type of resource by the people and agencies guiding water utilities in California. Thank you for granting us use of the background knowledge built into the Landscape Design Templates to reference as a resource and guide.



SOIL PREPARATION

Soil is the most important first step to a healthy, thriving landscape. Healthy soil is made up of organic and inorganic materials, including millions of living organisms. For this reason, it is important to treat your soil well by avoiding over-compaction and nutrient deficiency.

General Considerations

- + For improved landscape plant growth of introduced plant species, Colorado soils should generally be amended with organic material. Proper amendments will improve drainage, retain moisture, and, as a result, conserve water.
- + Fire impacted sites may necessitate further amendment and care due to potentially contaminated soil.
- + Native and low water adapted plants may not need amended soil. Consider minimizing use of compost or other amendments in landscape areas where these types of plants are planned.
- + To support sustainable and environmentally conscious practices, it is recommended to avoid chemical fertilizers and herbicides. These can eliminate healthy soil organisms and limit nutrient uptake by plants.

Recommended Steps for Soil Management

- 1) Testing of Site Soil
 - Testing your soil for pH level and nutrient content is a strongly recommended first step. This will provide the information needed to make decisions about soil amendment with organic compost and fertilizers. Soil samples may be sent to the CSU Soils Lab for testing. See included resources.
- 2) Site Preparation
 - Locate underground utilities prior to commencing work. Anticipate this step in the overall project timing. Some utility providers can take longer to respond than others. See included resources.
- 3) Weed Control & Surface Preparation
 - Remove all weeds prior to amending soil. Contain any potential flower/seed heads from weeds and throw away.
 - In beds where perennials and smaller plants will be planted, use a digging fork to remove rocks larger than 1/2" and to break up large dirt clods. Avoid tilling soil when possible as this can kill beneficial organisms living in your soil. Tilling may be necessary on sites where recent construction with heavy equipment was used.
 - Be sure not to work overly wet soils as this can lead to excessive compaction.
 - To aid in weed suppression, consider adding a 4" thick layer of squeegee rock, dried leaves, or wood mulch to the soil surface after planting. Do not add mulch right up to the plant base/stems to allow for necessary airflow.
 - Take measures to control and prevent soil erosion, blowing soil, and accumulation of wind-deposited material during landscape site work.
- 4) Soil Amendment
 - If amendments are recommended based on results of soil tests and plant type, evenly distribute soil amendments at the determined rate for the specific landscape application.
 - Soil amendments may be organic composts or specific nutrients depending on soil and plant needs.
 - Native plants and native planting areas need minimal soil amendments, if any.
 - The Sustainable Landscape Templates detail the use of squeegee (small 3/8" minus diameter rock) in planting holes for drainage. Soils that are heavy in clay content may be improved for native shrub



bed plantings by adding squeegee at a 1:3 ratio – one part aggregate to three parts native soil.

5) Fine Grading

- The top layer of soil should be finely graded to ensure positive drainage away from structures and to mitigate ponding during rain events or overhead irrigation. Complete fine grading of areas prior to planting.
- Keep in mind that finished surfaces will be higher than the soil level once planted. For example, sodded areas will be roughly 1" higher when sod is added, and planting beds will be roughly 4" higher once mulch is added. Allow for these additional depths when adjacent to patios, walks, stepping stones, or other site features.

Resources

Preparing Your Low Water Planting Area:

- https://www.botanicgardens.org/sites/default/files/file/2023-03/WesternBestPracticesFlyer_1.pdf

Colorado State University Soil Sampling Resource:

- <https://extension.colostate.edu/topic-areas/yard-garden/choosing-a-soil-amendment/>
- <https://agsci.colostate.edu/soiltestinglab/>

Utility Location Service:

- <https://call811.com/811-In-Your-State>

PLANT SELECTION

- + Plants should be selected and located based on their hydrozone. A hydrozone is the grouping of plants with similar water needs, sun exposure, and soil conditions. The following are presented in the Sustainable Landscape Templates:
 - **LOW WATER USE** - Designed to be adaptable with minimal to no additional

water after establishment. Predominantly native plant selection.

