Best Management Practices for Crime Prevention Through Environmental Design (CPTED) in the Management of Natural Landscapes

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Background

The Green Cities Partnerships are a coordinated effort to restore, manage, and maintain the natural areas within urban centers around the Puget Sound region. In these partnerships, city government, local organizations, and community members work together so that their community can benefit from healthy and sustainable habitats within their city.

Residents do not experience urban natural areas in the same way. A narrow trail with dense vegetation may feel adventurous to one person and dangerous to another. Research has noted that there are conflicting views of urban vegetation (Wolf 2010). It is valued as an environmental asset yet can be readily implicated in providing cover for illegal or undesirable activity. Current science offers data and insights into both aspects. Managers of natural areas have the challenge of both maintaining and restoring healthy native habitat while ensuring that visitors are safe and that they also feel safe. There are many public safety issues beyond the scope of either urban or landscape design solutions. There are not any absolute solutions, we do know that proper planning, design (plant selection and placement in ecological restoration and habitat enhancement projects), and maintenance can help to reduce perceived and real threats to public safety.

Crime Prevention Through Environmental Design (CPTED) is an approach to deterring crime that was developed for the urban built environment. Based off the principle of designing spaces that reduce the opportunity and desirability for criminal acts, effectively applied CPTED principles can also make spaces feel more comfortable and safer to visitors. With thoughtful planting, intentional pruning, and careful weed removal, these principles can also be applied to managed natural areas.

While there is a lot written on applying CPTED principles to the built environment, little is written on applying them to the natural environment, especially with to managing vegetation. This document was created to provide Green City volunteers and partners advice for effective application of CPTED within their managed spaces. We intend for this to be a helpful guide for ground crews and volunteers working in the park and greenspaces and for project managers at the planning level.

CPTED Basics

The earliest authors of CPTED, and related ideas about crime and security, emphasized that people's psychological response to spaces and related behaviors were influenced by physical features. A multidisciplinary approach emerged that focused on using physical design elements to help deter crime in urban centers. After decades of installations and test cases the First Generation principles were expanded to Second Generation CPTED, which incorporates social and psychological theories (described in Appendix 2).

The main principles of First Generation CPTED are:

- **Natural surveillance**. Sight lines, the ability to see and to be seen characterized by spaces with a lack of obstructions or blind corners, and the creation of spaces that foster ease of social interaction.
- **Natural access control**. Design features which facilitate wayfinding through spaces and clearly define entrances and exits.
- **Territorial reinforcement**. The use of elements that identify specific functions of a site and provide visual indicators of what the place and its users are about.
- **Maintenance**. A visual message of care, attention and stewardship that can discourage undesired activity.

The concerns for public safety in urban built spaces are also present in urban natural areas that residents visit. Site damage from inappropriate uses, vandalism, encampments, property damage, and incidents of crime beset some of our green spaces and CPTED approaches are increasingly employed to address them. There are greenspaces in cities that are intended to be relatively "wild" and are without concerns for visitor experience. This document gives suggestions on how to manage vegetation along trails and natural area edges so that these public spaces align to CPTED principles.

Figure 1: Placing smaller scale plants at the front edges of planting areas provides a sense of open space and greater depth of view through the area (left). Large shrubs and trees planted too close to trail edges (right) leads to extensive pruning demands, often resulting in hard walls of clipped vegetation that detract from the visual experience and sense of safety.

A basic tenet for sustainable landscape design that can be applied to meeting CPTED goals is "right plant, right place." This means choosing plant species with the appropriate natural adaptations, growth habit, and mature size for the location. Trails that are well planned use well-placed sight lines and views to guide visitors through the site. Placing smaller scale plants at the front edges of planting areas or more formal planting beds provides an enhanced sense of space and greater depth of view into the plantings. Strategically placed trees can add definition to entrances and boundaries. Combining the basic principles of landscape design with the CPTED principles offers opportunities to achieve safety goals while preserving the amenities and benefits provided by naturalized vegetation.

CPTED Goals for Natural Area Vegetation Management

Traditional CPTED recommendations often discuss installing lighting, cameras, and fencing in spaces as a way to prevent unwanted activities. This guide focuses only how to install and manage vegetation in accordance to CPTED principles. Given these principles, goals for landscape management of urban green spaces that preserve the naturalistic character while providing for people's personal safety are:

- **Trees with high canopy.** Trees provide some of the greatest contributions toward environmental quality, habitat, and aesthetics than any other plant form. Urban areas planted with trees that have a high branching structure allowing for strong sight lines are associated with greater sense of safety and lower crime rates.
- **View corridors**. Open sight lines provide the ability to see and be seen at main entry points, along trails, and in other critical locations integral to natural surveillance.
- **Vegetation with transparency**. Plantings which are open and composed of plants with varied heights will allow for visibility through the vegetation and reduce opportunities for concealment.
- **Well maintained settings**. Providing a more intentioned level of care for trails, main entrances, and other critical locations will not only help manage vegetation for needed clearance and visibility, but also helps maintain a positive sense of attention and community.

Natural Area Planting for CPTED

Plant Selection and Placement

Random placement of native trees, shrubs, ferns and groundcovers without consideration of their position to trail edges and sight lines will create future maintenance problems. The same is true for allowing naturalized native plant seedlings that will grow too large for a given location to remain where they are. The concept of "right plant, right place" pays immense dividends when applied to the edges of natural area planting projects. Arrange plants according to their size, growth, and habit, as well as their natural adaptations for soil, light, and moisture conditions. Take lessons from observations of plant combinations in more mature plantings which could be successfully applied to new plantings.

Poorly designed plantings cannot always be remedied with pruning. Good plant placement in relation to trails can reduce or even eliminate the need for future pruning. A small sapling conifer or a small rose shrub will eventually command a very large area and can overwhelm trails and block sight lines. By the time they grow to a problematic size, it will be too late to make adjustments, and a costly plant removal is likely the only option.

Figure 2: Spreading, multi-stem shrubs and brambles like thimbleberry (left) can quickly overtake trail edges and require a lot of effort to maintain clearance and visibility. They should not be planted or allowed to spread within several feet of trail edges

Follow these basic tenets when installing a new set of plants:

- Place low growing species near trail edges
- Place larger shrubs and trees with an ample setback from trails and from each other (see following guidelines), at least 5 feet.
- Keep densely growing plants away from trail and forest edges.
- Adjust the placement of evergreen trees and shrubs to accommodate different visibility needs within the site:
    - Corners and entries need a broader view corridor
    - Trails are more inviting and safer when maintained with a sense of open space and good views of what is ahead.

Edge Friendly Plants

Place the lowest growing species closest to the edges, within 5 feet of the forest or trail edge. Combine ferns and shrubs with carpeting groundcovers. The edge zone is a good area to introduce a variety of woodland perennials for added visual interest and to serve as "living mulch". If goals include preventing people from entering sites or preventing weeds, edge friendly plants can be planted densely to create a clear boundary or to shade out potential weeds. Following is a selected list of edge-friendly choices.

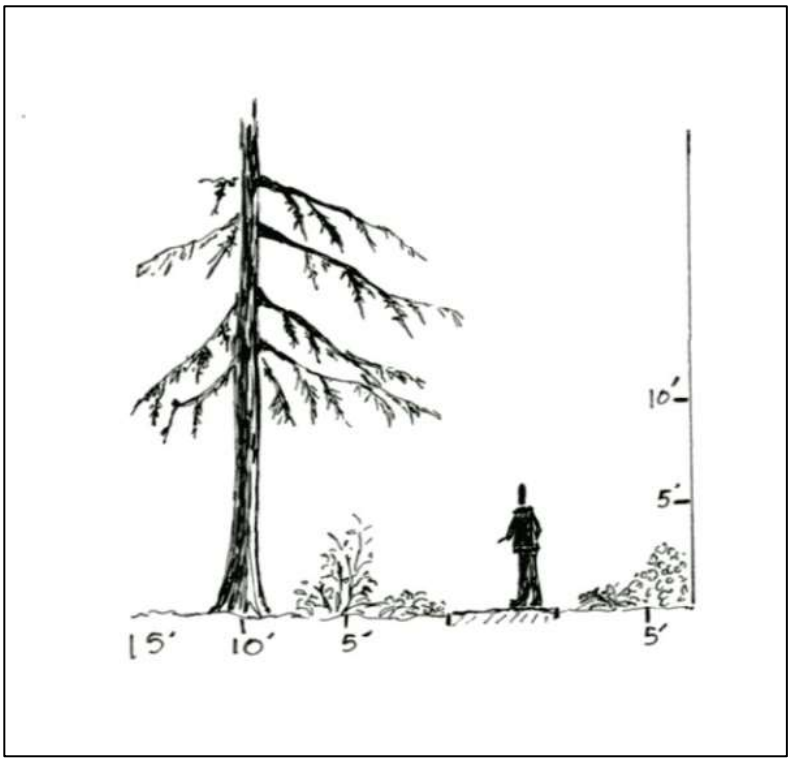


Figure 3: A sketch showing ideal plant placement along a forested edge or trailside. Low groundcovers grow within the first 5 feet of the trail corridor, medium sized shrubs grow sparsely at least 5 feet back, and trees are growing 10 feet back from the trail with branches trimmed up to 10 feet.

