# Appendix:

## Trail Work Sheets

***Walnut Creek Unified Stewardship Plan***
***Produced by Siglo Group***

# ACTIVITY LOG

## PURPOSE:

To establish records of all actions taken at Walnut Creek Metropolitan Park under the Unified Stewardship Plan, to coordinate volunteer and stakeholder actions, and to evaluate the performance of past actions.

Date: _____ Recorded by: _____ Organization: _____

Crew size: _____ Crew lead: _____ Lead contact email: _____

Location: _____

latitude: _____ longitude: _____

Action taken: _____

Example include: tree planting, invasive plant removal, seed sowing, trail maintenance, etc. Include methods, quantities, and details.

_____

_____

_____

_____

_____

Area treated:

☐ Point (one or few invasives or locations) Count: _____

☐ Linear (erosion or invasives extending along a line) Length: _____

☐ Area (of non-linear type) Area: _____

Photos Taken and Attached: Yes No

PARD notified: Yes No PARD contact: _____

# MONITORING LOG

## PURPOSE:

To monitor existing conditions at Walnut Creek Metropolitan Park, identify current or future threats, and to plan and prioritize future actions.

Date: _____ Recorded by: _____ Organization: _____

Location: _____

latitude: _____ longitude: _____

Type of threat:

- ☐ New invasive infestation
- ☐ Expanding invasive infestation
- ☐ New denuding of vegetation
- ☐ Informal trail
- ☐ New erosion
- ☐ Expanding erosion
- ☐ Overgrown trail or hazard limb/tree
- ☐ Poor trail drainage
- ☐ Other; describe: _____

Patch type:

- ☐ Point (one or few invasives or locations) Count: _____
- ☐ Linear (erosion or invasives extending along a line) Length: _____
- ☐ Area (of non-linear type) Area: _____

Detailed observation: _____

Narrative observation to include details not included above. _____

Potential restoration opportunities:

- ☐ Invasive removal
- ☐ Restoration plantings
- ☐ Tree pruning
- ☐ Trail armoring
- ☐ Drainage improvements
- ☐ Trail brushing
- ☐ Other; describe: _____

Labor required: _____

Photos Taken and Attached: Yes No

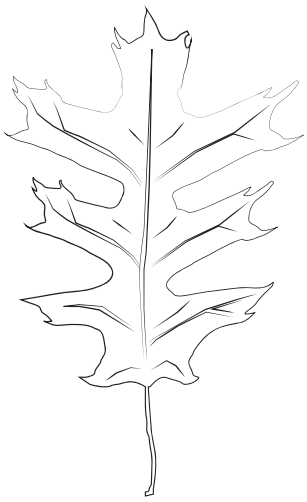
PARD notified: Yes No PARD contact: _____

# NATIVE TREE I.D.

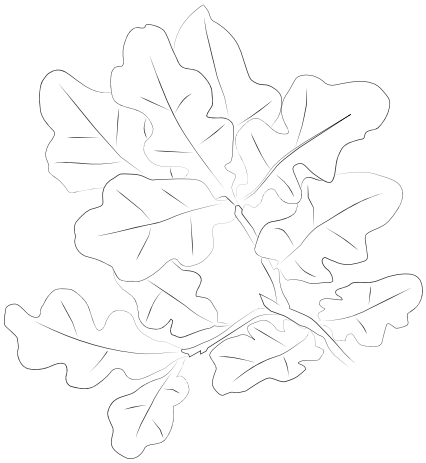
The following native trees are some of the most commonly observed species in Walnut Creek Metropolitan Park. This guide will help make field identifications. For more species and more information, refer to *Trees of Central Texas* by Robert A. Vines or ***Native and Naturalized Woody Plants of Austin and the Hill Country*** by Daniel Lynch.

## UPLAND TREES

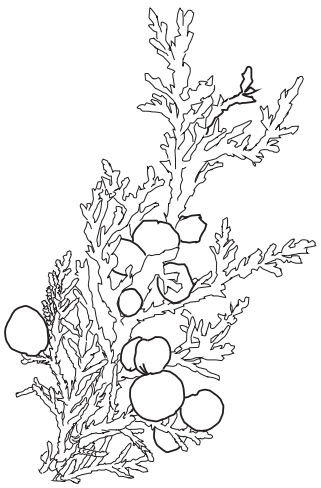
**LIVE OAK, *Quercus virginiana var. fusiformis***
Large, evergreen, overstory tree up to 50′ tall
Simple, alternate, evergreen, thick, and dark leaves
Dark grey/brown bark, smooth and light when young, furrowed with age



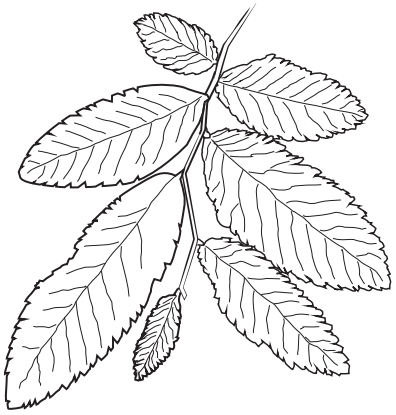
**BUCKLEY OAK, *Quercus buckleyi***
Medium, decidous tree 15-30′ tall
Glossy, green leaves, bright red in falleeply lobed, generally 5-7 lobes, with pointed tips
Mottled gray bark resembling camouflage pattern
Often multi-trunked or low-branching, and may re-sprout from the stump



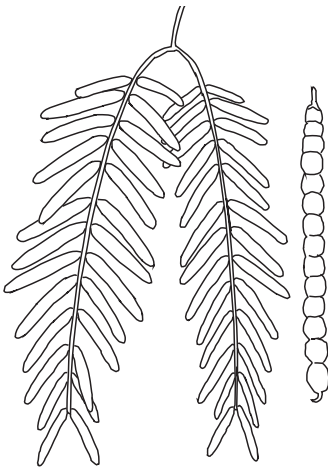
**WHITE SHIN OAK, *Quercus sinuata var. breviloba***
Medium, deciduous tree 12-40′ tall
Single, lobed leaves
Gray and flaky bark with broad, thin scales
Shin-high sprouts around base
Single-trunked and often found growing in clusters of 3-5 trees, seldom a single tree



**ASHE JUNIPER, *Juniperus ashei***
Medium, evergreen tree up to 30′ tall
Evergreen, scaly foliage
Strips of shedding, red, stringy bark
Dark blue berries appearing August-September
Form may be conical with one trunk, but often broad and shrubby with low-branching limbs



**CEDAR ELM, *Ulmus crassifolia***
Tall, vertical tree reaching up to 75′
Small simple, alternate, and serrated leaves 1-2″ long
Leaves are dark green with coarse texture
Gray-brown bark with flat ridges made of flaky scales
Smaller branches and twigs have lateral corky wings

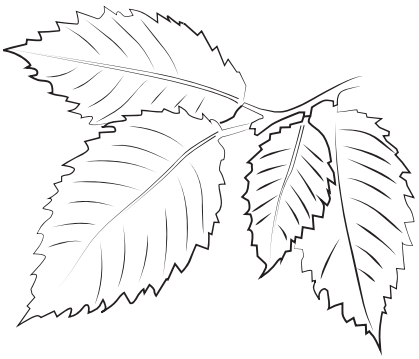


**HONEY MESQUITE, *Prosopis glandulosa***
Small, deciduous tree 15-25′ tall with 1-3″ thorns
Alternate, compound leaves with two diverging leaflets
Smooth gray bark when young, deep ridges once mature
Long, fuzzy yellow flowers turn into long, tan bean pods
Form may be sinuous and single-trunked, or shrubby with multiple trunks

# NATIVE TREE I.D., CONT'D

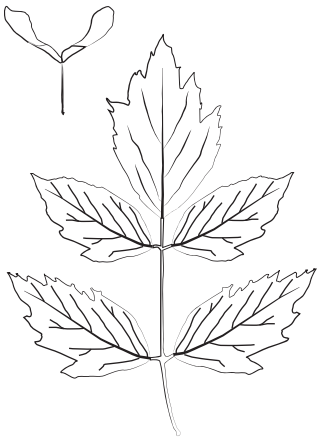
The following native trees are some of the most commonly observed species in Walnut Creek Metropolitan Park. This guide will help make field identifications. For more species and more information, refer to *Trees of Central Texas* by Robert A. Vines or ***Native and Naturalized Woody Plants of Austin and the Hill Country*** by Daniel Lynch.