- **MODERATE WATER USE** - After establishment, plants will still require supplemental water during growing season. Moderate water use planting areas can also include plants adapted to the local climate.
- **HIGH WATER USE** - High water plants should be limited to specific functional uses such as vegetable gardening. This can include annual flowers in planter pots or small in-ground bed areas. High water use plants are used sparingly in the template designs.

- + In addition to considering the hydrozone of specific plants, also consider plant location. Check individual plant light/exposure requirements when selecting locations.
- + The north side of structures is generally the shadiest, and the south side generally has the most exposure to sun, heat reflection, and dry conditions. The afternoon sun on the west side will generally be more intense than the morning sun on the east side. Take time to observe your site at different times of the day when finalizing locations.
- + Be mindful of mature plant size when choosing locations. Special consideration should be given to placements adjacent to permanent site features such as homes, power lines, property lines and any other hardscape features.
- + Planting a deciduous tree in front of south-facing window can provide additional benefits as it will provide shade for the home in the summer, yet will allow sun into the home during the winter when the leaves have fallen.
- + In areas where soil erosion is a concern, such as on a slope, select plants that grow low and spread, as they will aid in soil stability as their root system spreads laterally. Plants that are known to establish deep roots are also a good choice for stabilizing soil.



- + Consider native plants whenever possible. They often require less water and are better for local pollinators as they have adapted alongside each other, and oftentimes they are more resilient than exotic plants.

Resources

Colorado Native Plant Society - For finding information about where to buy native plants and how to use them in your yard.

- <https://www.conps.org/>

PLANTING BASICS

- + Spring and fall are generally the best times to plant in our region, taking care to avoid late spring or early fall frosts. Plants should have six weeks to establish healthy roots before our first frost of the season. Regardless of when you plant, ensure plants have had a chance to acclimate to current outdoor temperatures and exposures. Do this carefully during high heat situations, being especially mindful that plants in containers will get hotter and dry out quicker than when planted in the ground. Acclimating new plants can take several days at minimum if temperatures are extreme.
- + Observe the root ball of each plant when removed from its container. If roots are circling or stuck to each other, gently loosen with your fingers.
- + For all plants, whether a small perennial or a tree, dig each hole twice as wide and the same depth as the rootball.
- + Immediately water plant deeply after planting, including the area beyond the rootball if the surrounding soil is dry.
- + New plantings require additional care. Water deeply, preferably in the morning, and observe them on particularly hot days for signs of stress. Be mindful not to over water, especially for low hydrozone plants. A deep watering in the morning will help ensure even the deepest

roots have moisture to last them through the day.

- + Be vigilant about removing any weeds that pop up in newly landscaped areas. Pulling them when small is significantly easier and avoids the possibility of them spreading seed.
- + When planting single-trunk deciduous trees, it is advisable to brace them in place using a wide nylon webbing material (min. 1" wide) secured to two wooden or metal posts. Staking keep the new tree in proper upright alignment and prevents the tree from blowing over. It is advised that trees are not staked too tightly, as allowing the tree to sway *minimally* in light winds will encourage healthier root development. Use care with trees that have scaly bark or powdery bark, such as Aspen, as you do not want the nylon webbing to rub this off. New trees should be staked for one year, but not longer than two years.
 - Reference the Template plan files for a detail drawing.
- + Evergreen trees can be more susceptible to blowing over in wind due to their dense structure and should be staked for the first two years.
- + Always remove all tags, tape, and straps from tree trunks and branches Any material left on a tree can bite into the bark as it grows and cause girdling, which can lead to the death of the branch and tree.