Figure 4: This corner bed at the intersection of two trails is planted with sword fern, low companion plants, and widely spaced tall conifers, allowing for a broad area of view.

Table 1: Edge-Friendly Plants to plant along trails and forest edges that require clear lines of sight.

	Common Name	Botanical Name	Type / size	Habitat	Notes
Low profile, spreading groundcovers	Kinnikinick	*Arctostaphylos uva-ursi*	Woody evergreen, 8" tall spreading mat.	Sun to light shade. Slopes. Well-drained soil.	
	Broad-leaf sedum	*Sedum spathulifolium*	Evergreen perennial, 4" height.	Sun to light shade. Slopes. Rocky edges. Well-drained soil.	Plant in early spring.
	Narrow-leaf sedum	*Sedum divergens*	Evergreen perennial, 4" height.	Sun to light shade. Slopes. Rocky edges. Well-drained soil.	Plant in early spring.
	Beach strawberry	*Fragaria chiloensis*	Evergreen perennial 6" height, spreading.	Sun to light shade. Slopes. Well-drained soil.	
	Woodland strawberry	*Fragaria vesca*	Evergreen perennial, 8" height. Carpeting.	Damp to dry open woodland.	
	Wood sorrel	*Oxalis oregana*	Deciduous perennial, 6" height. Dense, aggressive carpet can outcompete weeds and other low plants.	Damp woods beneath large trees.	Plant in early spring when in leaf.
	False lily-of-the-valley	*Maianthemum dilatatum*	Deciduous perennial, 4" height. Dense carpet.	Damp woodland beneath large trees.	Plant in early spring when in leaf.
	Fringecup	*Tellima grandiflora*	Evergreen perennial, 4" height with taller flower stalks. .	Damp to dry woodland.	
	Piggyback plant	*Tolmiea menziesii*	Evergreen perennial, 4" height. Spreading.	Moist woods and stream sides.	
Ferns	Sword fern	*Polystichum munitum*	3 to 5' height and spread.	Woodland sun to shade. Drought tolerant.	
	Deer fern	*Blechnum spicant*	1 to 3' height.	Moist to damp soils.	
	Licorice fern	*Polypodium glycyrrhiza*	1' height.	Moist mossy banks, rock, and logs.	
Graminoids	Wood rushes	*Luzula* spp.	1 to 2' height.		
	Merten's sedge	*Carex mertensii*	2 to 3' height.		

	Common Name	Botanical Name	Type / size	Habitat	Notes
Shrubs	Low Oregon grape	*Mahonia nervosa*	Evergreen shrub with prickly leaves, 1 to 3' height. Spreads by underground stems.	Open woodland shade, well drained soils. Slopes.	Can be slow to establish. Plant closely with herbaceous companions for shelter to improve establishment.
	Shrubby cinquefoil	*Potentilla fruticosa*	Deciduous shrub up to 3' x 3'.	Open sun and damp soil.	
Deciduous Herbaceous Perennials	Vanilla leaf	*Achlys triphylla*	Deciduous. 1' height. Carpeting.	Dappled shade.	
	Pacific bleeding heart	*Dicentra formosa*	Deciduous. 1' height. Spreading.	Dappled shade.	
	Fairy bell	*Disporum smithii*	Deciduous. 1' height.	Dappled shade.	
	False Solomon's seal	*Maianthemum racemosum*	Deciduous. 3' height.	Dappled shade.	Combines well with sword fern.
	Dwarf false Solomon's seal	*Maianthemum stellatum*	Deciduous. 1' height.	Dappled shade.	
	Oregon iris	*Iris tenax*	Deciduous. 8 to 18" height.	Sun to light shade. Damp to dry soils.	
	Wood rush	*Luzula campestris*	Evergreen. 2' height. Spreading.	Shade.	Combines well with sword fern.

A quick note on maintenance: Deciduous perennials may not be visible during winter months after the foliage dies down. Beware of adding thick wood chip mulch where perennial groundcovers are dormant, as it can readily smother them. Apply a couple inches or less of mulch as needed around perennials when they are visible.

Thoughtful Placement for Trees

Trees provide greater contributions toward environmental quality, habitat and aesthetics than any other plant form. Trees are long lived and their placement in relation to trails and infrastructure is especially important for long-term sustainability and safety.

Planting trees too close to trail edges can create problems with visibility, greater pruning demands, trunk wounds, and disruption of trail surfaces as buttress roots grow and expand. Tree wounds (including pruning wounds) are vulnerable to disease and eventual decay. New wood grows around injured areas which can reduce longevity and lead to future structural problems. Planting trees too close together can also lead to future problems; it creates competition, which can result in stunted growth or a heavy lean toward sunlight along trail openings. Proper placement can reduce the potential for tree injuries as well as the need to move or remove a tree that grows too large for its placement.

Planting trees at closer density is sometimes used to account for potential transplant loss. This method can be helpful provided someone follows up to remove or transplant crowded trees. There may be reluctance to remove mature crowded trees in the future. As an alternative, it can be helpful to plan for monitoring of tree establishment and to follow up with replacement planting as needed.

As a rule, the larger the mature size of the species, the greater the space needed between each tree and from built edges.

The following table provides information on potential mature sizes and optimal spacing for commonly planted native trees in the Puget Sound region.

Table 2: Recommendations for planting native trees in natural areas

	Common Name	Botanical Name	Habitat	Potential canopy radius	Minimal spacing on-center*
Conifers	True firs	*Abies spp.*	Sun.	10-15 feet. Horizontal branching habit.	10-15 feet.
	Douglas fir	*Pseudotsuga menziesii*	Full Sun.	15 – 25 feet.	15 feet .
	Western red cedar	*Thuja plicata*	Sun to light shade. Prefers moist soil.	15-25 feet. Typically retains lower branches.	20-feet from trails and structures.
	Western hemlock	*Tsuga heterophylla*	Sun to light shade.	15-20 feet.	15-feet.
	Sitka spruce	*Picea sitchensis*	Sun. Moist soils.	10-15 feet.	10 feet.
	Shore pine	*Pinus contorta var. contorta*	Sun. Drought tolerant.	8-12 feet, often irregular form.	8 feet.
Large Deciduous Trees	Black cottonwood	*Populus trichocarpa*	Sun. Prefers moist soil. Large trees are hazards.	10-15 feet.	15 feet.
	Bigleaf maple	*Acer macrophyllum*	Sun to part shade.	15-50 feet.	15 - 20 feet.
	Red alder	*Alnus rubra*	Sun.	10-20 feet.	10 feet.
Medium Deciduous Trees	Pacific dogwood	*Cornus nuttallii*	Shade.	10-15 feet.	10 feet.
	Bitter cherry	*Prunus emarginata*	Sun to partial shade.	10-15 feet.	10 feet.
	Cascara	*Rhamnus purshiana*	Sun to shade.	10-15 feet.	10 feet.
Small Deciduous Trees	Vine maple	*Acer circinatum*	Sun to deep shade.	10-15 feet.	6 – 10 feet.
	Western serviceberry	*Amelanchier alnifolia*	Sun to part shade.	8-12 feet.	6 – 10 feet.
	Scouler's willow	*Salix scouleriana*	Sun. Damp to dry soil.	8 – 20 feet.	6 – 10 feet.

*On center spacing refers to the distance center to center between tree trunks and between the trees and built edges such as trails, fences, buildings or parking areas. Some organizations use a standard 10-foot setback from trails for tree planting. This allows room for both the basal growth of the trunk and for the canopy spread of lower branches on young trees. As trees grow taller, the lowest branches can be gradually removed until the lowest lateral branches are above trail clearance height. There are less likely to be any pruning concerns for trees planted farther back from the trail than their anticipated potential canopy radius.

Thicket Forming Plants to Steer Away from Edges

Large multi-stem shrubs and brambles which grow wider through underground stems and/or readily root from branches touching the ground offer great habitat but are poorly suited for use close to trail edges. Their rapid dense annual growth can quickly overwhelm trail edges, require constant maintenance, and create visibility problems within a few years of planting. Some may send new growth up through trails, constraining them, ruining trail tread and causing footpaths to creep (See Figure 2). Their small size at planting can be deceiving. These types of plants are best planted where they have plenty of room to spread without crowding trails and other edges. Give them a healthy setback from trail edges to reduce pruning needs and protect important sight lines.