## LOWLAND TREES



**AMERICAN ELM, *Ulmus americana***

Large deciduous tree, up to 100' tall
Simple, oval leaves with serrated teeth and pointed tip, 2-4" long
Notably asymmetrical leaf base
Dark gray bark with narrow, shaggy ridges

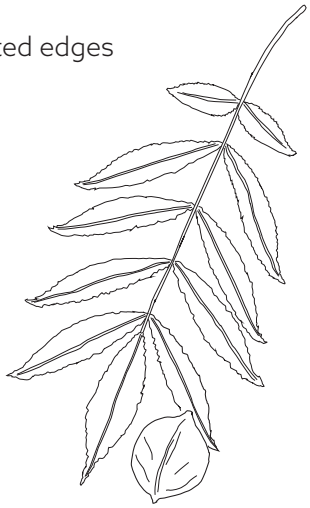


**BOX ELDER, *Acer negundo***

Medium, deciduous riparian tree, up to 50' tall
Opposite, pinnately compound leaves with 3,5, or 7 coarsely toothed leaflets
Resembles poison ivy when young
Winged, paired seeds that fall in spirals

**COTTONWOOD, *Populus deltoides***

Large deciduous tree, up to 100'
Simple, spade-shaped leaves with a pointed tip and serrated edges
Massive branches with arching ends
Smooth white bark matures into dark, scaly ridges

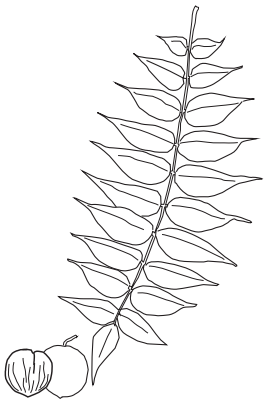


**PECAN, *Carya illinoensis***

Large, deciduous riparian tree up to 75' tall
Alternate, compound lanceolate leaves, 9-20" long
Grayish-brown bark with thick, rectangular, gray scales
Green-brown nut pods ripening September-October

**BLACK WILLOW, *Salix nigra***

Fast growing wetland tree up to 50' in height
Light brown to black bark, rough and deep ridges with thick shaggy scales
Simple, slender leaf blades 3-6" long
Almost always growing near water source



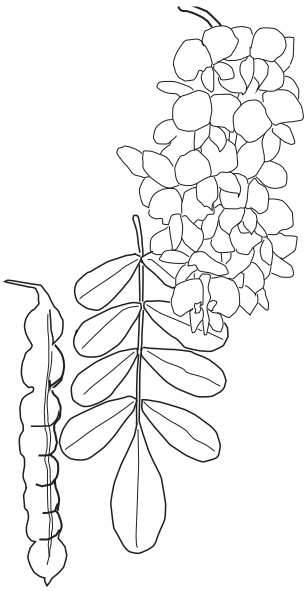
**LITTLE WALNUT, *Juglans microcarpa***

Small deciduous tree, 10-20' tall
Compound, narrowly lanceolate leaflets
Gray to dark brown bark with deep fissures
Often shrubby or multi-trunk
Typically found in riverbeds

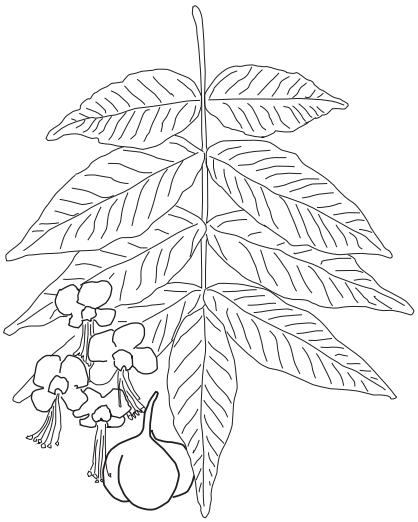
# NATIVE SHRUB I.D.

The following shrubs are some of the most commonly observed species in Walnut Creek Metropolitan Park. This guide will help make field identifications. For more species and more information, refer to *Trees of Central Texas* by Robert A. Vines or ***Native and Naturalized Woody Plants of Austin and the Hill Country*** by Daniel Lynch.

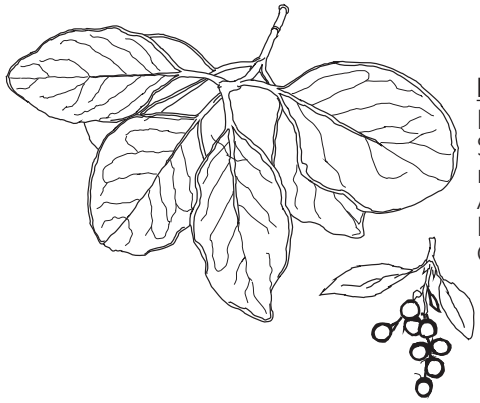
## UPLAND SHRUBS



**TEXAS MOUNTAIN LAUREL, *Sophora secundiflora***
Small, evergreen shrub, 5-20′ tall
Dark green compounded oval leaves
Showy, fragrant violet flowers, drooping growth
Dark seed pods with bright red seeds
Smooth and green bark matures into dark gray, and scaly ridges



**MEXICAN BUCKEYE, *Ungnadia speciosa***
Large, deciduous shrub, 6-12′ tall
Multi-trunked, light gray to brown bark, smooth on young branches, becoming fissured with age
Medium green, leathery leaves, pinnately compound, 5-7 leaflets
Small, light pink flowers in spring followed by 3-celled seed pods



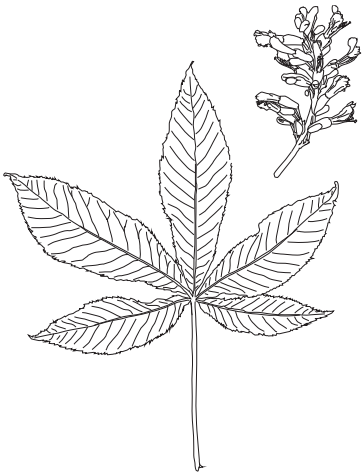
**LINDHEIMER SILKTASSEL, *Garrya ovata ssp. lindheimeri***
Evergreen shrub, 2-15′ tall
Simple, oval-shaped, fuzzy leaves, up to 2.5″ long with rounded edges
Arching, fountain-shaped growth
Frilly tassel-like blooms, dark blue berries
Often mistaken for glossy privet