Resources

Less Turf = Greener Landscape

- <https://www.youtube.com/watch?v=cqBTJ6MGUY>

Gardening with Colorado Native Plants

- <https://www.youtube.com/watch?v=P8hEulqxnw>



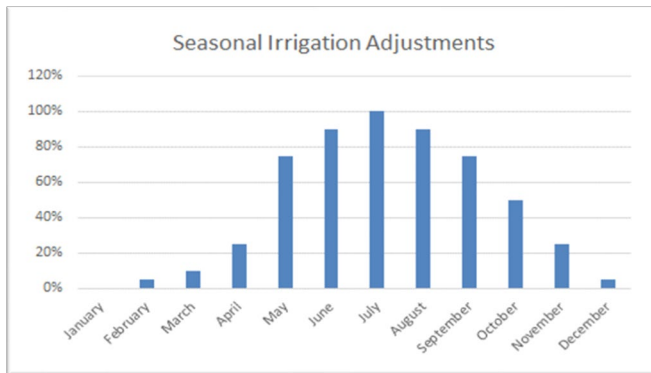
IRRIGATION MANAGEMENT AND MAINTENANCE

General Considerations

- + In Colorado, a regularly maintained irrigation system is a critical element to ensuring long term soil & plant health as well as the conservation of water resources.
- + Once established, native plant material can thrive primarily on natural precipitation. During low moisture years be vigilant and water stressed plants deeply. Non-native plant material will require supplemental irrigation for the specific water needs of the plant species.

Irrigation Scheduling Method

- + Creating a Water Budget; the typical Colorado irrigation season runs between mid-April to mid-October with peak watering requirements in July (100%), each respective month is expressed as a percentage of July (i.e. May/Sept. 60-65%, June/Aug. 75-85%) dependent on site specifics.



- + Develop run times with consideration to the seasonal irrigation adjustments from above and the site-specific items in the table below:
- + Evapotranspiration (ET) is the total amount of water loss from plant material into the atmosphere through evaporation and plant transpiration and can be expressed as the target amount of water to apply. See resources on next page for collecting ET data.
- + Precipitation Rate (PR) is the average depth of water accumulated in an area over a period of

time and is commonly expressed in inches per hour. $PR = (96.3 \times \text{Zone GPM}) / \text{Area in SF}$

Controller ID/Name			
Station #			
Item Description	Source		Units
A Target amount of water to apply	management choice		inches
B Precipitation rate	gross or net		inches per hour
C Distribution uniformity (DU _v)	audit or estimate		decimal
D Scheduling multiplier (SM)	table		
Scheduling Parameters			
E Ideal run time (lower boundary)	$\frac{A \times 60}{B}$		minutes
F Upper run time boundary	E x D		minutes
G Recommended run time	management choice		minutes

- + Distribution Uniformity (DU) is the measurement for how evenly the water is applied across the target plant material and is expressed in a percentage or decimal form (i.e. 75% or 0.75).
- + Scheduling multiplier (SM) is a variable applied to the total zone run time to compensate for the lack of uniformity from an irrigation system and is expressed in decimal form. (i.e. 10min runtime with SM of 1.5 = 15min total run time). $SM = 1 / DU$

Type of Zone	Excellent (%)	Very Good (%)	Good (%)	Fair (%)	Poor (%)
Fixed Spray	75	65	55	50	40
Rotor/Rotary	80	70	65	60	50

Tree Irrigation

- + Trees should be irrigated independently from other (smaller) plant material as trees require a reduced frequency of irrigation cycles and should be watered for longer durations as deep watering encourages extensive rooting. This approach allows for the landscape's most essential long-term investment to be preserved during periods of extreme drought.
- + During the establishment period, irrigation should be applied to the perimeter of the root-ball to encourage roots to spread outward in addition to downward. As trees mature, the target watering area should extend to the perimeter of the tree canopy.



Controller Programming

- + Operation of the irrigation system should typically not be programmed to operate between the hours of 10am and 6pm due to higher rates of evaporation during the heat of the day and shall follow all ordinances set forth by the local jurisdiction including watering time restrictions, equipment standards, and maintenance practices.
- + Seasonal adjustments should be made to the duration and frequency of irrigation to account for the actual water needs and life-cycle requirements of the plant material.
- + As plant material matures, deeper yet more infrequent watering is encouraged to extend root depths. Encouraging deeper roots will improve plant material's resistance to drought.
- + Cycle & Soak is the process of applying the required water in multiple short cycles to prevent runoff and allow for greater soil infiltration rate. To determine the length of cycles, record the time each zone runs until pooling or runoff is observed, divide this by the total zone runtime to obtain the number of cycles required. Provide 30-60 minutes between cycles.

