



CSUDH Sustainable Landscape Plan

Goals & Policies (Rev. date 3/23/2018)

Table of Contents

I.	Executive Summary	2
	Landscape Targets (2018 and beyond)	
	New Landscape Policies	
	Existing Landscape Policies	
II.	NEW LANDSCAPE POLICY	4
	Landscape Ownership	
	Irrigation	
	Watershed Management/Hydrology	
	New Landscape Review Process	
III.	EXISTING LANDSCAPE & MAINTENANCE POLICIES	5
	Facilities Services Maintenance	
	Faculty/Student-Run Maintenance	
	New Maintenance Requests	
IV.	Approved & Prohibited Plants	9
	Native Plants	
	Water-Wise Plants/WUCOLS	
	Trees	
	Invasive Species	
V.	Enforcement & Penalties	10
	Governing Body	
	Enforcement	
	Penalties	
VI.	Appendix	11
	List of Approved Species Resources	
	New Landscape Form	
	MWELo Irrigation Worksheet	
	Temporary Tree and Plant Protection (Copy)	
	How to Prune Guide (Copy)	

Executive Summary

Cal State Dominguez Hills (CSUDH) maintains approximately 170 acres of landscape across the campus which encompasses 346 total acres of property in Carson, California. This plan outlines campus policies and preferences for new and existing landscape in order to support the university's sustainable landscape goals which include:

- Moving beyond just aesthetic considerations in making landscape choices with a focus on high and multi-function landscape that accomplishes multiple aims:
 - Provides a living laboratory environment for students to experiment and learn in.
 - Supports student research and involvement.
 - Aggressively conserves water resources in compliance with statewide mandates and policies.
 - Restores native ecosystem functions and/or improves resiliency in the face of climate change impacts.
 - Restores watershed function and supports efficient hydrology to reduce run-off problems and impacts on campus.
 - Supports high and multi-function plant species such as California native plants and edible plants (e.g. fruit trees, vegetables, etc.).
 - Provides urban tree cover/shade canopy for campus users.

Landscape Targets (2018 and beyond)

In order to achieve these goals, the campus has set the following targets for its landscape:

- Increase existing urban tree cover on campus from 13% to 25% by 2025.
- Support at least one student research project per academic year related to landscape.
- Support an increase in bird, butterfly, and pollinator diversity on campus.

Landscape Ownership

State-run property is under the jurisdiction of CSUDH Facilities Services. All faculty/student-run spaces are considered at-will tenants of spaces on state-run property and must abide by the maintenance guidelines outlined under the **Existing Landscape Policy**. Contractors and outside parties installing landscape as part of construction activities must abide by the **New Landscape Policy**.

Facilities Services exercises the right to re-possess state-run property that is mismanaged by any party that fails to abide by the new landscape or maintenance policies set forth in this plan. It may remove affected landscape at its sole discretion upon written warning to the party in question

and/or the current department head of the responsible department if the sponsoring staff/faculty member is non-responsive.

If construction activities require an existing faculty/student-run space to relocate, Facilities Services will perform due diligence to identify a similar space on campus in which to relocate based on availability. If no alternative space is immediately available, Facilities Services will create a first-come first-serve waitlist for future space.

Auxiliaries on campus (Loker Student Union and Housing Services) as well as the StubHub Center operate property independently of this agreement for their respective spaces. Any maintenance or mismanagement issues of landscape on these properties must be handled by that auxiliary/party. If an Auxiliary requires permanent assistance from Facilities Services to manage an auxiliary-run landscape space, they must provide information sufficient to complete the ***New Landscape Review Form*** and/or agree to a Memorandum of Understanding (MOU) to adequately address ongoing maintenance concerns.



Figure 1. Satellite map of approximate landscape boundaries (purple: StubHub Center, dark red: Loker Student Union, blue: Housing, yellow & orange: faculty/student-run, remaining= Facilities Services)
<https://drive.google.com/open?id=1Rr2gruBKIHZyOKwebVUdQrS4uVB5VUF&usp=sharing>

New Landscape Policies

Faculty, students, outside parties, etc. looking to plant new landscape on campus must abide by the New Landscape Review process.