# NATIVE SHRUB I.D., CONT'D

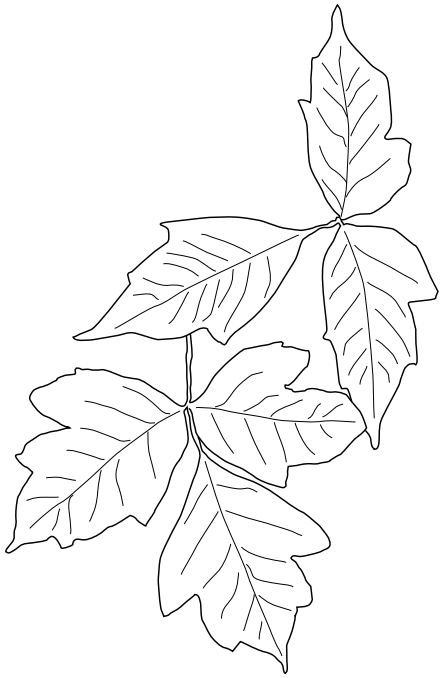
The following native trees are some of the most commonly observed species in Walnut Creek Metropolitan Park. This guide will help make field identifications. For more species and more information, refer to *Trees of Central Texas* by Robert A. Vines or ***Native and Naturalized Woody Plants of Austin and the Hill Country*** by Daniel Lynch.

## LOWLAND SHRUBS

**BEAUTYBERRY, *Callicarpa americana***
Deciduous shrub, 3-6′ tall, 4-6′ wide
Rough, light green, opposite ovate leaves with serrated edges
Thin, reddish-tan branches with small white speckles
Bright magenta berry clusters



**RED BUCKEYE, *Aesculus pavia***
Small deciduous shrub, 4-8′ tall
Dark green, palmate leaves, 5-7 ovate leaflets
Large, red flower clusters
Mostly smooth, reddish-gray bark



**POISON IVY, *Toxicodendron radicans***
Poisonous shrub or vine, 1-3′ tall, capable of climbing trees
Smooth trifoliate leaves, alternate, consisting of 3 leaflets
Leaflets ovate, typically lobed but highly variable
Leaves bright green in spring, turn red-yellow in fall
Greenish-white flowers bloom May to July, white berries in fall
Oils cause highly irritating rash upon skin contact; appears 12-24 hours after contact with the plant
All plant parts are poisonous and should be avoided

# INVASIVE PLANT I.D.

The following invasive trees are some of the most commonly observed species in Walnut Creek Metropolitan Park. This guide will help make field identifications. For more species and more information, refer to *Trees of Central Texas* by Robert A. Vines or ***Native and Naturalized Woody Plants of Austin and the Hill Country*** by Daniel Lynch.

## INVASIVE TREES

**GLOSSY PRIVET, *Ligustrum lucidum***

Fast-growing, evergreen tree up to 45′ tall
Glossy, dark green leaves, opposite, simple
Dusty, drooping, dark blue berry clusters
Multiple, tightly-grouped trunks with pale grey bark

**CHINABERRY, *Melia azedarach***

Large deciduous tree up to 50′ tall
Smooth reddish bark with white spots when young. Bark is grey and furrowed when mature
Dark green, alternate, bipinnately compound leaves with serrated edges
Clusters of small, lilac flowers, developing into golden, drooping clusters of fruits that persist through the winter

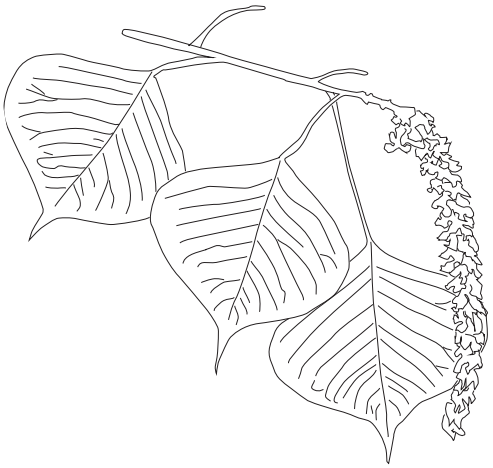
**CHINESE PISTACHE, *Pistacia chinensis***

15-25′ tall with a single-trunked, symmetrical form
Splotchy gray-brown bark, flakes with age
Pinnately compound leaves, usually with an even number of leaflets. Leaves do not have a terminal leaflet.
On female trees, small red to blue berry clusters
Bright yellow and red foliage in fall
Leaves have an unpleasant odor when crushed
Often mistaken for Western soapberry

# INVASIVE PLANTS, CONT'D

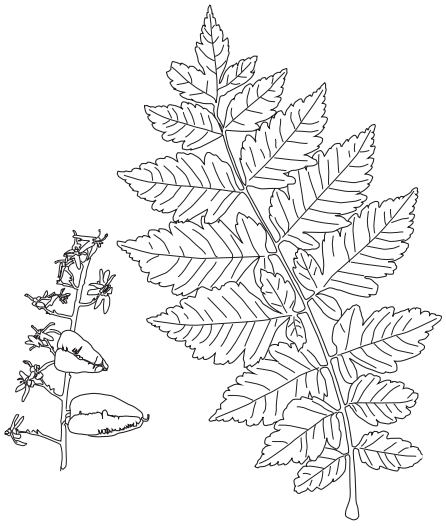
The following invasive trees are some of the most commonly observed species in Walnut Creek Metropolitan Park. This guide will help make field identifications. For more species and more information, refer to *Trees of Central Texas* by Robert A. Vines or ***Native and Naturalized Woody Plants of Austin and the Hill Country*** by Daniel Lynch.

## INVASIVE TREES, CONTD



**CHINESE TALLOWTREE, *Triadica sebifera***
25-35' tall
Simple, glossy leaves with pointed tip
Beige flaky bark
bright yellow and red foliage in fall

**TAIWANESE PHOTINIA, *Photinia serratifolia***
10-20' tall with bushy growth
Simple serrated leaves
Glossy leaves, dark green to burgundy
Smooth and dark reddish-brown to gray bark

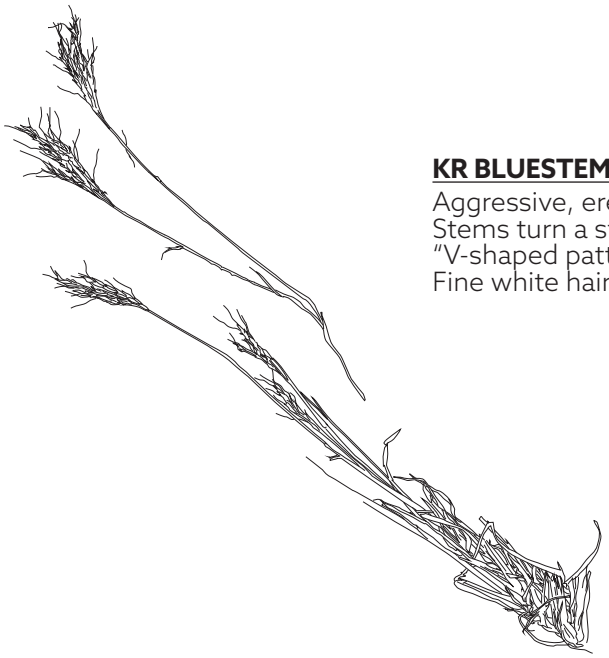


**GOLDEN RAINTREE, *Koelreuteria paniculata***
Bright yellow flowers, followed by papery, pink, lantern-like seed pods
Compound, alternating serrated leaves, medium green color
Bright golden foliage in the fall
Light brown bark, thin plates once mature

# INVASIVE PLANT I.D.

The following invasive grasses are some of the most commonly observed species in Walnut Creek Metropolitan Park. This guide will help make field identifications. For more species and more information, refer to *Grasses of the Texas Hill Country* by Brian Loflin & Shirley Loflin.