Seasonal Maintenance – Spring Startup

1. Exercise and open ball valve #1, close all test cocks aside from the last (to be left open at 45-degree angle) and close ball valve #2 to prevent any air from being trapped.
2. Slowly turn on the main water supply to irrigation system, followed by opening each ball valve on the backflow prevention device to pressurize the irrigation system (**Opening the ball valves too quickly can result in "water hammer" and damage to the system**).
3. Switch the controller position from OFF to RUN.
4. Activate any weather/rain sensors through the controller programming, verify all wiring connections and/or batteries are in working

condition, and devices are cleaned/tuned for operation.

5. Operate each station electronically from the controller in sequence and observe the operation of each emission device (i.e. sprinkler, dripline, etc.) adjusting nozzle angles and ensuring there are not any leaks, breaks, or malfunctions that need to be repaired/replaced.
6. Adjust any pressure reducing valves (PRV) and flow control valves across the system to optimize system performance. Insufficient or excess pressure can drastically impact the operation of system. Note: Time of day can affect water pressure.

Seasonal Maintenance – Growing Season

1. Ensure sprinklers are installed perpendicular to soil surface, rise above planting material, nozzles are not clogged, and arcs/radius are adjusted to apply water to the landscape only. Note: Regular mowing/maintenance will often alter the placement and position of irrigation equipment throughout the season.
2. Regularly examine for damaged, missing, or leaking driplines/emitters, it is common for this equipment to be damaged by foot traffic or animals across the landscape.
3. Remove and clean drip valve filters seasonally (or as required).
4. Check the soil and planting material for signs of over-watering/under-watering, such as but not limited to dried plant stems, leaves, or buds, areas with heavy weeds, or very wet/dry soil.
5. Repair and/or replace any defective hardware to match existing equipment as in accordance with the original design. Test any repairs or modifications of equipment once completed.
6. Adjust positioning of equipment as plant material matures; trimming or removal of plant material may be required to maintain system performance.



Seasonal maintenance - Winterization

1. Manually clean all drip valve filter screens and remove all dripline end caps; flush water through until a clear stream is observed.
2. Shut off main water supply to the irrigation system and open manual drain valves (if applicable) to passively evacuate water from mainline. Close once complete.
3. Exercise all ball valves and test cocks of the backflow prevention device and in the half-way open position for the winter (completely close the last downstream ball valve for now).
4. Locate and connect an air compressor to the irrigation system 'blow-out' port downstream of the backflow prevention unit or at a quick coupling valve (compressed air should never be blown through a backflow preventer). Set the pressure regulator to a max of 50 PSI (or approximately 50% of operating pressure), with 50-80 CFM recommended. Insufficient pressure will not evacuate all water and excessive pressure can lead to damage of irrigation components (the compressor should never be run without an outlet, valve, or drain open to allow air to escape).
5. Operate each individual station in sequence until water no longer is discharged from ALL of the emission devices (process may need to be repeated if using smaller air compressors).
6. Once all water has been evacuated, open the last downstream ball valve halfway.
7. Switch the controller position from RUN to OFF.

Resources

Irrigation Association Tools & Calculators

- <https://www.irrigation.org/IA/Resources/Tools-Calculators/IA/Resources/Tools->

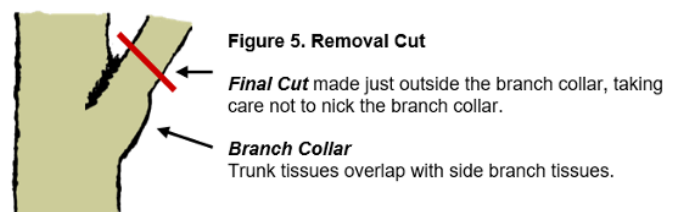
Collecting ET Data

- <https://etdata.org/>
- <https://coagmet.colostate.edu/>

PLANT CARE & PRUNING

Trees

- + Deciduous trees are to be pruned during dormant season, in late winter or early spring, prior to buds opening. Pruning young trees and shrubs just after flowering should be avoided when possible. Pruning is generally not necessary for the first two to three years, which will ensure a healthy, natural structure. There are certain species that benefit from being pruned after flowering and therefore it is always recommended to research the specific needs of each plant species.
- + Pruning to remove dead, broken, insect-ridden or diseased branches can be done any time of year, especially in the case of infestation or disease, which should be removed as soon as possible.
- + Intention should be given to not make trees lopsided, nor to "top" trees.
- + Prune all evergreens, except pine, prior to new tip development in the spring. Avoid shearing evergreens to shape as this disrupts their natural shape.
- + Prune outside of the branch collar so as not to cut too close to the trunk.