Table 3: Thicket forming plants to avoid planting along forest edges.

	Common Name	Botanical Name	Height	Notes
Bramble	Native roses	*Rosa spp.*	3 - 10 feet.	
	Salmonberry	*Rubus spectabilis*	3 – 10 feet.	
	Thimbleberry	*Rubus parviflorus*	3 – 8 feet.	
Shrubs	Tall Oregon grape	*Mahonia aquifolium*	3 – 10 feet.	Growth habit can be more tree-like in shade or spreading multi-stem habit in open areas.
	Snowberry	*Symphoricarpos albus*	1.5 – 7 feet.	
	Douglas spirea	*Spiraea douglasii*	3 – 7 feet.	
	Red stem dogwood	*Cornus sericea*	7-15 feet tall by wide	
	Shrub willows	*Salix* species	5 – 15 feet tall and wide.	

Resources for More Information on Native Plant Identification and Characteristics:

Krukeburg. A. 1996. *Gardening with Native Plants of the Pacific Northwest, 2nd ed.* University of Washington Press.

Pojar J and A. MacKinnon. 2004. *Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia & Alaska, revised*. Lone Pine Press.

Washington Native Plant Society Plants. 2018. www.wnps.org/plants.

Protecting New Edge Plantings during Establishment

Until they have had enough time to grow and cover the ground, new plantings along trails are vulnerable to being damaged by foot traffic. Here are some useful approaches to protecting them:

- **Take advantage of existing stumps or fallen logs.** Placing new groundcovers, ferns, perennials and other low growing plants close to existing stumps or logs will provide some shelter and protection.
- **Place sturdy wood stakes near young trees.** A stake may be a good idea in locations where the setback distance from the trail isn't enough to protect young trees from potential trampling. Stakes can be milled wood or made of sturdy branches. Don't tie trees to stakes, just place stakes near enough to prevent the tree from being stepped on.
- **Interpretive signage.** Simply worded signs such as "New plants growing, please stay off" can help inform the public about staying on trails and about the purpose for the temporary fences.
- **Strategically placed large woody debris.** Arrange small logs and large fallen branches in a random fashion along the trail edge and near young plants. This technique can also help define the boundary between a trail and planting beds where it may not be clear. Materials need to be large enough to deflect foot traffic while also blending in as a natural element. Use this as a last resort as decomposing woody material can cover trail tread and lead to maintenance and drainage concerns.

These techniques also convey the two CPTED principles of territorial markers and evidence of maintenance.

Figure 5: Strategically placed large woody debris like the log in this photo help protect new plantings from trampling.

Figure 6: Two examples of interpretive signage.

Natural Area Pruning for CPTED

Good stewardship is necessary where native trees and shrubs meet the edges of trails, roads, parking lots, and adjacent property. These

plantings provide important environmental functions, including wildlife habitat and storm water interception. They are generally expected to look natural, not manicured. They should not interrupt lines of sight, making the space feel unsafe.

The choice of pruning methods not only affects the look, but also impacts how often pruning will be needed, the density of new growth after pruning, and how well the plants fulfill their environmental functions.

The common practice of shearing and tipping branches along boundary edges typically results dense growth at that edge, which is the opposite intent of this action and it demands more frequent pruning. Pruning according to the natural habit of each plant type will prevent this. The benefits include:

- Maintenance of open vegetation structure near trails and other edges of natural areas.
- The look of being "untouched by human hands".
- Preserved habitat functions of edge plants.
- Optimal environmental functions in the interception and infiltration of rainfall.
- Less future pruning!

Introduction to Pruning

How Woody Plants Grow

Understanding a few principles of how plants grow is a vital first step toward effective pruning practices.

Plant Physiology Related to Pruning

Growth concentrates at the highest point of the plant. Growth in height and length originate at the apical buds located at branch tips. Apical dominance is the suppression of growth in lateral buds and branches below the growing branch tip. This is largely controlled by plant growth regulators called auxins which are concentrated at the highest points in the plant. The farther down the stem, the less auxin and the less shoot suppression. We can see the effects of apical dominance when a stem bends over in a strong arc; auxins and apical dominance move to the high point of the arc, releasing the growth of vertical stems from that point. Pruning can change the location of apical dominance, whether productive or unproductive for management goals.

Wounds do not heal. New layers of wood grow to surround woody stems each growing season. This growth originates from the bright green layer of cambium cells just below the bark. This is also where the xylem and phloem cells that move water and other materials through the plant are located. Wounds, including pruning cuts, will remain in that year's layer wood for the life of the plant. They do not heal, but grow new layers of wood around and over the injured area. Old wounds, particularly larger wounds, can become future locations of decay. In addition, dormant buds may jump into action to provide replacement shoots and leaf area.

Natural Growth Habit

The size and form of each plant species is determined by genetics and environmental conditions. Particularly in natural area plantings, pruning that matches the natural form and structure of the species will produce the best results in the long run. Take a good look at how the plant grows for clues on how to best prune it:

Trees have a permanent architecture of a main trunk, large scaffold limbs and lateral branches. Many conifers mature with a strong central leader while deciduous trees lose their central leader as they develop a broader spreading branch structure at maturity.

Shrubs may be multi-stemmed with new stems originating from the roots or tree-like with one to a few well branched main stems. Cane growers form thickets of long, thin stems (*Rosa spp., Rubus spp*). Most shrub species will regenerate well with new growth from the roots.

Pruning and Seasonal Growth Cycles

Pruning can be done year round take advantage of but it is important to use seasonal growth cycles to meet your pruning goals.

Dormant season pruning (December through March) will promote vigorous shoot growth. Energy reserves are at their peak. Plant structure and pruning needs are easy to see. This is the time of year for hard pruning to stimulate strong new growth. As a general rule, the harder the pruning at this time of year, the stronger the response. Modest pruning at this time of year is useful for training young plants and for maintaining form. If managing size or avoiding the development of excess shoot growth from dormant buds (watersprouts and suckers) is important, avoid pruning in winter and prune lightly in summer instead.

As the growing season progresses, the main flow of energy shifts away from growing points and toward storing carbohydrates in the stems and roots. There is generally less available moisture and less shoot expansion in the latter half of the growing season.

Summer pruning (about mid-July through September) results in a subdued growth response. This is an optimal time for light pruning to remove problem branches and to manage size. Heavy pruning in summer can harm plant health and should be avoided on valued plants. Avoid pruning live branches during periods of high heat or if plants are drought stressed.

Light pruning that removes about one-quarter or less of live tissue as well as the removal of dead branches can be done just about any time of year without significant impact to plant growth responses.

Bird nesting season in this region is typically March through June. Avoiding heavy pruning during this period meets both the goals of vegetation management and avoiding nesting season disturbances.

Types of Pruning Cuts and Growth Response

Productive Pruning Cuts

Using a combination of reduction and removal cuts will reduce the overall branch density, allowing greater light and air circulation through the canopy. This approach is useful for maintaining some "transparency" though plantings. Healthy plants will respond to the injury of a pruning cut with new growth. Choose the right cut at the right location to promote new growth that meets your pruning objectives.

Reduction Cuts shorten the length of a stem by cutting to a lateral branch large enough to serve as the new, shorter leader. Choose a lateral branch that is at least one-third the diameter of main stem.

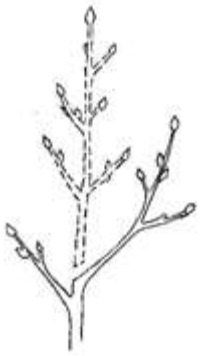


Figure 7: Example of a reduction cut.

Resulting growth response:

- Apical dominance is maintained with the selected new leader.
- New growth tends to be more moderate and natural form is preserved while size is reduced.
- NOTE: If a reduction cut is made at a lateral that is too small in diameter, the growth response will be like that from a heading or topping cut.

Figure 8: Example of a removal cut

Removal Cuts are used to remove an entire branch at its point of attachment. These cuts are made at the **branch collar** on trees and larger shrubs, and down to the root crown for multi-stem shrubs and cane plants.

Resulting growth response:

- Natural plant structure is maintained.
- On trees and large shrubs, depending on which branches are removed, the canopy will be higher or less dense.
- A ring of callus (woundwood) develops around the circumference and eventually over the face of the pruning cut.
- New shoots will grow from the root crown area.