Contractors installing new landscape as part of construction activities must abide by the landscape requirements set forth in the CSUDH Master Plan and Project Review process.

Existing Landscape Policies

There are several categories of ownership of landscape and maintenance responsibilities. For maintenance issues and clarification of boundaries, please see the **Existing Landscape** section of this plan.

NEW LANDSCAPE POLICY

Irrigation

New landscape over 500 square ft. installed by contractors must meet state requirements including the 2015 Model Water Efficient Landscape Ordinance. CSUDH applies all minimum requirements set forth in MWELO but in addition, **does not treat landscape watered with recycled water as a Special Landscape Area (SLA)**. Landscape watered with reclaimed water should be treated as regular landscape under the ordinance.

Please consult <http://www.water.ca.gov/wateruseefficiency/landscapeordinance/> and provided planning documents for additional information on compliance.

Newly created student run-spaces greater than 500 square ft. are subject to MWELO requirements, but will receive full technical assistance from the Sustainable Landscape Committee to ensure compliance.

Watershed Management/Hydrology

New landscape that supports the campus MS4 stormwater management program (SWMP) via bio-swales and other water retention bodies will receive special consideration in the new landscape review process.

New landscape installed by contractors as part of construction activities must comply with the run-off and storm water best practices requirements provided by Capital Planning.

New Landscape Review Process

Faculty/student-run spaces that consist entirely of native and/or edible plants are subject to minimum MWELo requirements only with an ETAF of 1.0 if the space represents over 500 square ft. in new plantings.

The review process for a new faculty/student-run space regardless of size consists of the following:

- 1) Prior to any planting, contact the Sustainable Landscape Committee via the Office of Sustainability to request a review of your landscape plan which must include:
 - a. Completed *New Landscape Project Proposal Form (Appendix B)*
- 2) Meet with the Sustainable Landscape Committee to discuss approval of the proposed landscape choices.
- 3) Receive written approval and begin planting.

EXISTING LANDSCAPE & MAINTENANCE POLICIES

This section outlines the policies for existing landscaped areas on CSUDH state-run property which is under the jurisdiction of Facilities Services.

Facilities Services Maintenance

Facilities Services provides landscaping services to all state-run property on campus with the exception of faculty/student-run spaces. **Issues related to irrigation and landscaping should be brought up via a formal Work Control request through Facilities.**

Planned routine grounds and landscape care and maintenance responsibilities include manicuring of turf and athletic fields, Alumni Courtyard; perennial, annual, and remedial flower planting; maintenance of shrubs, trees, roads, parking lots and walkways; irrigation system maintenance; landscape pest control; and exterior trash collection disposal.

This unit also manages pest control, litter disposal, flood control, and the maintenance of firebreaks, as well as providing guidance to contractors. Assistance is provided during public works construction and expansion projects by capping of irrigation lines, removal and restoration of plantings, and the return of the grounds to their original state upon the completion of those projects. General landscape design and consultation for special campus events is also available.

Training and Professional Development

To ensure appropriate maintenance practices for plants requiring special care such as natives and water-wise landscapes, Facilities Services provides training support for grounds staff on these topics including:

- One native plant maintenance training per year.
- Access to free landscape workshops as the opportunity arises.

General Plant Care and Maintenance Best Practices

Campus standards require the following best practices:

- **Right Plant, Right Place**
 - Evaluate spacing requirements and give plants appropriate space to grow. Consider mature plant width when placing new plants, not just immediate aesthetics.
 - Choose plants that fit the unique conditions of the site and purpose of the landscape.
- **Pruning**
 - All contractors are expected to follow ANSI A300 pruning standards when pruning trees. (Reference guide “How to Prune” attached in the Appendix).
- **Integrated Pest Management**
 - Use chemical treatments to address weed and pest issues only as a last resort.
 - First look for solutions in the following order:
 - Education- Change user behavior to prevent pest problems in the first place.
 - Culture- practice good maintenance habits to support strong, healthy plants.
 - Physical- physically remove pests, or use traps, lures, barriers, etc.
 - Biological- use other living organisms to control pest populations (e.g. beneficial insects, owl boxes, etc.).
 - Chemical- reduce risk of human exposure and apply the minimum amount required to address the issue.