## INVASIVE GRASSES



**KR BLUESTEM, *Bothriochloa ischaemum var. songarica***

Aggressive, erect bunchgrass 18-48″ tall
Stems turn a straw color when mature
"V-shaped pattern" seed head, light green to burgundy
Fine white hairs visible on stem joints

**GIANT REED, *Arundo donax***

Tall, perennial cane, up to 20′
Thin, elongated leaves, often 1-2′ long
Very dense and aggressive root rhizome
Large plume of flowers at top of stalk

**JOHNSONGRASS, *Sorghum halepense***

Fast-growing, warm-season perennial grass 36-72″ tall
Rhizomatic growth, often grows in patches
Long, fibrous leaf blades with thin white stripe through center
Round, cylindrical stem
Noticeable light green to burgundy panicle seed head

# INVASIVE PLANTS I.D.

The following invasive shrubs and vines are some of the most commonly observed species in Walnut Creek Metropolitan Park. This guide will help make field identifications. For more species and more information, refer to *Central Texas Invasive Plants Volunteer Field Guide* by the City of Austin Watershed Department or ***Invasive Plant Atlas of the United Sates*** at invasiveplantatlas.org

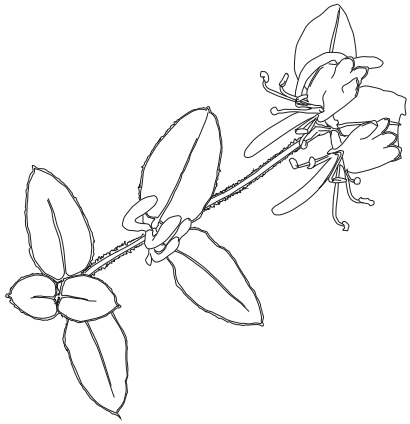
## INVASIVE SHRUBS AND VINES

**NANDINA, *Nandina domestica***

Multi-stemmed, evergreen shrub, 4-8′ tall
Dark green-red pinnately compound leaves
Bright red berry clusters atop of each plant in fall-winter
Thin, long trunk with woody, brown bark, and fissures near the base

**SWEET AUTUMN CLEMATIS, *Clematis terniflora***

Beautiful but aggressive flowering vine, climbing 15-30′
Small cream-white, 4-petaled blooms in fall
Semievergreen shiny compound leaves with 3-5 elliptic leaflets



**JAPANESE HONEYSUCKLE, *Lonicera japonica***

Vigorous, spreading vine, 15-30′
Opposite, simple, ovate, dark green leaves. Soft in texture
New leaves produced in spring are often highly lobed
Small white and yellow flowers spring-fall

# RESTORATION PLANTINGS

## PURPOSE:

To increase biodiversity, create pollinator habitat, restore soils, increase shade, and improve woodland health.

## SAFETY:

Be aware of snakes, scorpions, or fire ants that may be living under rocks or logs.

Use sharp tools responsibly.

Stay aware of fellow workers to avoid hitting them with brush or tools.

Poison ivy is a common understory plant in many areas of the park. Avoid coming in contact with any part of this plant. Wear long sleeves and pants to avoid skin contact.

## MATERIALS:

Plant material for installation:

- container plants or plugs
- bare root saplings or shrubs
- live root grasses and forbs
- seed

Amendments:

- single-grind mulch or straw
- compost

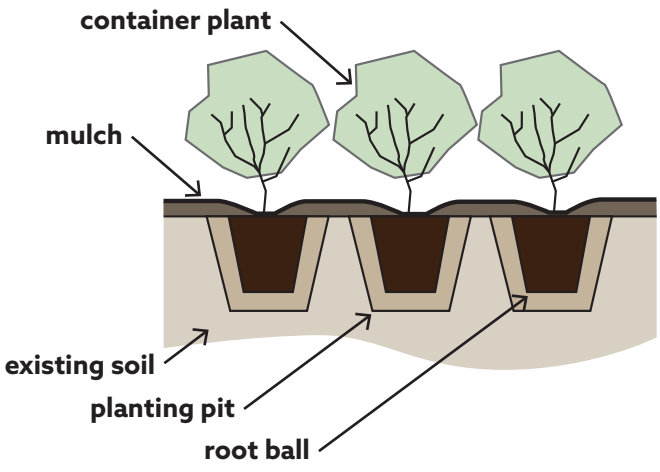
Tools needed:

- gloves
- long-sleeved shirts and pants recommended
- soap and/or lotion for poison ivy treatment
- spade or sharpshooter shovel if planting live plants
- rake if seeding
- buckets, wheelbarrows, or carts

## METHODS:

### CONTAINER PLANTINGS

1. Identify the planting area. Prioritize areas of recently-removed invasive species, thin vegetation, bare soil, eroded slopes, low plant diversity, or high visibility.
2. Schedule planting. Most live planting should occur from November to February to allow plants to establish before the heat of the summer.
3. Source plant material. Species should be native to the area and suited to the water and light conditons. Plants should be the smallest size suitable for the circumstances.
4. Establish clear boundaries with fences, rocks, logs, brush, or biodegradable straw logs (also called mulch socks or straw wattles) that are durable and deter foot traffic.
5. Do not remove native plants.
6. Arrange plants, considering their mature size and assume 50-75% survival.
7. Ensure holes for planting are twice as wide as the plant's containter and the plant is planted to full depth, flush with the soil surface.
8. Plant plants and fill hole with excavated soil. Ensure soil around the plant is firm and without voids.
9. Water plants immediately after planting.
10. Container plantings should be mulched with a 3" layer of wood mulch. Take care to not bury container plants with mulch. This may be sourced locally from PARD or arborists, and should be free of trash and invasive species.
11. Plan for maintenance. Long-term success requires that the new plants have sufficient water, are not being outcompeted by invasive species, and are not impacted by erosion issues.



# RESTORATION PLANTINGS

## METHODS:

### SEEDINGS

1. Identify the seeding area. Prioritize areas of recently-removed invasive species, low plant diversity, low canopy cover, high erosion, or high visibility.
2. Source seeds. Species should be native to the area and suited to the water and light availability. Seed rate should be between 20 and 40 lbs per acre, dependent on species, for areas of thin vegetation.
3. Establish clear boundaries with fences, rocks, logs, or brush that are durable and deter foot traffic. Plan for erosion and utilize logs, brush, or biodegradable straw logs to retain soil.
4. Most seeding should occur from October to March to allow plants to establish before the heat of the summer.
5. Clear the seeding area of leaf litter and duff layer to expose the soil. Lightly disturb the soil if it is soft, or actively break up the top 3-6″ of soil if it is compacted. Retain all leaf litter and duff layer on site and replace following seeding.
6. Do not remove existing native plants. Leave native plants in place and seed around them.
7. Plan for maintenance. Long-term success requires that the new plants have sufficient water, are not being outcompeted by invasive species, and are not impacted by erosion issues.