Removal cuts are often on large weight-bearing branches. Use the **Branch Collar Cut** to reduce injury to the plant:

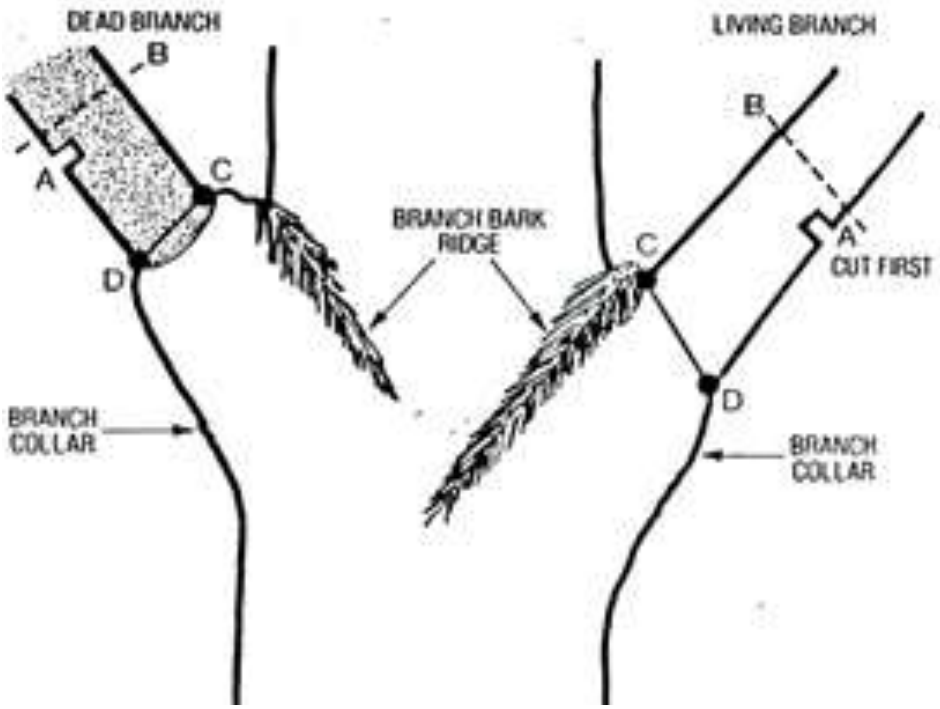


Figure 9: Example of branch collar cuts. The finish cut is placed at C—D to keep the branch collar intact. The result is a smaller diameter wound and better callus growth than a cut made flush to the trunk. Cut A—B is critical to remove the weight of the branch and avoid tearing of the bark into the branch collar. (Diagram: USDA Forest Service)

In general, expect new growth to emerge nearby the cut. If cuts are concentrated near branch ends, so will new shoots. If a long branch from a multi-stem shrub is pruned back to the ground, new growth will emerge from the roots or base of the plant. When a tree branch is removed at the trunk, new growth will be in the form new wood growing around the wound, and in certain species, from nearby dormant buds.

Counter-Productive Pruning Habits

Shearing, heading and topping cuts are often considered easiest and quickest. However, they are all generally counterproductive to CPTED and habitat planting objectives. In the long run, plants that are sheared, headed or topped will demand greater management attention than plant which are pruned to their natural structure.

Heading Cuts lop the ends off of branches near buds or randomly. Shearing is a form of making heading cuts.

Resulting growth response:

- Apical dominance in the stem is broken.
- Initially size reduction is likely to be short lived as vigorous new shoots develop near the cut end.
- Branch density increases
- Natural plant structure is lost.

Figure 10: Example of a heading cut. Next season's growth will vigorously emerge from the bud close to the cut

Figure 11: Example of a topping cut.

A topping cut is a heading cut made to stems and trunks greater than 2 years old and/or ½-inch diameter.

Resulting growth response:

- Apical dominance is broken.
- Vigorous growth from existing and dormant buds near the cut.
- New shoots are weakly attached.
- Natural plant structure is lost.
- Tree architecture is permanently damaged.
- Poor to no callus wood is formed.
- Cut ends remain exposed to the elements and are prone to future decay.

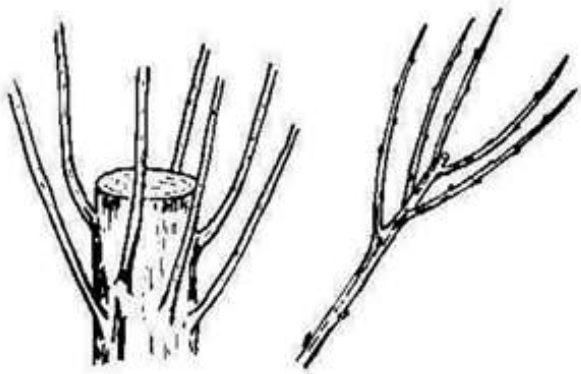


Figure 12: Growth response of topping and heading cuts.

Pruning Tools and Uses

By-pass (scissor) style blades on hand pruners, loppers, and pole pruner heads provide the best quality finish cuts for pruning. Anvil style blades have a straight blade that cuts against a flat metal anvil which can crush and damage plant tissue.

Handheld Tools: A set of **sharp loppers, hand pruners, and a small pruning saw** can effectively handle many important pruning tasks along trails. Use:

- **Hand pruners** for branches up to ¾-inch diameter.
- **Loppers** for branches up 1.5-inch diameter, sometimes larger depending on the size of the cutting head.
- A **pruning saw** with tri-edged teeth that cut on the pull stroke. This type of hand saw can be amazingly effective at removing branches up to a few inches in diameter.

Figure 13: Common pruning tools from left to right: Loppers, hand pruners, and a pruning saw.

Pole tools: These are valuable to extend your reach without needing a ladder. They can also be useful to reach into beds to make small cuts without having to step in. Some have extendable pole lengths. Due to safety concerns, pole tools should only be used by trained staff and not offered as a tool to volunteers.

- **Long-arm pruners** have a cutting head similar to hand pruners, which is activated with a pistol grip at the base of the pole.
- **Pole pruners** typically have a larger cutting head with capacity similar to loppers and are operated with a pull cord.
- **Pole saws** are useful for removing low hanging tree branches. They can be awkward to handle and don't work well for making reduction cuts.

A specially designed **root saw** has a strong stiff blade and tri-edged teeth for cutting roots and branches at soil grade. It is useful for cutting out stems and root crowns to reduce the spread of multi-stem, colonizing shrubs and cane growers along trail edges.

Figure 14: Example of a root saw.

While not initially considered a pruning tool, a sharp **shovel** is useful for removing dense growth of multi-stem, colonizing shrubs and cane growers along trail edges. Digging out and/or transplanting plants that are too large or crowding trail edges is more effective and long lasting than pruning alone.

Power equipment including chainsaws, string trimmers, and mowers used by trained operators may be needed for work on larger scale plants and areas. Volunteers should not be using powertools.

General Pruning Principles to Meet Natural Area CPTED and Habitat Objectives

Following are three guidelines to meet the goals for safe and productive natural areas:

1. Avoid shearing and heading cuts in line with the width of the trail

- It creates dense growth at that boundary and reduces visibility and sight lines.
- Frequent pruning is needed to manage resulting dense new growth.
- This technique results in the look and function of a tightly manicured hedge.
- Species which are intolerant of shearing will gradually die back.
- Repeated shearing and heading can compound drought stress impacts.
- Consider plant replacement or renovation pruning every 10 years or so.
- Provides low quality bird habitat.

Figure 15: Example of CPTED unfriendly trailside plant maintenance.

2. Remove plants which are too large for their location and encourage plant types that are the right size for that location.

- Pruning cannot fix a plant that grows too large for the given location.
- Remove seedlings of large growing plants that crop up in locations where they will block sight lines or grow into the trail.
- Native plants dug up during the dormant season may be transplanted to better locations at the same time.

Removal of the hardhack at this bend in the trail and replacement planting with lower growing species would improve sight lines and greatly reduce ongoing pruning needs.

Figure 16: Example of a trail with dense and large plants growing too close to the edge.

3. Use reduction and removal cuts to keep branches clear of trail edges.

- Thinning branches out helps maintains both size and open-density allowing for natural aesthetic and some lines of sight through shrubs.
- Pruning cuts should be intentional and well placed to match natural form.
- Less frequent pruning is needed when this is done correctly.
- This technique preserves the normal look and function of native plant species.

Shrubs pruned to natural form and for trail clearance.

Area closest to the trail is maintained with low growing plant species.

Figure 17: Example of a well-planted and a well maintained forested edge for meeting CPTED principles

Species-Specific Considerations

Ferns and Perennials

When ferns and larger perennials grow over trail edges, transplanting them to a location farther back from the edge is the most effective long-term solution. Transplanting is best while ferns are still dormant in the early spring. Consider dividing ferns if transplanting.