Shrubs

- + Some shrubs bud on the previous year's branching, and some bud on the current year's branching. Pruning those that flower on previous year's growth after spring flowering. Prune those that bud on current year's growth prior to budding, in late winter or early spring. Look up shrubs by species to determine their specific growth habits and needs.



Winter Care

- + Trees and woody plants may require supplemental watering during winter for the first one to two growing seasons. This is particularly important for evergreens when significant snow is absent.
- + Consider giving mature trees a slow deep watering once per month when temperatures are above 40 degrees.
- + The trunks of young, smooth-barked deciduous trees should be wrapped in fall for the first two years minimum to protect from winter sun damage. Wrap should be removed in early spring, generally at the beginning of April. Wrap the trunks from the bottom of the lowest branch to the ground. Avoid wrapping trees that have delicate, exfoliating (peeling), or powdery bark (such as aspen or birch).
- + Protect all plants through winter by adding about 3-4" of mulch around the base; keep mulch about 2-3" from trunk of trees and base of shrubs to allow for airflow. Fallen leaves from deciduous trees can be used as mulch if desired. This may not be an option in areas where there is risk of wildfire.
- + All trees are susceptible to branch breakage during snow events. Be mindful of your trees and gently shake snow from the branches as needed.

Ornamental Grass & Perennials

- + Timing of pruning is a primary consideration for these types of plants. Two general cases include:
- + A fire-smart focused treatment prioritizes earlier removal of dead material especially near structures to limit fuels.
- + A pollinator habitat-focused treatment prioritizes leaving dormant growth until spring temperatures are consistently above 50 degrees to benefit nesting pollinators and beneficial insects.
- + Ornamental grasses benefit from being pruned in late fall their first year after planting. This

allows the plant to focus energy on its roots prior to dormancy. Do not prune shorter than 4-6" above ground (top of rootball), depending on the type and maturity (size) of the plant. Each subsequent year, ornamental grasses should be pruned in spring when temperatures are consistently reaching 50 degrees. Some grasses collapse after heavy snow events and may not stand back up. If this is a case and you wish to clean this up by pruning, it will not damage the plant.

- + During winter, ornamental grasses provide aesthetic interest and can be beneficial for wildlife habitat. If you must cut them back for fire or other reasons, consider leaving stands of grasses that will not pose a threat to your home for the benefit of pollinators.
- + After perennials flower, the seed heads can be removed to encourage new growth instead of seed production. However, seeds can be beneficial for wildlife and can be left to fall naturally if desired.

Resources

Pruning Evergreen Plants

- <https://mortonarb.org/plant-and-protect/tree-plant-care/plant-care-resources/pruning-evergreens/>

Pruning Deciduous Plants

- <https://mortonarb.org/plant-and-protect/tree-plant-care/plant-care-resources/pruning-deciduous-shrubs/>

