



A Field Guide to Practices for Reducing the *Impact of Climate Change*

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What is a Healthy Landscape?

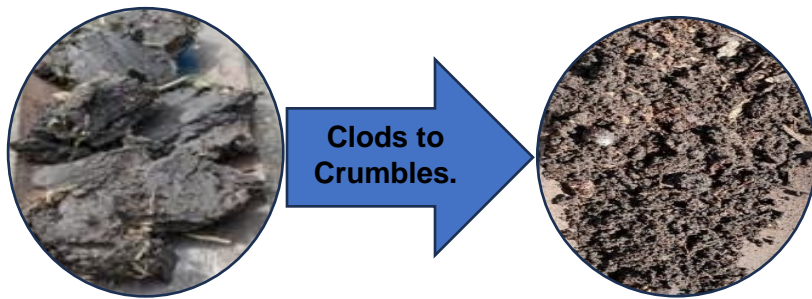
Healthy landscapes can assist in mitigating climate change. They can be attractive and are in balance with the local climate and environment, requiring minimal resources.

A Healthy Landscape will be able to:

- Reduce summertime temperatures,
- Improve the quality of our air and water,
- Reduce stormwater runoff and flooding,
- Reduce pollution in creeks and lakes,
- Improve the health of landscapes,
- Survive droughts better, and
- Promote local pollinating insects and songbirds.

How to Build a Healthy Landscape:

1. Maximize soil cover and allow vegetation to grow taller;
2. Maximize the presence of roots in the soil;
3. Minimize soil and vegetation disturbance, especially soil compaction;
4. Maximize biodiversity of plants and soil organisms;
5. Modify mowing practices to accomplish the above.



The Foundation of a Healthy Landscape

The foundation of a healthy landscape is its soil. Soil is made of particles such as sand, silt and clay with air, water and organic matter (such as dead plant roots, fungi, insects, leaves, etc.) as shown in Figure 1.

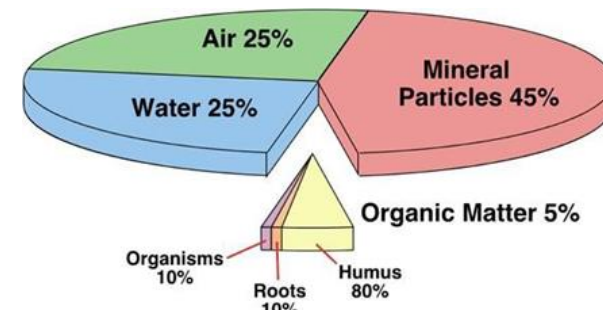


Figure 1: Typical Soil

While all of these parts are important, the soil organic matter provides the greatest benefits to addressing climate change. It feeds the soil microbes that allow soils to remove up to 3 times more pollution from the air than all of the trees and plants growing above ground. Soil organic matter also provides food to plants while increasing the soil's capacity to store rainwater. This water is then made available to plants for their growth, even during droughts. By increasing the soil organic matter, more water can be stored in the ground. In fact, a **1% increase in soil organic matter** can hold an *additional* 20,000 gallons of water per acre and remove an *additional* 29 tons of carbon dioxide from the air, reducing flooding and summer temperatures.

This means that the recommended practices for a Healthy Landscape are designed to increase organic matter and protect the soil.

Mowing/Line Trimming on Non-Irrigated Turf Areas

Proper mowing and line trimming of turf areas is crucial. Heights and frequency are key. Therefore, the supervisor needs to set the mower height and direct when and how mowing operations should proceed. Scalping is to be avoided at all times.

When:

1. Allow turf to reach 5" - 6" high before cutting.
2. Do not cut (with riding mowers) when the soil is wet.
3. Stop or cut at higher heights during droughts.
4. Cut more often during warm/wet weather with a minimum height of 4".
5. Allow mowers to set height first for line trimmers

How:

1. Maintain at 4" height or *more*.
2. Cut no more than 30% at one time.
3. Maintain at 5"-6" during droughts.
4. Avoid mowing in Low Impact Maintenance Areas (LIMA) areas unless directed.
5. Set and use equipment to avoid scalping.
6. Vary mowing patterns to reduce compaction.