*For approved seed mixes, reference Unified Stewardship Plan or City of Austin Standard Specification Manual 609S Native Seeding and Planting for Restoration*

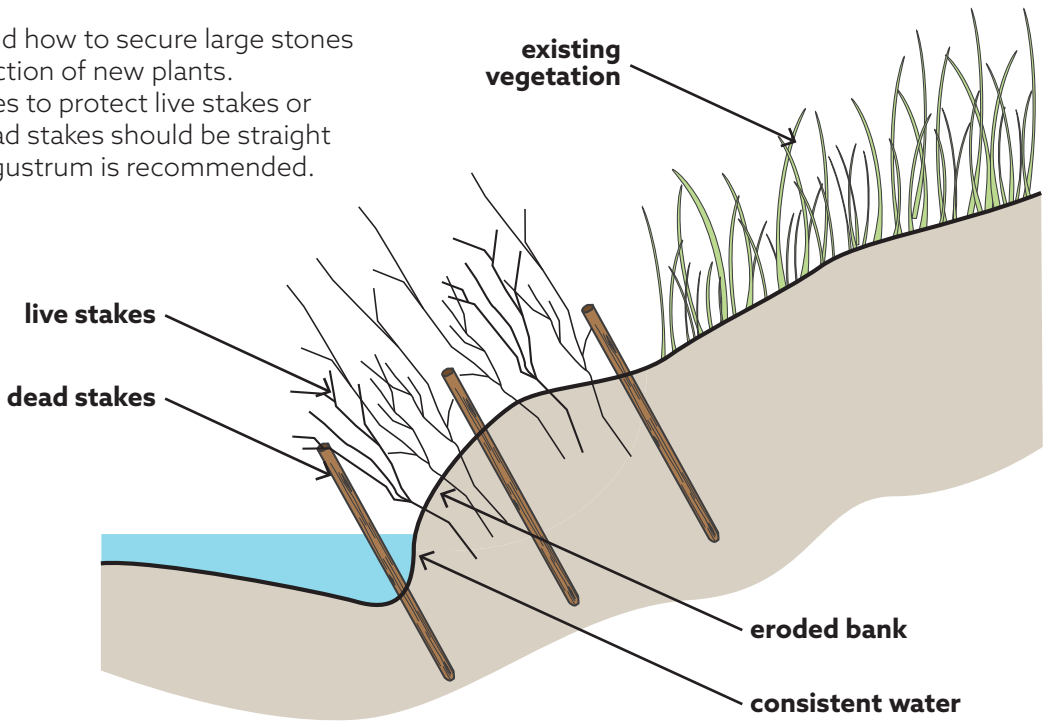
### LIVE STAKING

Be aware of snakes, scorpions, or fire ants that may be living under

1. Identify an area of creek bank with consistent moisture, low canopy cover, high erosion, or high visibility. The outside of a curve will receive higher floodwater velocities, but is also in greater need of staking.
2. Source stakes by pruning existing willows on-site. Use stakes of roughly ½-1″ diameter and 3-8′ length.
3. Embed stake 12-18″ in the creek bank, using a sharpshooter shovel if needed. Embed stakes 1-3′ apart from one another.
4. Consider floodwaters and how to secure large stones or utilize them for protection of new plants.
5. Optional: use dead stakes to protect live stakes or secure large stones. Dead stakes should be straight and free of branches. Ligustrum is recommended.

Species appropriate for live stakes:

- Black willow (***Salix nigra***)
- Buttonbush (***Cephalanthus occidentalis***)
- Roosevelt weed (***Baccharis neglecta***)
- Cottonwood (***Populus deltoides***)
- Roughleaf dogwood (***Cornus drummondii***)
- American sycamore (***Platanus occidentalis***)



# INVASIVE PLANT REMOVAL

## PURPOSE:

Invasive species are plants that have been introduced to Texas from other regions around the world. They cause problems by crowding out native species and do not provide the same wildlife habitat value. Removing these invasive species allows for a healthier native plant community and a healthier community of other flora and fauna that depend on relationships with native plants.

## MATERIALS:

Tools needed:

- Gloves and eye protection
- Weed wrench or Lawn Jaws
- Utility knife or linoleum knife
- 2-3″ stiff putty scraper or similar
- Coarse plastic scrub pads
- Spray bottle with soapy water
- 70% rubbing alcohol

## METHODS: INVASIVE TREES

**Includes glossy privet, Chinaberry, Chinese pistache, Taiwanese photinia, golden raintree, and Chinese tallowtree**

If focusing on a large area of 75% or greater invasive species cover, it is recommended to remove no more than 1/3 of the invasive trees during one season if using mechanical removal. Girdling is a preferrable method for areas like these.

### MECHANICAL REMOVAL

1. For saplings 2″ or less diameter (measured at the base of the trunk), uproot using a Weed Wrench or other mechanical device.
2. Provide for erosion control or restoration plantings as needed.
3. Leave as much of the pulled material as possible on site in low-use woodlands, taking care to remove any seed material, and leaving roots without soil contact.
4. Plan on removing seeds or fruit from the site.
5. Ensure woody material is broken down into shorter lengths and lays flat on the ground surface so that it readily decomposes. Do not leave large piles of brush or logs in natural areas. Reference Trail Brushing sheet for ways to use brush to close informal trails.

### GIRDLING

1. For trees 2″ or greater diameter (measured at the base of the trunk), remove the outer layer of bark.
2. With cutting tool, score the bark around the trunk twice, 4-6″ apart, at 1/16-1/8″ depth.
3. With a flat-edged scraping tool, remove the outer layer of bark from the tree, which should separate from the wood relatively easily.
4. With coarse plastic scrub pad and soapy water, roughly scrape away the toothpick-like remainder of the bark until smooth.
5. Repeat with 70% rubbing alcohol.

## SAFETY:

Use sharp or heavy tools responsibly. Weed wrenches may pinch or injure with their weight. Girdling tools are extremely sharp.

Stay aware of fellow workers to avoid hitting them with trees, limbs, or tools.

Use appropriate clothing and protective gear, including long-sleeved shirt and closed-toed shoes, and gloves and glasses.

Supply first-aid, including gauze, tape, super glue, and other materials for lacerations.

Poison ivy is a common understory plant in many areas of the park. Avoid coming in contact with any part of this plant. Wear long sleeves and pants to avoid skin contact.

## GIRDLING EXAMPLE

### NOTES

For mechanical removal of Chinese pistache, loosen soil at base of plant to reduce the risk of the trunk snapping at the base.

For girdling of Chinaberry and Chinese pistache, plan to follow up every 3 months to remove or girdle new sprouts from the trunk.

Plan for re-seeding or planting in the areas where significant amounts of invasive plants are removed or soil is disturbed. Reference Restoration Plantings sheet for more information.

For video instructions on girdling ligustrum, refer to “Demonstration of Invasive Tree Girdling with Cliff Tyllick”, availble on YouTube:

https://www.youtube.com/watch?v=R-L1RJn095w

# INVASIVE PLANT REMOVAL

## METHODS: INVASIVE GRASSES

**Includes KR bluestem and Johnsongrass**

### MECHANICAL REMOVAL

1. If the area will be mostly bare following invasive removal, plan for erosion control measures and/or restoration plantings before beginning work.
2. Remove existing plant material including root material from the site.
3. Ensure removal of as much below-ground rhizome material as possible.
4. Remove all plant material and dispose off-site.
5. Install erosion control materials, such as mulch logs, or jute netting if necessary. If replanting, immediately plant after invasive removal. Refer to Restoration Plantings task sheet for more information.