Tree Care and Maintenance

Trees affected by new construction activities are protected by the *Temporary Tree and Plant Protection* protocols listed in the State University Administrative Manual (SUAM) which includes compensation for damaged and destroyed trees.

Facilities Services implements a 1:1 ratio rule for replacement of trees, though it reserves the right to re-plant in a location other than the original site of the tree removed. All trees that must be removed due to age, disease, or structural problems are to be replaced with a new tree selected based on the standards set for the in the Approved Species section of this plan. Trees will be removed when they pose a risk to human health (i.e. falling branches) and/or present a significant risk to campus infrastructure and buildings.

Catastrophic events that significantly affect the existing tree population on campus (e.g. fire, invasive pests, etc.) will initiate an emergency budget request to replace affected trees according to the 1:1 ratio outlined above.

Tree trimming services are handled by one of three approved contractors. **Consult the “How to Prune” Guide for definition of tree terms and appropriate pruning practices. However, because there are no overhead wires on campus, crown reduction or drop crotch cuts as demonstrated on page 4 and 6 are not approved.**

All contractors are provided this guide and instructed to follow these best practices before commencing tree trimming services.

Protection/Preservation Policies

In the interest of protecting the sometimes fragile plant life, as well as the other physical surroundings, no connections, bolts, nails or other objects may be attached to any tree on campus. Similarly, no modifications to existing landscape or irrigation systems may be made, and no plant materials may be removed or changed without prior approval. Questions may be directed to the manager of grounds and landscape services at (310) 243-2142.

Faculty/Student-Run Maintenance

There are several faculty/student run gardens on campus as follows:

- **Heritage Creek:** This is a bioswale at the south end of Parking Lot 7 designed to provide bio-filtration for storm water and provide native habitat. The area is open to the campus and the public, and is available for research activities. Any requests for new plantings, modifications, or infrastructure changes should be directed to the current Chair of Biology.
- **Garden of Dreams:** This is a native garden located at the Child Development Center/Infant Toddler Care Center (CDC/ITC). This garden is publicly accessible and available for research activities. Any requests for new plantings, modifications, or infrastructure changes should be directed to the current Chair of Biology as well as CDC/ITC directly.
- **Pollinator Garden:** This is a native garden located west of Central Plant. Management of the Pollinator Garden is handled by the Faculty Advisor for the Ecology Club as well the Chair of Biology. Requests for new plantings, modifications, or infrastructure changes should be directed to these two contacts.
- **Butterfly Garden:** This is a native garden located west of Central Plant. Management of the Butterfly Garden is handled by the Faculty Advisor for the Ecology Club as well the Chair of Biology. Requests for new plantings, modifications, or infrastructure changes should be directed to these two contacts.