Why:

Plants depend on their roots to survive, especially in dry weather, and taller plants have more roots that grow deeper.

Taller vegetation is better able to:

- Slow stormwater to allow the water to soak into the soil.
- Remove pollution from the air and water.
- Prevent soil erosion and weeds.

Remember most of the organic matter is in the topsoil so don't lose it!

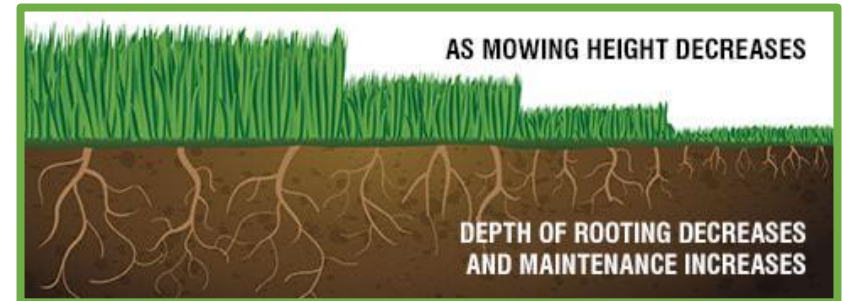


Figure 2 : Higher vegetation protects the soil and plant roots from extreme temperatures and maintains soil moisture while reducing weeds.



Figure 3: Mowing height is too low causing grasses to die, weeds to grow and soil to wash away. Rain cannot enter the soil and will runoff.



Figure 4: Mowing height is sufficient; soil is well covered, weeds are minimum, and rain can soak into the ground.

More on Line Trimming

Line trimming is an important activity in managing turf areas. In fact, it is often the only way to manage difficult areas such as on slopes as seen in Figure 5 and around trees as in Figure 6.

When:

1. On a site, edge first, allowing mowers to set the height for the line trimmers.
2. Line trimmers can be used to remove the tops of plants for a uniform height across a turf area; eliminating the need for mowers, especially during droughts or when the soil is wet.

How:

1. Cut flat turf areas at 4" and slopes at 5-6".
2. Keep the line trimmer head level to prevent scalping.

Why:

1. When the mower sets the height, it is easier for the line trimmer to maintain a uniform height.
2. Soil washes down a slope more easily than on flat land so keeping the vegetation taller will better protect slopes.



Figure 5: Slopes present a challenge; this vegetation has been cut too short increasing soil erosion and allowing weeds to grow.

Line trimming around trees

Line trimming around trees is especially challenging and if done incorrectly, can cause the tree to die such as in Figure 6.

Just behind the outer bark is the tree's water transportation system. When this system is damaged as in Figure 6, the tree cannot transport water from its roots to the leaves causing dieback and death.

For proper line trimming, slant the line trimmer head down and away from the trunk. Keep mowers away from young trees as they have thinner bark and are damaged more easily.

When 30% or more of the bark has been damaged around a tree, it should be replaced.

Maintaining mulch around trees and or using tree trunk guards can assist in reducing damage.



Figure 6 : This young tree died due to trunk damage caused by line trimming and or mowing.

Mulching and Soil Amendments

Mulch is applied to the top of the soil. Mulch can be either organic, like wood chips, or inorganic, like rocks.

A soil amendment such as compost can be mixed into the soil or applied to the surface, and is made of partially decomposed organic matter such as animal manures, biosolids, leaves, green wastes, etc. Soil amendments should be weed free.

When:

1. During the fall season, blow leaves into landscape areas and cover with bark mulch which will reduce labor and provide organic matter to the soil.
2. Mulch around newly planted and even established trees but keep the mulch away from tree trunks.
3. Amend turf areas to increase soil health and fertilize plants.