## METHODS: INVASIVE VINES AND SHRUBS

**Includes nandina, sweet autumn clematis, and Japanese honeysuckle**

### MECHANICAL REMOVAL

1. For vines 2″ or less diameter (measured at the base of the trunk), cut 6-8″ above ground level.
2. Uproot using a Weed Wrench or other mechanical device.
3. For nandina, loosen soil around the plant and extract as much of the root mass as possible.
4. Provide for erosion control or restoration plantings as needed.
5. Leave as much of the pulled material as possible on site in low-use woodlands, taking care to remove any seed material, and leaving roots without soil contact. Use pulled material for trail brushing if appropriate (refer to Trail Brushing task sheet).
6. Leave vines in trees and do not attempt to pull them down.
7. Cut vines above 7′ height if they interfere with trail users.

### NOTES

Refer to Invasive Species ID task sheet for descriptions of common invasive species.

Refer to Native Plant ID task sheet for descriptions of common native species, including those that can be mistaken for invasive species.

Plan for re-seeding or planting in the areas where significant amounts of invasive plants are removed or soil is disturbed. Reference Restoration Plantings sheet for more information.

Plan for next year: the process of invasive species removal often creates the conditions for germination of invasive species seeds in the seedbank. Hand pulling of new sprouts is required for multiple years until the seed bed is diminished and other plants can fill the niches.

Plan to remove materials: the removal of invasive species can generate significant amounts of brush. Plan on removing seeds, fruit, or rhizomes (depending on species) from the site. Ensure woody material is broken down into shorter lengths and lays flat on the ground surface so that it readily decomposes. Do not leave large piles of brush or logs in natural areas. Reference Trail Brushing sheet for ways to use brush to close informal trails.

Contact City of Austin Watershed Protection Department for guidance on invasive species removal efforts as well as Ready Set Plant events for re-planting of native species following invasive species removal.

Contact City of Austin Urban Forestry Department for removal of mature invasive trees that cannot be removed by volunteers or hand tools.

Contact City of Austin PARD for removal of invasive giant reed (*Arundo donax*) that cannot be removed by volunteers or hand tools.

# TREE PRUNING

## PURPOSE:

To safely remove branches from live or dead trees to maintain their health, improve their form, and remove obstructions from the trail.

## SAFETY:

Use sharp tools responsibly.

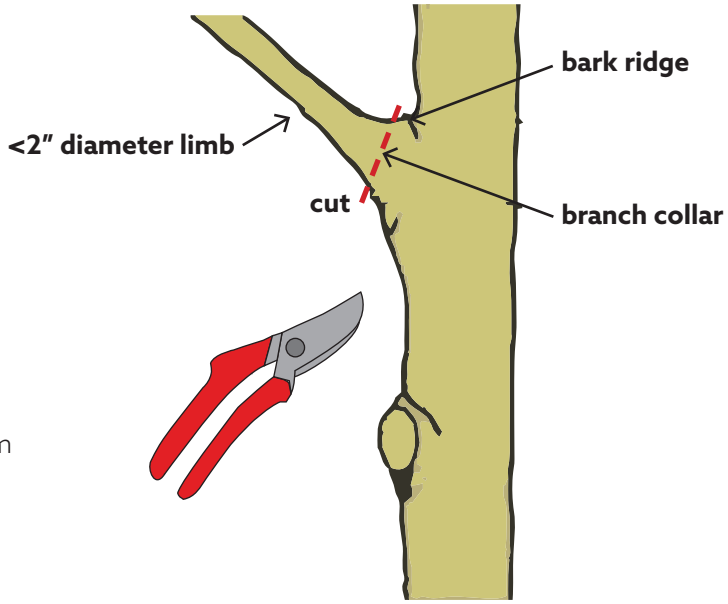
Stay aware of fellow workers to avoid hitting them with limbs or tools.

Use appropriate clothing and protective gear.

## MATERIALS:

Tools needed:

- gloves and eye protection
- pants, closed-toed shoes, and long-sleeve shirt
- hand saw
- loppers
- pruning shears




## METHODS:

Identify the visual or physical obstruction before determining limbs to be pruned. Do not prune more than necessary.

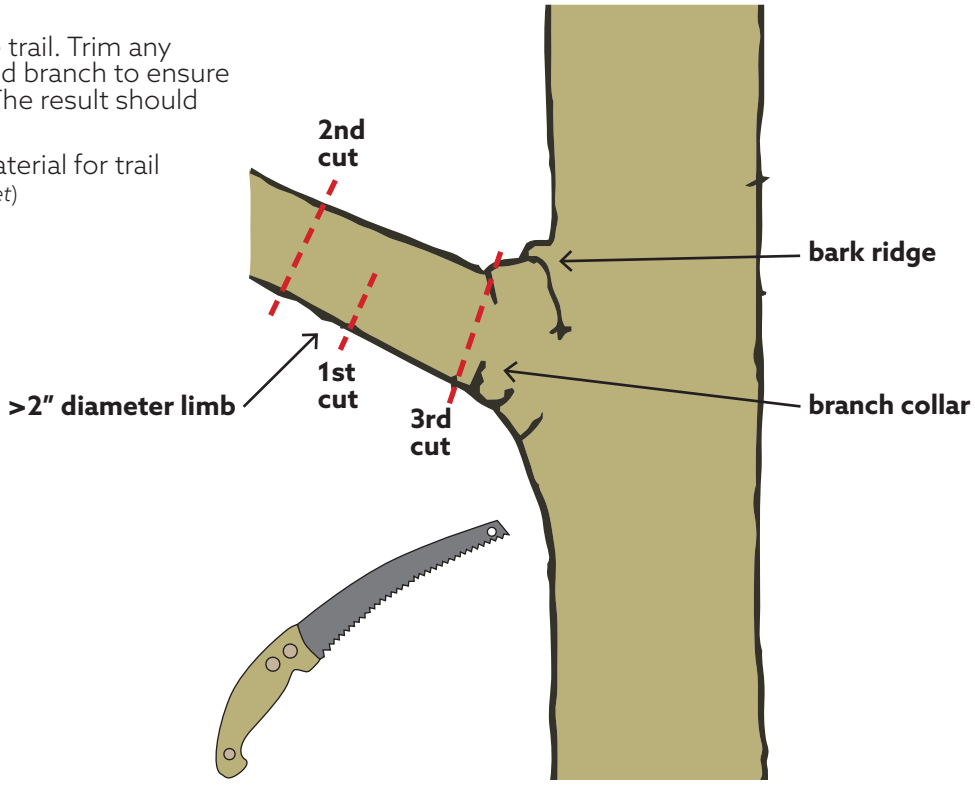
Ensure work area is clear of fellow workers and safe from other trail users.

For smaller branches (top), cut right outside the branch collar. Do not leave a stub or cut into the branch collar. Fit the branch as deeply into the jaws of the shears or loppers as possible before cutting.

For larger branches (bottom), first create an undercut a couple of inches above the branch collar. Then a couple inches above that, saw from above and cut through the limb. Finally, remove the stub just outside the branch collar.

Dispose of pruned branches off the trail. Trim any additional branches from the pruned branch to ensure the debris lays flat on the ground. The result should appear to be a naturally fallen limb.

If appropriate, utilize the pruned material for trail brushing. (*refer to Trail Brushing task sheet*)




*Reference ANSI A300 pruning standards for more information.*

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# DRAINAGE IMPROVEMENTS

## PURPOSE:

To create a trail that sheds water from its surface and does not channel or gather water. This is most useful in low-lying areas where excess water ponds, or where minor drainages cross or follow the trail.