Pruning Tips

- <https://csfs.colostate.edu/wp-content/uploads/2024/01/Pruning-Cuts.pdf>



FIRE-SMART MAINTENANCE

- + The Landscape Templates take defensible space around homes into consideration by leaving a buffer of 5 feet around the perimeter unplanted. As plants outside of this buffer mature, it is important to maintain this 5-foot buffer for defensible space.
- + Maintain plants in small, irregular clusters or islands. This limits the potential of fire spreading from plant to plant solely due to their proximity.
- + Tree crowns at maturity should not be within 10 feet of the home.
- + Keep a clearance between tree branches and understory plants of 8-10 feet. Plant low groundcovers under trees to avoid creating ladder fuels to the lower branches.
- + Native grass areas can ignite easily and burn rapidly. Low-grow seed mixes are recommended when near structures or other potential fuels.
- + In defensible space Zone 2 keep native grass areas watered and mowed more regularly as a preventative measure to fuel build-up.
- + Regular management of weeds is important as they pose significant flammability risks, especially when dead.
- + Manual weeding can be reduced by using dense, low-flammability groundcovers to crowd them out.
- + Adding mulch to the plant bed, particularly inorganic mulch, can help conserve moisture and reduce weeds. Gravel, rock, and squeegee mulch are encouraged; do not use man-made inorganic mulches such as recycled rubber.
- + If using wood mulch, locate this in beds that are away from the home and are surrounded by non-flammable materials, such as squeegee, rock, or hardscapes.
- + Avoid all junipers and large evergreen trees and shrubs within 30 feet of the home.

NATIVE PLANTS AND HABITAT GARDENING

- + Promoting pollinator habitat in residential landscapes is an opportunity to make a powerful impact by benefiting biodiversity and sustainability, while supporting and safeguarding native pollinator populations.
- + Pollinator friendly planting can require less maintenance, reduce water demand, and connect pollinator habitats in the greater local landscape.
- + Weed by hand to prevent unintended harm to pollinators and wildlife by chemicals.
- + To create new planting beds for a native pollinator garden, see the following for non-chemical methods of landscape management.
- + Inspect planting beds bi-weekly for weeds and pull by hand as needed.
- + Mechanical means are the preferred method for removal of weeds.
- + Plant densely. If you arrange plants close together, and use low, ground-covering plants to fill in around them, you reduce the sunlight, moisture, and open soil available to weeds.

NATIVE GRASS AREA MAINTENANCE

Mowing

- + Mowing should include string trimming around fence posts, under fence rails, and wet areas where mowers will cause rutting.
- + Do not mow when areas are too wet to mow without tracking or damage.
- + Select areas to be mowed for control of annual grasses and weeds in spring and early summer.
- + Expect to mow for weed control during the second week of May.
- + Limit mowing outside of that timeframe to allow for grasses to mature with seed head growth and naturalization.



Weed Control

- + Throughout the growing season, weed control of native areas can be performed using a spot treatment method.
- + Do not spray in windy weather. Use extra caution in application of chemicals to prevent overspray onto desired plant material or onto pollinator-friendly plants and habitats.
- + Minimizing mowing to once a year supports healthy grass stand establishment by reducing the sunlight, moisture, and open soil available to weeds.

Overseeding and Re-Seeding

- + Re-seeding areas can be completed using a broadcast method at a rate of 1-2 pounds per square foot.
- + Re-seeding and over-seeding timing is recommended to occur by the third week in June when soil and air temperatures promote warm season grass growth.

Resources

Xerces Society

- https://www.xerces.org/sites/default/files/publications/24-004_Rethinking%20Weed%20Management%20at%20Home.pdf

RAIN GARDENS

- + Rain gardens are planting areas that retain more water from rains, such as catchments, swales, or sometimes areas around downspouts.
- + Retaining water in the landscape stimulates deeper root growth and provides some additional infiltration of stormwater.
- + Intentional landscape features, such as berms or hardscape, can help direct rainwater toward certain areas.
- + Plants should be selected that can tolerate heavier water at times, as well as dry periods if supplemental irrigation will not be available.
- + Rain gardens should not be surrounded by hard surfaces, such as a home or concrete, as this can cause the water to sit for too long, which is not ideal for most plants as well as most hardscapes. Provide overflow paths in open landscape areas away from structures.
- + Rain gardens of any size should also not be installed over septic systems, in leach fields, nor over utility lines.
- + Do not use landscape fabric, toxic inorganic mulches such as recycled rubber, nor chemical herbicides and insecticides in rain gardens.

Dry Stream Beds (Cobble Swales)

- + See the Sustainable Landscape Templates for a detailed drawing reference.
- + These benefit functional drainage where needed and can add to the visual appeal.
- + Use cobble swales in conjunction with rain gardens to move stormwater to the garden basin and away from structures.