Cane-like Shrubs

These are mostly thicket-forming plants with thin, upright stems which can grow up to 5 or 6-feet tall.

As a group, they should not be planted or allowed grow within 6-feet of trail edges (see previous sections on planting for more information). They are tolerant of hard pruning and cutting all the growth down to ground. However, pruning to manage size in these locations is difficult at best. Rather than pruning these plants along trail edges, it is best to dig them out and replant that zone with smaller scale plants.

Examples include *Rosa* species, *Rubus* species, and hardhack (*Spirea douglasii*)

Figure 18: This thicket of native rose is aggressively growing into the trail and blocking sight lines. Removing this shrub and replanting with something lower will open up the trail and create a safer space.

Multi-stem Shrubs

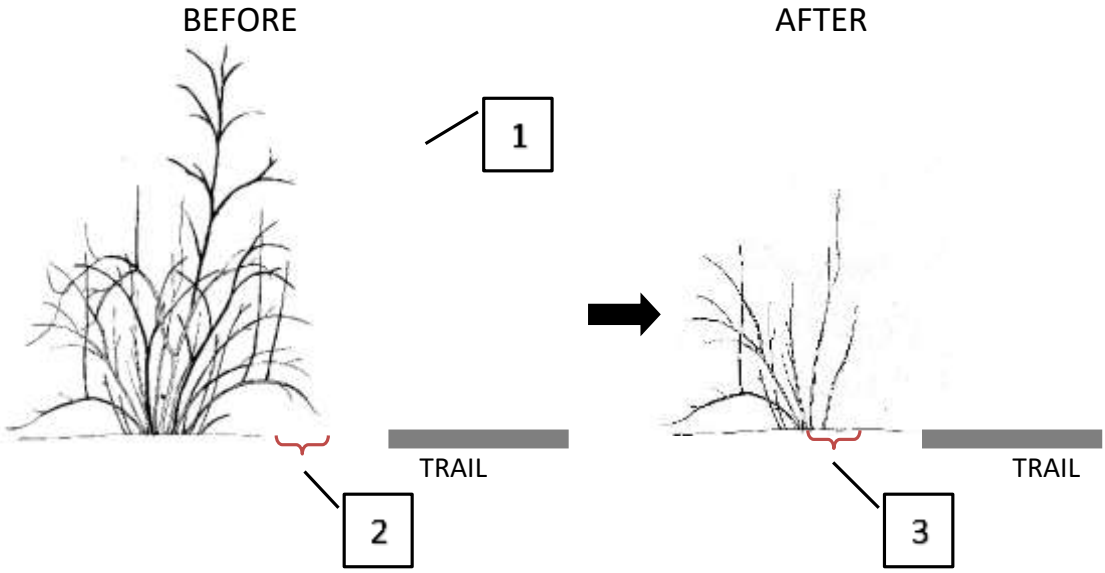
Some shrubs generate new stems from the root system. These can grow in distinct clumps (mock orange, western azalea) or spread via underground stems (snowberry, Oregon grape). The stems of some species may develop a more tree-like growth habit (red-flowering currant, red huckleberry) and can be pruned as described for trees. Multi-stem shrubs can have arching stems (oceanspray, oso-berry) or generally vertical stems (tall Oregon grape, western serviceberry).

Examples Include**:**

Salal
Evergreen huckleberry
Tall Oregon grape
Low Oregon grape
Silk-tassel bush
Western serviceberry
Red-osier dogwood
Oceanspray
Mock-orange
Western azalea
Twinberry
Oso-berry
Red huckleberry
High bush cranberry
Western blackhaw
Shrubby cinquefoil
Gooseberry
Devil's club
Shrub willows

The key common characteristic for pruning multi-stem shrubs is that they all generate new stem growth from their roots.

- **Use reduction and removal cuts for trail clearance and to maintain open-density**.
- **Remove strongly leaning or overhanging stems by cutting them back to ground level**. When stems are cut to a location several feet back from the trail edge, pruning should not be needed for another three to five years, about the time it takes for new stem growth from the roots to reach the trail edge.
- **Staged renovation of older shrubs can be done to reduce overall size and improve sightlines.** Remove the largest and oldest stems and retain smaller younger stems. Fifty-percent or more of the live stems can be removed with this method. At the time of pruning, the remaining stems should be smaller than the desired boundaries to allow some room for growth.
- **Severely overgrown plantings can be started over** through drastic renovation by cutting entire plants down to soil grade during the dormant season. This is helpful when growth has gotten too dense for effective selective pruning.
- **Some species can be managed for size by cutting them back to ground level periodically** when the overall height of the planting reaches the maximum desired height and would exceed that height the next growing season. This can be done with power equipment for large scale beds. This technique can be effective for red-stem dogwood, snowberry, twinberry, tall Oregon grape, and salal.



1. Identify the branches that are blocking the trail and critical sight lines.
2. Remove entire branches to soil line or close to the soil line on a major branch.
3. Avoid leaving stubs, these are like short topping cuts that may produce multiple shoots.

Figure 19: Pruning a multi-stem shrub for visibility

Tree-like shrubs

These may have a single main trunk or a clump of multiple trunks with a growth habit more similar to trees. They are generally best pruned as described for trees. Some species are tolerant of renovation pruning.

Examples: red-flowering currant, western rhododendron.

Trees

Because of their close proximity to people, trees growing near trails and other highly occupied areas need some extra attention not typically needed for trees farther within natural areas.

Two important pruning practices for young trees are:

1. Early training for future overhead clearance over trails. By gradually removing the lowest branches when they are less than two-inches in diameter, trees will develop a stronger trunk and branch structure. Cut branches from all the way around the trunk. Place cuts at the branch collar and don't leave stubs. The remaining branch area after pruning should cover at least two-thirds of the total height of the tree.

Figure 20: When the ends of low tree branches are clipped off near the trail edge (left), the growth gets denser near those pruning cuts. After repeated clipping, stubbed off branches on conifers often die. When lower branches are removed early (right), the small pruning wounds close over quickly and sight lines around the tree are kept open.

2. Correcting co-dominant leaders. This is a common point of structural failure due to the weak connection resulting from the embedded bark between multiple leaders. It is a concern for deciduous trees and conifers alike, whether the trunks divide at ground level or higher up. The resulting crowded growth is also problematic for maintaining desired open canopy density near trails. Look for and correct co-dominant and multiple leaders at planting and during the early years of establishment when hand pruners and small saws can be used to remove the extra leaders.