## MATERIALS:

Tools needed:

- gloves and eye protection
- spade shovel
- pick mattock
- rock bar
- McLeod
- tamper
- rake if seeding
- buckets, wheelbarrows, or carts

## METHODS:

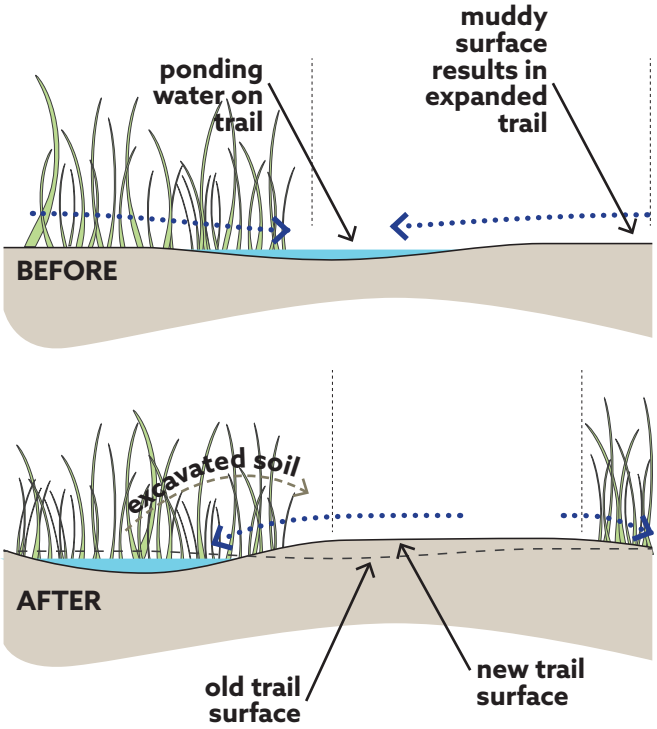
### RAISED TREAD

Use this method when there is frequent mud or ponded water on a flat or gently sloped section of trail.

Source excess soil to create the fill. This may be sourced from directly adjacent to the trail. Limit excavation to 6" depth and avoid creating linear ditches that may erode.

Add excavated soil to the trail surface. Thoroughly compact the fill soil as you go for every 2-4" added. The finished trail surface should be a firm and compacted layer of soil with a smooth transition to the existing trail.

If needed, use larger logs or rocks along the edge of the trail to retain the added fill material (refer to Stone Pitching in the Trail Armoring task sheet for more information). Ensure these logs or rocks are buried 1/3-1/2 their depth into existing soil so they remain in place.




## SAFETY:

Stay aware of fellow workers to avoid hitting them with logs, rocks, or tools.

Use appropriate clothing and protective gear.

Use proper lifting techniques to avoid injury when moving heavy objects.

Ensure trail improvements are stable and able to withstand significant abuse from future trail users. A poorly-built trail improvement may fail under use and cause avoidable injury to a trail user.

### CHECK DAMS

Use this method when the trail crosses a minor drainage and is experiencing gully or rill erosion perpendicular to the trail. Drainages steeper than a 3:1 slope may be more difficult to address.

Reinforce the downhill side of the trail with large rocks or stacked logs. Ensure rocks are buried 1/3-1/2 their depth into existing soil so they remain in place.

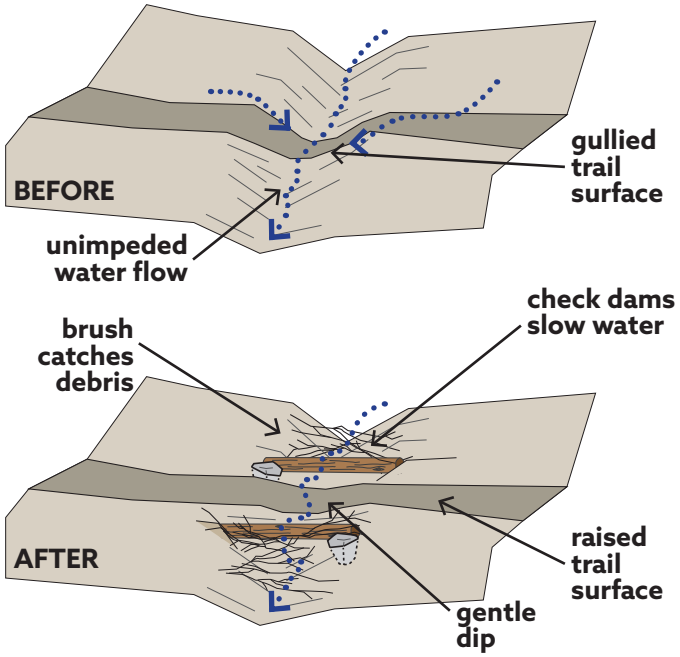
Optional: bury a section of drainpipe at the bottom of the drainage if it is deep. Use 4-6" perforated plastic pipe and secure well with compacted soil and add an apron of large (4-12") gravel to either side of the pipe.

Backfill the eroded portion of the trail, bringing the tread up 12-18" to the top of the rocks. Allow the trail to gently dip to allow for water to gently flow over the top in heavy rain events.

Thoroughly compact the fill soil as you go for every 2-4" added.

Optional: armor the final surface of the trail with flat rocks embedded into the soil (refer to Stone Pitching in the Trail Armoring task sheet for more information).

Optional: incorporate containter plantings, seedings, or live staking to encourage plant growth in eroded areas. (*refer to Restoration Planting task sheet*)



# TRAIL ARMORING

## PURPOSE:

To create a more durable and resilient trail surface for a short section. This is most useful in areas of rill or gully erosion, where trails are very steep, or combined with drainage improvements (refer to Trail Drainage Improvement sheet)

## MATERIALS:

Tools needed:

- gloves and eye protection
- spade shovel
- pick mattock
- rock bar
- McLeod or tamper
- rake if seeding
- buckets, carts, or wheelbarrows
- hand saw (power tools not permitted)

## SAFETY:

Stay aware of fellow workers to avoid hitting them with logs, rocks, or tools.

Use appropriate clothing and protective gear.

Use proper lifting techniques to avoid injury when moving heavy objects.

Ensure trail improvements are stable and able to withstand significant abuse from future trail users. A poorly-built trail improvement may fail under use and cause avoidable injury to a trail user.

## METHODS:

### STONE PITCHING

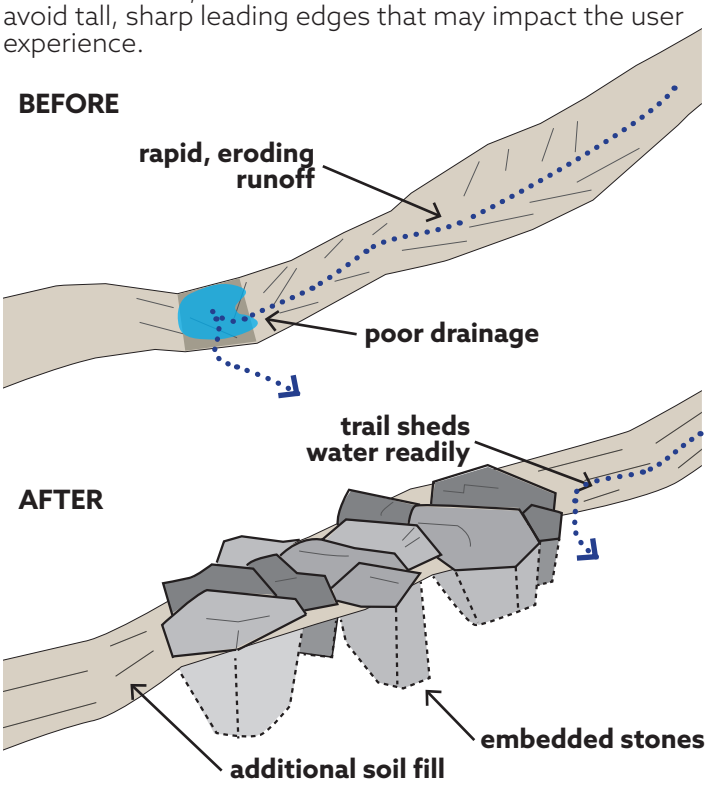
Use this technique when the trail surface needs to be re-created with a more level and durable surface.