How:

1. Add 2-3" of mulch to landscape surfaces ensuring the mulch is under and not on plant leaves.
2. Add ½-1" of clean compost to turf area surfaces and landscapes.
3. *Note:* Avoid high nitrogen fertilizers and amendments (greater than 3% nitrogen) to prevent water contamination, especially over the aquifer recharge zone.

Why:

1. Mulch will protect roots, reduce soil summer temperatures, maintain soil moisture and reduce weeds.
2. Organic mulches increase soil organic matter and provide plant nutrients.
3. Avoid sawdust as it will rob nitrogen from the soil during the first year causing landscape plants to suffer.

Proper mulching



Figures 7 & 8 : Avoid mulch against tree trunks; “volcano” mulching leads to bark or trunk rot and promotes “girdling” roots which can kill a tree over time.



Figure 9: Proper mulching around trees will promote stronger and deeper root systems while reducing suckers.

Maintenance in Low Impact Maintenance Areas

Maintaining Low Impact Maintenance Areas (LIMAs) with native grasses and wildflowers (pocket prairies) are excellent ways to build healthy soils. In urban areas, some mowing may be required for appearances or safety. Therefore, a supervisor will direct when and how mowing operations should proceed if needed.

When:

1. If mowing is needed, delay until July; after wildflower plants have seeded and ground nesting birds have matured. If a second mowing is needed, delay until October.
2. Do not mow if soil is wet and mower leaves ruts to prevent compaction.
3. Eliminate or reduce mowing during droughts.

How:

1. When cutting is needed, cut at 5-6" high or more except along walkways for pedestrians, then lower to 4".
2. Remove unwanted vegetation selectively such as with spot treatment or by hand.

Why:

1. Most native grasses have their growing points well above ground level. If cut too low, they will eventually die.
2. Cutting higher will allow the grasses and wildflowers to develop deeper roots so they can survive droughts while continuing to build healthy soils.
3. Unwanted vegetation can often overcome those plants that have been selected for the area.

Other maintenance activities may be required

Areas that are not mowed regularly can be invaded by tree seedlings until well established. Keep area tree-free by **removing** the seedlings. If mowed only, often tree seedlings will continue to grow and become even more difficult to remove. A good plant cover will reduce invasion of trees seedling. Check areas 2-3 times/year.

If the seedling is small enough, it can be pulled by hand or needle nose pliers as in figure 10. If it grows larger, ½-1" then a weed wrench tool can be used as in figure 11.

Larger trees require digging. Remove weed trees 2x/year to maintain native grasses and wildflowers, otherwise, it will become a forest.



Figure 10: Using needle nosed pliers to pull a Hackberry tree seedling.



Figure 11: A weed wrench can be made or purchased in different sizes to remove larger tree seedlings.

Maintenance Along Rivers, Creeks and Lakes

The land along a river, creek or lake plays an even greater role in improving air and water quality than uplands. Proper maintenance of land along water bodies is directly related to water levels, flood control and the quality of recreational activities such as fishing and birding. It is crucial to leave a LIMA buffer of at least 10-15' from the water's edge as seen in figures 12 and 13.

When:

1. Pickup debris during each site visit.
2. Minimize activities during March-September.
3. Remove unwanted plants under supervision with minimal disturbance to soil and remaining plants.
4. If mowing is required, mow during dry periods.

How:

1. Clearly mark a 10-15' or more LIMA buffer.
2. Select desirable trees to grow within the buffer.
3. Avoid driving equipment into this area by using
 - a. An extended boom to cut vegetation or
 - b. Line trimmer.
4. Leave vegetation 6" in height or more.

Why:

1. Debris and silt can cause flooding and harm people and wildlife.
2. Trees and large plants provide shade to cool the soil and water for fish and people while stabilizing banks.
3. March-September is the season for bird migration and for ground nesting of birds such as ducks and kildeers; where the vegetation is used for shelter.
4. Equipment operating in the water can destroy fish habitat and birding opportunities.