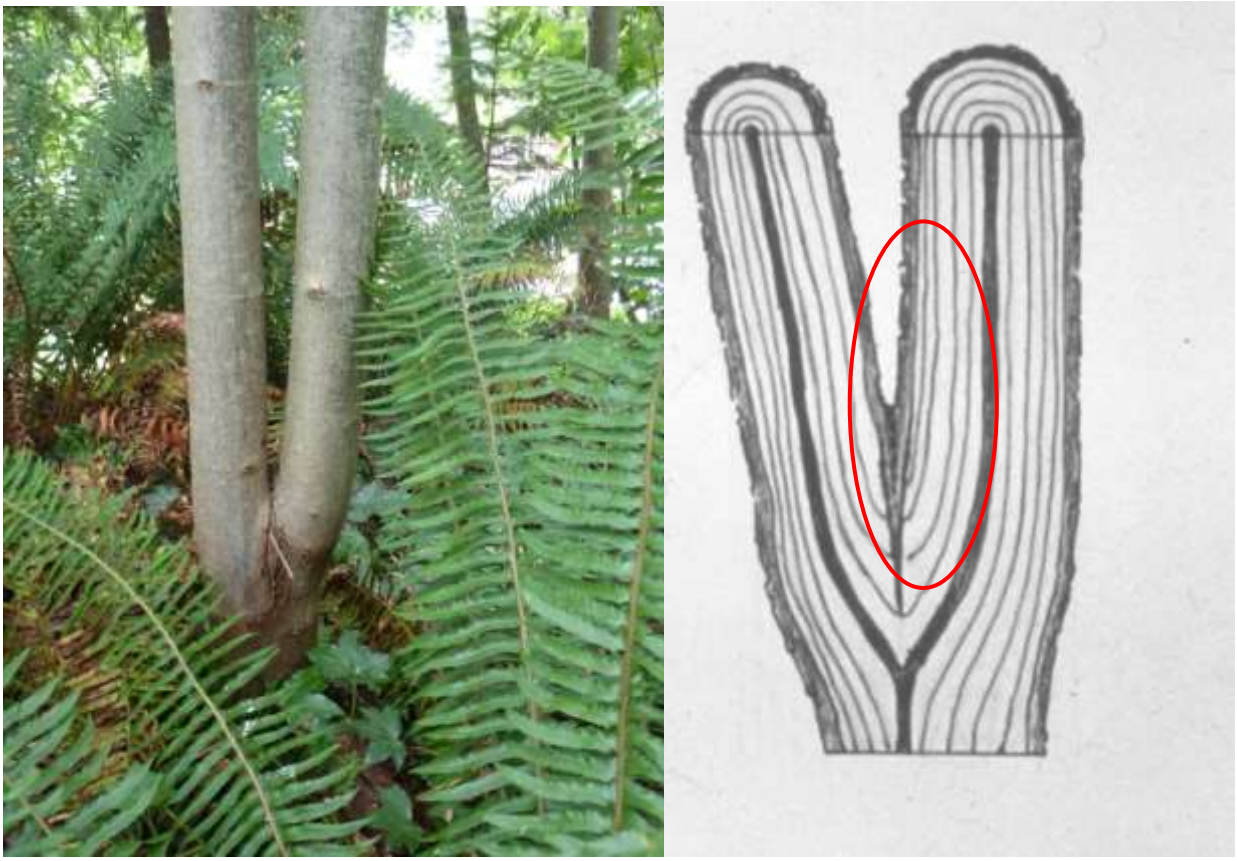


Figure 21: The tree on the left has been allowed to grow with two co-dominant leaders. As the leaders grow, embedded bark between the leaders (right) weakens their structure leading to early tree failure. Correcting co-dominant leaders early can prevent this.

Ultimately, providing a planting setback of at least 10-feet from trails for most species of trees will help avoid most future problems and pruning demands.

Conifer trees:

Conifers have a strong pyramidal shape when young. Branches can die back from excess shade. They will not break new growth from older stems and are not tolerant of hard pruning.

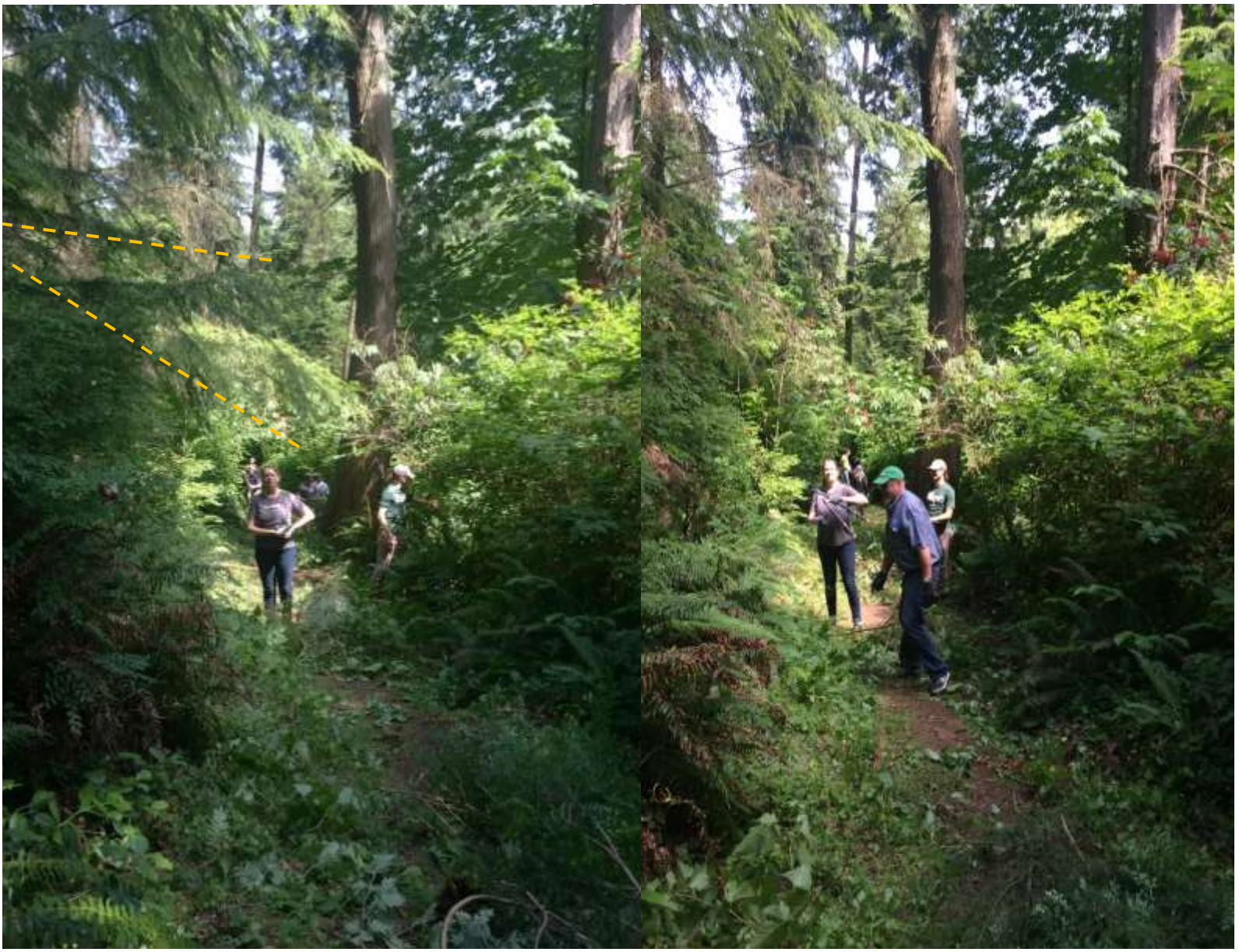


Figure 22: Pruning is needed for the tree branches overhanging the trail (left, yellow dashed lines. The two branches were pruned at the branch collar (right) with a pole saw. No future pruning of this same tree for clearance should be needed.

Broadleaf trees:

Evergreen Pacific madrone and deciduous broadleaf trees generally develop with a strong central leader while young and develop a broad spreading crown with age. Like with many shrubs, they readily break new growth from dormant buds in older stems. Leaving branch stubs often leads to clusters of vigorous shoot growth as seen after topping and heading cuts; place cuts at branch collars and well-sized lateral branches to avoid this problem.

Broadleaf trees in the Pacific Northwest region generally prefer full sun. They can sometimes send large leaders at angles to "follow" the light and lean into trails when growing near forested edges and are competing with nearby trees for sunlight. When this occurs with trees such as alders, willows, it is usually most effective to remove severely leaning young trees back to the base. This can also serve to release other plants growing nearby the trail. Pacific madrone is an exception in this regard, as a leaning, but strong, growth habit is common to the species.

Figure 23: Sometimes severely leaning trees that block trails cannot be saved with pruning and must be removed.

Natural Area Maintenance for CPTED

General Maintenance

Well-maintained natural areas indicate care and create a sense of ownership. Address vandalism and garbage promptly. Locations where there is a visible presence of care and attention are less likely to appeal to criminal elements and they will make visitors feel safer.

Well-cared for areas with good lines of sight will attract more visitors and will reduce potential for criminal activity.

Invasive/Unwanted Plants

Learning to recognize unwanted species when they are young and easily extracted from the ground is a vital management tactic. At the very least, they should be removed before they have the chance to flower and start producing seeds.

Common invasive trees and shrubs that establish in natural areas include English holly (*Ilex aquifolium*), cherry laurel (*Prunus laurocerasus*), Portuguese laurel (*Prunus lusitanica*), European mountain ash (*Sorbus aucuparia*), English hawthorn (*Crataegus monogyna*), butterfly bush (*Buddleia davidii*), and Scotch broom *(Cytisus scoparius)*. They compete with desired vegetation and create shrubby monocultures if left to grow too long. Consult with local counties or conservation districts for recommendations for best management practices for removal.

Although they are not invasive species, seedlings of some of our native trees and shrubs can become weeds when they crop up in locations where they might smother out desirable plants or aggressively encroach into trails and critical sight lines. Black cottonwood, red alder, salmonberry, and hardhack are examples of native species which often seed into openings in woodland areas and which can result in conflicts. These and any other larger growing native species which spread or seed into “low vegetation” zones should be removed while they are small (less than an inch trunk diameter for trees).

Herbicides (applied by a certified professional) may be a useful tool for removing large quantities of unwanted vegetation.

Planning

Following the recommendations in this guide for proper planting will not only create natural spaces that feel safer and more inviting, but can also reduce the amount of maintenance required. For example, more thoughtful planning and pruning of shrubs can ultimately result in fewer and quicker pruning needs. Proper placement and translocating of plants may eliminate the need for pruning maintenance altogether.