Identify the work area, typically an eroded, sloped section of trail that is either gullied or eroding.

Source nearby stones. Stones should be as large as volunteers can safely move to the work site.

Starting from the bottom of the work area, prepare an excavated bed. Add large rocks pitched on their sides and soil to create the fill. Compact fill soil thoroughly and ensure rocks are stable and stationary. Continue until the stones reach the top of the work area.

Ensure the rocks are buried 2/3-3/4 their depth into existing soil so they remain in place. Arrange stones to ensure smooth, flat faces create an even trail surface and avoid tall, sharp leading edges that may impact the user experience.




### LOG STEPS

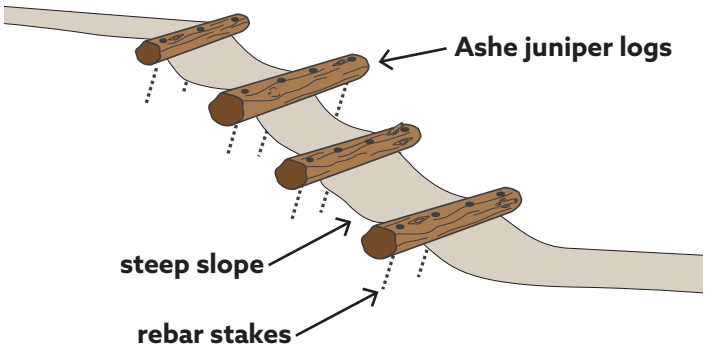
Use this technique when the trail surface is very steep, frequently slick, has few rocks, and used primarily by pedestrians.

Identify the work area, typically an eroded, sloped section of trail with a relatively level surface at the top and bottom.

Source nearby logs, minimum 6″ diameter, and relatively straight and clear of knots and branches. Ashe juniper is recommended due to its abundance and rot resistance. Bald cypress or bois d'arc are acceptable as well. Cut only dead or fallen juniper, never fell live trees. Trim to length 1-2′ wider than the desired trail surface.

Embed logs 1/3-1/2 their depth into existing soil so they remain in place.

Recommended: drill 2-4 holes through the juniper logs and drive 12-24″ rebar stakes through the holes. Ensure the tip of each rebar stake is flush or below the log surface so trail users do not come into contact with them.



# TRAIL BRUSHING

## PURPOSE:

To retire trails that are unsanctioned, need re-routing, causing degradation, or are redundant, including switchback cutoffs and informal water access points

To physically block people from using the path in question and visually obscure the trail from trail users.

To restore organic material and protect the soil from disturbance and compaction.

## MATERIALS:

Any size organic or natural material found nearby:

- removed invasive trees and shrubs
- removed hazard trees
- trimmed limbs
- relocated dead trees
- relocated boulders

## METHODS:

Identify the length of trail, including both ends where it meets the sanctioned trail(s).

Source brush materials nearby.

Pile brush on the trail, prioritizing the ends where it meets the sanctioned trail(s). Brush should extend beyond the immediate junction to be an additional deterrent.

Brush should be piled at least 3′ high to appear imposing and impassable. Place brushy, branched end towards sactioned trail.

## SAFETY:

Be aware of snakes, scorpions, or fire ants that may be living under rocks or logs.

Use caution when lifting or rolling heavy material that may pinch fingers and toes or injure your back.

Use sharp tools responsibly.

Stay aware of fellow workers to avoid hitting them with brush or tools.

Poison ivy is a common understory plant in many areas of the park. Avoid coming in contact with any part of this plant. Wear long sleeves and pants to avoid skin contact.

Tools needed:

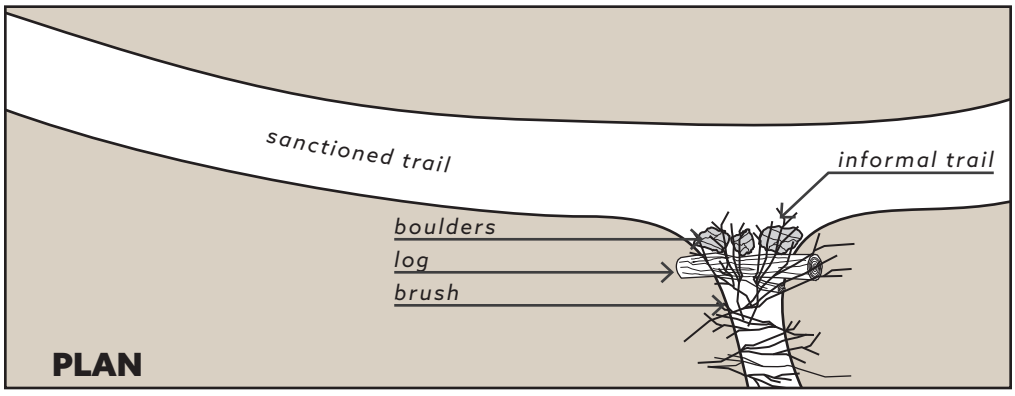
- gloves
- loppers and pruning saws (*if pruning live trees, refer to Tree Pruning task sheet*)
- buckets, wheelbarrows, or carts
- rake
- pick, shovel, or McLeod

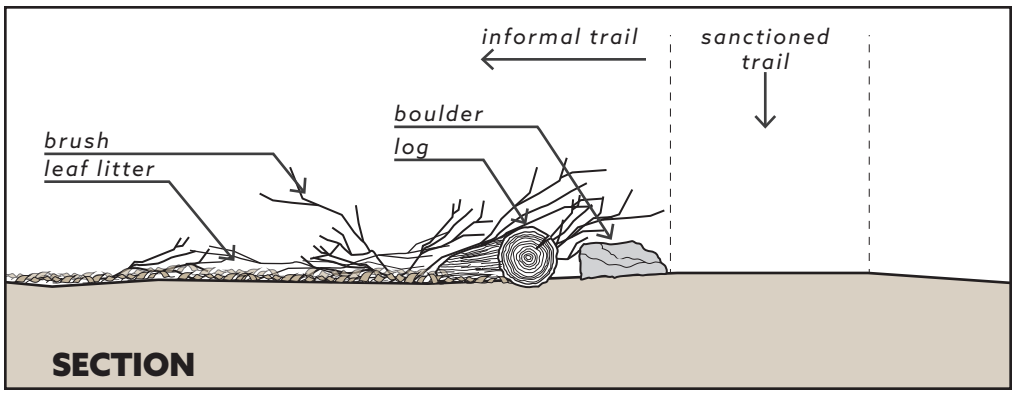
Utilize leaf litter and brush to hide the trampled soil surface so that it is not visible to passers-by.

Brush should be a diversity of materials: 4″+ diameter logs at the surface, smaller limbs and sticks piled above to increase volume and visibility, boulders at the trail junction, relocated leaf litter and small brush on the soil surface to reduce its visibility.

Heavier rocks and logs are less likely to be removed especially if they are heavy enough that they cannot be easily moved by a single person.

## DESIGN:




## EXAMPLE:

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