Stormwater drainage channels

These practices are also preferred for stormwater channels but are not always possible due to other flood control requirements. Directions will be given by an agency or other property manager. They may include some of these recommendations, especially for mowing heights and the no mow season for migratory birds and ground nesting.



Figures 12 & 13: These well-vegetated LIMA areas protect the banks and water from erosion and silt.



Figure 14 : Mowing to the edge causes erosion, bank failure and silt filling the lake.

Maintenance of Stormwater Features

Stormwater features can be simple such as the curb cut shown in figure 15 and the energy reduction feature in figure 16, or complex such as an engineered, multi-stage feature as shown in figure 17. These features are types of green infrastructure used to direct stormwater from a hard surface into a landscape area. Here the water infiltrates, removing pollution and sediment which improves water quality in streams. The most common maintenance issues are from the silt that builds up, which clogs the system and the unwanted tree seedlings and other vegetation that will grow in these areas. Their removal is required to ensure that the systems function as designed.

When:

1. Mow turf when 4.5"- 6" high.
2. Do not mow with riding mowers when the soil is wet.
3. Remove silt when the feature no longer allows water to drain into the feature.
4. If drainage areas are landscaped, ensure the soil is covered with mulch at all times to prevent erosion.

How:

1. Mow at 4" high or more unless there is a drought.
2. Cut no more than 30% of the height of the vegetation.
3. During droughts allow vegetation to grow 5"-6".
4. Remove silt to below grade of drainage area.

Why:

1. Higher vegetation will capture more silt and allow roots to survive even after silt removal operations or during droughts.
2. These systems will also remove many dangerous pollutants from stormwater including animal feces.

Stormwater features require maintenance



Figure 15: Silt removal is required to allow stormwater to enter the turf area.



Figure 16: This feature directs and slows stormwater while preventing erosion.



Figure 17: Silt removal is required to allow stormwater to enter the turf area.

Maintaining water quality basins within the Edwards Aquifer Recharge Zone

Most of the water quality basins (WQBs) are engineered features required to mitigate the water pollution resulting from rain flowing over hard surfaces (impervious) within commercial and residential sites within the Edwards Aquifer Recharge Zone (EARZ). WQBs come in various forms, all serving the same purpose of treating stormwater runoff by removing urban pollutants like suspended solids such as sediment, excess nutrients such as phosphorus and nitrogen, heavy metals and even bacteria from pet and wildlife feces. A WQB must be properly maintained to perform as required by law.

When:

- Inspect the WQB once a month and 48 hours after a significant rainfall event.

How:

- Ensure the stormwater runoff flows into the WQB and is not flowing around it, by-passing treatment.
- Remove collected sediment, unwanted vegetation and debris (litter, dead plant material, etc.) monthly.
- Cut vegetation to design criteria as stated in contract.
- If there is standing water in the basin after 48 hrs, additional maintenance is required. Removing excess sediment from the surface will often fix this and allow proper infiltration.

Why:

- These systems are required by law and help to protect our drinking water that comes from the Edwards Aquifer.
- A non-functioning WQB not only increases the risk of contamination causing public health concerns, but it is also a violation that can lead to fines being charged.



Figure 18: Sand filtration system properly maintained; no standing water, tree seedlings or debris. The turf height is also good.



Figure 19: Standing water indicates maintenance required for proper filtration which would include sediment removal.

Basics of Tree Pruning

Trees are living systems that include roots, trunks and branches with leaves. They are incredible sources of organic matter for soils and assist in protecting that organic matter. They require proper care to provide this service along with cleaning our air and water while reducing flooding and summer temperatures. Proper pruning is a vital part of their required care as seen in figures 20 and 21.

When:

1. Pruning in the winter will invigorate a tree, summer pruning results in less tree vigor/growth.
2. It is best to prune oak trees in very cold weather or very hot to prevent oak wilt, but painting is still required on wounds 1" or greater year round.