Challenges and Opportunities for Vegetation Management

Breaking from routines and trying new and unfamiliar methods pose challenges for individuals and work teams alike. The new method may feel counter-intuitive to what they are accustomed to or like it does not fit in the scope of a work plan.

Each natural area site has its own set of conditions and stewardship challenges that may not neatly fit into the examples and recommendations included in this manual. These basic techniques can be built into the routine stewardship for a wide range of conditions and situations. The following are recommendations for incorporating these techniques into a workplan:

Start small. Choose a manageable spot to do some trial and error practice to fine tune the optimal methods for your site and work team. Build on what's successful in incremental steps toward a larger scale.

Keep records of the dates, the time required, and the tools used. Take before and after photos the day of work and then again later in the growing season. Also take photos of areas not addressed or done with existing techniques. Photo records are easy to take and are incredibly informative. By tracking the data and using the photos for reference, you will have good information to guide future work efforts and to train others.

Communication and education is vital. Training in the planting and stewardship methods for CPTED in natural areas is critically important for success, especially for incoming workers, volunteers, and seasonal staff who are likely to be unfamiliar with the techniques. Ongoing communication and training are also important for more seasoned workers to reinforce use of preferred methods, build on lessons of past efforts, and to foster greater coordination for consistent results throughout a work team.

Be patient. At first, the tasks of selective pruning and organizing plants by future size for trailside areas can appear too time consuming or expensive to be worth the effort. The field experience of those utilizing the kinds of methods covered in this manual validate the proactive approaches to plant placement, pruning, and selective plant removal along trailside plantings. As with many new jobs, it can be a bit more difficult and time consuming the first time through. This is the value of beginning with a small area or a single component. After the initial years of changing over to selective pruning and plant removal along trail edges, the frequency and amount of work required will be reduced. In addition, the character of the plantings will develop more naturally and be somewhat more self-sustaining over time as the plantings mature.

Glossary

Apical buds: Buds located at the tip of a branch.

Apical dominance: The phenomenon by which the central leader is dominant over the lateral branches, allowing the plant to grow vertically.

Auxin: A plant hormone that regulates plant growth.

Branch collar: The ring around the base of a branch where it shoots out from a larger branch, which is typically wider in diameter than the rest of the branch.

Branch collar cut: A pruning cut placed above the branch collar in order to create a smaller surface area wound, which can prevent excess water loss and tree stress.

Buttress roots: The lateral surface roots that aid in stabilizing a tree.

Callus: A hard formation of new tissue over and around a wound

Cambium: Vascular tissue that divides to produce xylem and phloem and is responsible for increasing the girth of plant stems and branches.

Cane growers: Shrubs with annual growth or "canes" emerging from a central root crown. Canes may or may not be perennial.

Central leader: A dominant stem located more or less in the center of the crown.

Co-dominant leaders: When a tree has two leaders that are similar in height and diameter and originate from the same point.

Colonizing shrub: Shrubs that are able to colonize adjacent areas with new stems that grow up from a spreading root system.

Deciduous perennial: A plant that dies back at some point in the year, typically fall or winter, and re-sprouts from its roots during the next growing season.

Dormant (dormancy): A period during the year when activity is temporarily stopped to conserve energy when environmental conditions are not right for a plant to grow. For most plants in the Pacific northwest, this period happens during the late fall and early winter.

Finish cut: The cut that completes the removal of a branch.

Growth habit: The shape, growth rate, mature size, and branching structure of a tree without pruning.

Heading cut: A type of pruning cut that severs a shoot or stem that is no more than one year old, back to a bud; cutting a stem back to a lateral branch less than one-third the diameter of the cut stem; cutting a stem of any diameter to a node (the assumed position of a bud).

Heavy pruning: Removing more than 50% of live foliage on young trees, 25% on medium-aged trees, and 10% on mature trees at one time.

Lateral branch: A stem growing from an older and larger stem.

Light Pruning: Removing less than about 20% of the foliage on young trees, 10% of the foliage on medium-aged trees, or 5% of the foliage on mature trees.

Line of sight: A straight line along which an observer has an unobstructed view.

Mature tree: A tree that has reached at least 75% of its final height and spread, but is not declining due to old age.

Monoculture: When one species is severely dominant in a given area. This can lead to weakened ecosystem resilience.

Open vegetation structure: A structure of a shrub with lots of space between branches, promoting healthy growth and allowing some lines of sight through the shrub.

Perennial: A plant that persists for many growing seasons. See also **deciduous perennial**.

Phloem: Vascular tissue that transports energy produces in the leaves to other parts of the plant.

Pruning: removal of plant parts.

Reduction cut: A type of pruning cut that shortens the length of a branch or stem back to a live lateral branch large enough to assume apical dominance – this is typically at least one-third the diameter of the cut stem; cutting back a stem to an existing, smaller, lateral branch that is large enough to prevent bark death on the retained lateral branch.

Removal cut: A pruning cut that removes a branch back to the trunk or parent stem just beyond the branch collar.

Renovation pruning: Cutting a shrub back to the ground in order to encourage healthy, vigorous growth in the next growing period.

Root crown: The base of the trunk where roots and trunk merge that becomes swollen as trees grow.

Scaffold limb: A permanent branch that is among the largest in diameter on the tree.

Shearing: Shaping a plant with heading cuts to branches that are no more than one year old to form a defined, smooth surface.

Social ecology: The study of the relationships within and between the environment and people with a focus on social, cultural, physical, institutional, and cultural contexts of these relationships.

Suckers: Fast growing shoots that develop from the roots of a plant or the trunk below the root collar.

Tipping: Similar to topping except heading cuts are made through smaller-diameter branches on the edges of the crown.

Topping: An inappropriate pruning technique used to reduce the size of a tree by making heading cuts through a stem more than 2 years old. It destroys tree architecture and causes discoloration and decay on cut branches.

View Corridors: Open spaces that provide unobstructed lines of sight.

Water sprouts: Fast growing shoots that develop from dormant buds on a tree's trunk or branches.

Wound wood: a very tough, woody tissue that grows behind a callus and replaces it in that position. When wound wood closes wounds, then normal wood continues to form.

Xylem: Vascular tissue that moves water and nutrients up the stem of the plant from the roots.

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Landscaping for Wildlife

Seattle list of native plants best for natural area edges

Wolf, K.L. 2010. Crime and Fear - A Literature Review. Accessed 10 February 2019: Green Cities: Good Health, University of Washington: http://depts.washington.edu/hhwb/Thm_Crime.html.

Appendix 1: Tree Training Cue Card

Tree Training Cue Card

Trees that grow to be large are more structurally sound and cost-effective to maintain when trained with a central dominant leader that extends 30 feet or more into the crown (Fig. 1, left). Vigorous, upright branches and stems that compete with the central leader can become weakly attached (Fig. 1, right).

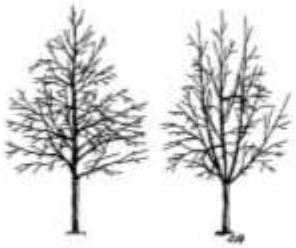

Figure 1. Good tree structure (left); poor structure (right).

Trees with branches spaced along the central leader, or trunk, (Fig. 1, left) are stronger than trees with branches clustered together (Fig. 1, right). Prune newly planted trees to one central leader by shortening competing stems (Fig. 2). All branches and stems should be shorter than the central leader after pruning is completed (Fig. 2, right).

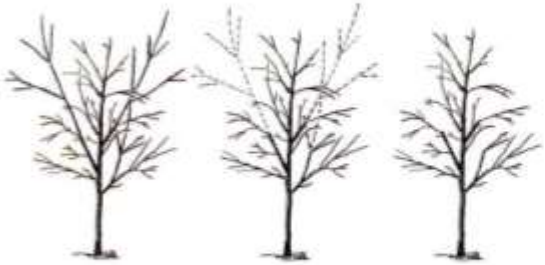

Figure 2. Shorten competing stems to improve structure.

Shorten or remove branches that are larger than half the trunk diameter at planting and every few years thereafter. Shorten them by cutting back to a live lateral branch (Fig 3, top drawing). This lateral branch should be pointed away from the trunk and it should not be growing upright. The central leader should be more visible in the crown center after pruning. Only large-diameter branches need to be pruned because they compete with the leader and could be weakly attached (Fig 3, L). Small branches (Fig. 3, S) do not need pruning because they will not compete with the leader.

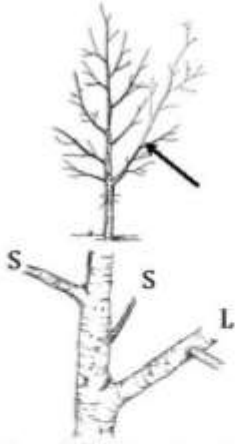

Figure 3. Only large branches need pruning (L). Small branches (S) do not need to be pruned.