- **CALL Garden:** This garden, located by the NSM Loading Dock, is managed by the Biology Department and is open for observation. Research activities can be conducted upon request to the current Faculty Advisor for the Ecology Club and the Chair of Biology.
- **Greenhouse:** The Greenhouse itself is available for classes only, and is an academic facility operated by the Biology Department. Requests for access or use should be directed to the current professor teaching Botany/Plant Physiology. The outside fenced area of the greenhouse is available to other campus entities for the propagation of plants such as faculty from other departments, students, the Ecology Club, Facilities Services, etc. Requests for use of this outdoor area should be directed to the current chair of Biology. All requests must be compatible with existing class use of the space.
- **Dominguez Hills Wetland Preserve:** This natural area is located at the southwest corner of campus and is a restricted area. As-needed access is controlled by a combination lock, and the code is available upon request to the current Chair of Biology. The outside berm that runs along the boundary of the wetland has a public access walking path, but activities inside the actual wetland are limited to research, maintenance, restoration, or management. Current entities that are permitted to access the wetland for these purposes include Vector Control, Facilities Services, AEG, and students/faculty conducting research that has been approved by the current Chair of Biology.
- **Campus Farm:** The Campus Farm is a living laboratory space designed to support faculty/student research related to food, and primarily consists of edibles and plants with cultural significance. The Farm is open for student, faculty, staff, and public use during the school year. Classes and groups may also request special access on weekends. Requests to plant or conduct classes at the Farm are handled by the Office of Sustainability/Farm Intern and are accommodated based on availability.
- **Ocean-Friendly Garden:** This garden was established through a formal agreement between Housing and West Basin to install an ocean-friendly bioswale/demonstration garden outside of Housing Phase I. The Biology Department through partnership with the Office of Sustainability now provides maintenance to this garden in exchange for Housing's financial and infrastructural support for irrigation and replacement of sick/dead plants. This garden is used as a living laboratory space. Requests for research activities or to make modifications to the space should be directed to the current chair of Biology and Housing.

For a space to be added to the permanent list of spaces to be maintained by the faculty/students, it must undergo the New Landscape Review process. The space must also be available to faculty and students as a living laboratory space to qualify.

At no point should discounted and free student labor be used as a replacement for staff labor that should be provided by Facilities.

Additional support will be provided by the fall Annual Day of Service sponsored by SLICE which will provide supplemental maintenance support to the gardens of highest need (as determined by the Sustainable Landscape Committee).

New Maintenance Requests

Auxiliaries and faculty/student run-spaces that are unable to maintain upkeep for a landscaped space may request one-time maintenance service events from Facilities via Work Control. (This may result in a charge-back to the appropriate department).

Requests for student service days and/or maintenance by student clubs outside of the existing schedule for faculty/student-run areas must be submitted to the Sustainable Landscape Committee.

Approved & Prohibited Plants

An approved list of preferred plants is included in the Appendix and/or is referenced below. Plants that are not pre-approved must be submitted on the New Project Form with an explanation for deviating from the approved list.

Native Plants

California native plants appropriate for Southern California are encouraged. The campus has a special preference for endemic species found within a 30 mile radius that represent the original ecosystem of the site. For a list of these preferred species, please see the Native Plant Guide in Appendix A.

Water-Wise Plants/WUCOLS

Plant palettes that are submitted as “water-wise” must consist entirely of plants that meet minimum WUCOLS ratings of 0.7 for moderate use landscapes and 0.25 for low use landscapes (<http://ucanr.edu/sites/WUCOLS/>).

Functional Value

Plants that have functional value such as edibles and/or plants that restore ecosystem function can be considered for approval beyond this list.

Invasive Species

Species that have been rated “High” or “Moderate” by the Cal-IPC as invasive are prohibited from campus. High-rated invasive plants that are detected on-campus are subject to immediate removal without notice.

Enforcement & Penalties

Governing Body

The Sustainable Landscape Committee is responsible for determining policies for landscape decisions on campus and includes representation from students, faculty, and Facilities Services staff:

Current Members-

<u>Name</u>	<u>Title</u>	<u>Department/Organization</u>
Yasuhiro Osako	Grounds Manager	Facilities Services
Ellie Perry	Sustainability Coordinator	Facilities Services-Office of Sustainability
Bill Ota	Gardening Specialist	Facilities Services- Grounds
John Thomlinson	Professor	Biology Department
Brynne Bryan	Lecturer	Biology Department
Kathryn Theiss	Assistant Professor	Biology Department
Jenney Hall	Lecturer	Interdisciplinary Studies Department
Kelley Dawdy	Lecturer	Physics Department
Connie Vadheim	Professor Emeritus	Biology Department
Student Representative	President of the Farm Club	Farm Club
Student Representative	President of the Ecology Club	Ecology Club

Enforcement

Enforcement of the Sustainable Landscape Plan on state-run property will be under the purview of Facilities Services.