How:

1. Remove 25% or less of the foliage at one time.
2. Follow proper pruning methods, do not top, lion-tail on leave stubs.
3. Paint oak tree wounds within 20 minutes to prevent the spread of oak wilt no matter what time of the year.
4. Provide mulch under trees to protect roots and prevent soil compaction.

Why:

1. When the tree canopy is over-pruned, the tree cannot support its root system causing die back.
2. Topping or line-tailing will over prune a tree and can cause the tree or its branches to break, especially in winds.
3. The beetle that carries oak wilt can be active all year.
4. Protecting tree roots with mulch will produce a stronger and healthier tree, conserving soil moisture, allowing for the roots to breathe and providing nutrients.

Proper pruning methods

Figure 20: For larger branches, use three-step process.

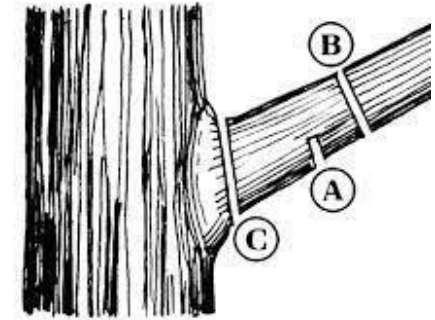


Figure 21: A proper cut forms callus protecting the tree from insect and diseases.

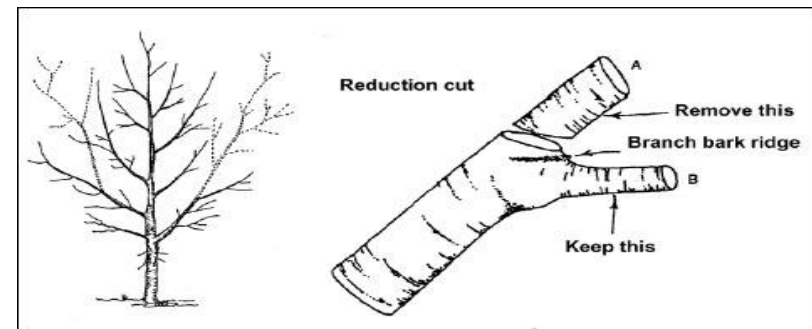


Figure 22: To reduce the size of a tree or branch cut back to an existing branch at least 1/3rd size of the branch to be removed which will become the new leader.

Equipment

Using the right equipment and keeping the equipment in good working condition is needed to create a healthy landscape.

Maintenance checklist (timing based on use)

- Clean and lubricate including the decks of riding mowers
- Check oil and fuel levels and change if needed
- Clean or replace air filters
- Check spark plugs or batteries
- Sharpen or replace worn blades
- Check tires for recommended pressures

Mowing tips to avoid ruts, compaction and scalping

- Use a lighter mower such as a Reel or self-propelled hand mower on small sites where the soil is wet and an extended boom for larger areas as in figures 23 and 24.
- Stagger the tracks, 6" to the left, or right.
- If a rut begins, leave a space of about $\frac{1}{2}$ the deck width and mow with a lighter mower or line trimmer.
- There are different opinions, but wider tires may help.
- Correctly inflate tires and sharp blades will allow you to move more quickly reducing ruts.
- Use a lighter weight person on the riding mower.
- In rough terrain, use a stabilized deck or a pull behind mower.
- Sickle bar mowers allow mower at higher heights for LIMA areas as in figure 25.
- *Note:* this may not be as big of a problem where the vegetation is 4" or greater nor in LIMA areas where heights should be mowed at 6" or greater.
- Using a soil amendment spreader such as in figures 26 and 27 can assist in increasing soil organic matter quickly.



Figures 23 & 24: Extended boom mowers keep equipment out of wet areas



Figure 25 & 26: Sickle bar mowers for LIMA areas will allow the vegetation to be cut 6" or higher



Figures 27 & 28: Soil amendment spreaders facilitate amending turf areas

Sources for Figure Pictures

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