Shorten the largest low branches when the tree is young to keep them small (Fig. 4). These shortened branches may be removed later for clearance; removing small branches creates smaller wounds with less likelihood of decay.

Figure 4. Shorten larger low branches to encourage growth in the leader and improve tree structure.

The best way to shorten large or long stems and branches is to cut them back to a live lateral branch (Fig 5). This slows growth on the pruned parts and encourages growth in the dominant leader creating sound structure.

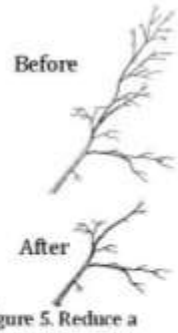

Figure 5. Reduce a stem back to a live lateral branch to slow its growth.

Remove larger branches by making three cuts (Fig. 6). This prevents the bark from peeling or splitting off the trunk below the cut. Make the final cut back to the branch collar (enlarged area around union of branch and trunk).

Structural Pruning Checklist

1. Develop and maintain a central leader.
2. Identify the lowest branch in what will become the permanent crown.
3. Prevent branches below the permanent crown from growing larger than half the trunk diameter.
4. Space main branches along the central leader.
5. Reduce vigorous upright stems back to lateral branches.

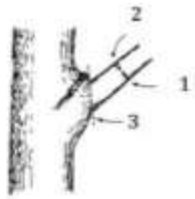

Figure 6. Remove large branches using three cuts.

Pruning Safety

Prune from the ground using proper tools and safety equipment. Do not prune near power lines.

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Appendix 2: Social Dimensions of CPTED

The earliest authors of CPTED, and related ideas about crime and security, emphasized that within built environments people's psychological response and related behaviors were influenced by physical features. First concepts of CPTED focused on theories of social dimensions. In time the principles of CPTED became embraced by law enforcement and urban planners and applied as design rules. A 1997 CPTED conference presentation introduced the notion of Second Generation CPTED, and encouraged practitioners to reconsider the social ecology origins of CPTED, including sociological and psychological dimensions of people in public space.

CPTED relies upon the conditions of an environment that will subtlety nudge an offender to make certain behavioral decisions. Criminal behavior research shows that the decision to offend or not is more influenced by the perceived risk of being caught than by possible reward or ease of entry. Certainty of being caught is a major deterrence for criminals, less so the severity of the punishment. CPTED practices are meant to discourage crime, while at the same time encouraging legitimate use of an environment. Given the complexity of crime and undesirable behavior, thinking about the social dimensions of a place should always be a part of the CPTED process.

Success requires community help. In her 1961 book Jane Jacobs interpreted many facets of city life and urban planning practices. She coined the term 'eyes on the street', noting that 'public peace' was not kept primarily by the police, but by the 'intricate, almost unconscious, network of voluntary controls and standards among the people themselves, and enforced by the people themselves.'

Social Dimension CPTED Principles

The main principles of 2nd Generation CPTED are:

Social Cohesion. The goal is to support places where there exists a mutual respect and appreciation for both the similarities and differences between people and groups within a site user population. This includes attention to the conditions and operations that recognize, support, and celebrate community diversity. Nurturing increased levels of formal and informal social control through relationships of users and nearby residents who have different backgrounds produces positive esteem and place attachment.

Community Connectivity. Achieving connectivity means nurturing partnerships within the community. Such connections serve as the foundation to coordinate activities and programs with and between government and nongovernment agencies. A more empowered, well-connected, and integrated community will have a stronger sense of place. This connectivity can help to encourage and maintain community self-policing.

Community Culture. This is present when community members come together and share a sense of place that contributes to positive expressions of ownership and territoriality. A strong sense of community can encourage the neighborhood to adopt positive outlooks and behaviors, including self-policing. Shared culture is expressed as people work on setting up and participating in festivals, cultural events, youth clubs, and commemorating significant local community events and people.

Threshold Capacity. Neighborhoods and places can be regarded as ecosystems. Pressures and drivers of change are constant and resulting changes can encourage or inhibit negative behavior. When neighborhood ecosystems exceed their threshold capacity, this is referred to as the tipping point. Place perceptions can tip from a positive outlook (despite modest levels of negative activity) to a sense of decline or threat, and vice versa.

Inclusion and Community Participation. Inclusive community participation is crucial to the effectiveness of CPTED. Within inclusive, healthy, and safe communities, people are able to generate and implement practical ideas to improve and enhance a place. Participation includes continued engagement with place users and the nearby community to do local safety audits of perceived problems, conflict resolution, and work to enhance social interactions. Inclusion also involves equal access to all for amenities and services.

Natural Surveillance. In addition to considering sight lines, view obstructions or blind corners, this includes the intentional presence of people as informal monitors of a place. Surveillance occurs by designing settings, activities and programs that welcome people to a space in ways that maximize visibility of users and fosters positive social interaction among legitimate users. Potential offenders feel increased scrutiny and perceive increased risk.

Activity Support. Activity support increases the use of a place for safe activities with the intent of increasing the opportunities to detect criminal and undesirable activities. This compares to natural surveillance which is casual and does not include any guidance for people to watch out for criminal activity. By placing signs or equipment for certain activities (such as 'caution children playing' signs) users will be more involved and pay closer attention to what should be happening around them. They will be more tuned in to who is and isn't likely to be within a space and what looks suspicious.

Social Dimension CPTED Recommendations for Natural Areas

While most of these recommendations apply to natural area land managers at the program level, residents can advocate and organize for the following recommendations to happen within their own community's natural areas.

Conduct a Social CPTED Audit for a Site. Assess the current conditions, programs and activities that encourage positive behavior within a site, and develop a plan to sustain what works and add additional opportunities. The audit can include access points, trails, site facilities (such as benches, picnic shelters and restrooms), locations where programs occur, and popular natural attractions.

Provide Positive Guidance for Site Activity. A social audit can help managers to identify key trouble areas and visualize how to introduce more social dimensions of CPTED. For instance, law enforcement assistance may be needed to correct existing trouble spots. Then currently positive situations can be reinforced and new social dynamics introduced through vegetation and other site management.

Plan Programs and Activities. Recurring and special events can foster inclusion and maintain a steady sense of 'eyes on the park.' Examples include environmental education and bioblasts. And with increased attention to the relationship of nature experiences and human health, a variety of health improvement programs are possible: schedule group walks or hikes; initiate Park Rx (a parks prescription program), Walk with a Doc, or forest bathing. Consider cultural diversity and equity in planning and implementation.

Integrate Local Policies of Equity and Environmental Justice. Local governments have recently launched equity and justice policies that include nature and urban greening. The values represented by these initiatives can be expressed in site planning, design and management.

Optimize Social Contacts in Access and Trails. Ecological assessments often propose ecosystem units within a parcel for specific management practices. In a similar way a social audit can suggest how to guide users across a site in a managed way so there are frequent and distributed social encounters.

Access locations and trail development can reinforce visitor density and interactions across the entire site. Discourage social trails that promote unobserved activity.

Support Placemaking and Promote Features for Visitor Appeal. Conduct an assessment of elements that are popular for visitors, such as promontories, water edges, wildlife viewing locations, or unique features (such as large trees) and orient trails to welcome visitors and provide comfortable access. Intentional placement of park furniture, such as benches or picnic tables, guides user flow and distribution across a site. Encourage legitimate spaces for lingering. This creates an ambience that unsettles negative behavior and nuisances by supporting natural surveillance.

Monitor Thresholds in Management. Examples of a tipping point in residential neighborhoods are the number of derelict or unoccupied buildings. The tipping point moves from the expected cycling of business use to a place image of decline. In natural areas excessive amounts of graffiti, trash or unkempt and abused facilities may signal thresholds. Networks of informal trails not only signal unexpected encounters, but can also lead to confusion in users' wayfinding. The result is a sense of uncertainty, even fear when in a natural area.

Support 'Friends Of' Groups. Engage nearby residents, civic organizations and school groups in site planning, as well as vegetation management and ecological restoration activities. The Green Cities Partnerships program is a great example of this. This helps to set up the partnership relationships and organization connections that encourage positive site use. It can also build a community alarm system, so that the neighborhood responds quickly to any emerging negative site uses.

Promote Civic Environmental Stewardship. Involving and engaging the community in stewarding natural areas provides more opportunities for surveillance, and ensures a more maintained setting. Stewardship roles can include both volunteers and green jobs, such as summer programs for youth. Stewardship programs that welcome people of diverse backgrounds nurtures broader place attachment and awareness about natural settings and actual crime incidence.

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