Penalties

Failure to maintain landscape as outlined in this plan, or the installation of new landscape without prior approval from the Sustainable Landscape Committee may result in the landscape removed by Facilities Services with department chargebacks assessed to the responsible party in order to restore the space to its original condition.

Damages caused by contractors due to unsafe or irresponsible practices in violation of the Plan's policies will be assessed back to the contractor per the requirements set forth in the *Temporary Tree and Plant Protection* and other related general conditions.

Appendix A

List of Approved Species Resources

General Guidance: Please consult the following guidance document for recommended planting types and general species recommended based on geographical origin:

<https://www.dropbox.com/s/ey8qk6llz1045ly/General%20Campus%20Planting%20Guidance-%20Design.pdf?dl=0>

Native Plants: Please consult the following index of campus preferred native plants and species information.

https://www.dropbox.com/sh/mkzw3bizm6pz9sk/AADH19lcRy_oHRzZd5fK_CDVa?dl=0

Water-Wise Plants: Search for plants that have low-moderate ratings on the Water Use Classification of Landscape Species (WUCOLS) database.

<http://ucanr.edu/sites/WUCOLS/>

Non Native Trees & Species: Please consult the following list of campus preferred non-native plants and tree species.

https://www.dropbox.com/sh/774bizjsid3z9v3/AAB57440MJT_3LVO9bOVUqB2a?dl=0

Cal IPC Ratings: Species rated as “high” or “moderate” are not allowed on campus. Please search the directory for species ratings.

<http://www.cal-ipc.org/plants/inventory/>

New Landscape Project Proposal Form:

Applicant Name:	Are you: <input type="checkbox"/> Student <input type="checkbox"/> Staff <input type="checkbox"/> Faculty <input type="checkbox"/> Other (Describe):
Contact E-mail Address:	
Contact Phone Number:	
Organization/Department:	Department Head (if applicable):
If a student club, faculty sponsor name:	Faculty Sponsor Department:
New Landscape Project Name:	
New Landscape Project Description and Maintenance Plan:	
Proposed Site Location (Nearest Building and Direction i.e. NSM SE Corner):	
Proposed Size (sq. ft): _____ Less than 500 sq ft.? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Types of Plants/Primary Function (check all that apply) and proposed percentage of area:	
<input type="checkbox"/> Native_____% <input type="checkbox"/> Water-wise_____% <input type="checkbox"/> Edible_____% <input type="checkbox"/> Bioswale_____% <input type="checkbox"/> Other (Describe): _____%	
Are <u>all</u> proposed species native, water-wise, or edible and/or are on the approved species list? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If no, please list the proposed species that are not on the approved species list and what function they fulfill:	
Have all species been reviewed to ensure they are not on the Cal-IPCC list for invasive species? <input type="checkbox"/> Yes <input type="checkbox"/> No	

New Landscape Form- MWELO Water Calculations

WATER EFFICIENT LANDSCAPE WORKSHEET

This worksheet is filled out by the project applicant and it is a required element of the Landscape Documentation Package.

Reference Evapotranspiration (ETo)

Hydrozone # /Planting Description ^a	Plant Factor (PF)	Irrigation Method ^b	Irrigation Efficiency (IE) ^c	ETAF (PF/IE)	Landscape Area (sq. ft.)	ETAF x Area	Estimated Total Water Use (ETWU) ^e
Regular Landscape Areas							
				Totals	(A)	(B)	
Special Landscape Areas							
				1			
				1			
				1			
				Totals	(C)	(D)	
				ETWU Total			
				Maximum Allowed Water Allowance (MAWA)^e			

^a**Hydrozone #/Planting Description**
 E.g
 1.) front lawn
 2.) low water use plantings
 3.) medium water use planting

^b**Irrigation Method**
 overhead spray
 or drip

^c**Irrigation Efficiency**
 0.75 for spray head
 0.81 for drip

^d**ETWU (Annual Gallons Required) = Eto x 0.62 x ETAF x Area**
 where 0.62 is a conversion factor that converts acre-inches per acre per year to gallons per square foot per year.

^e**MAWA (Annual Gallons Allowed) = (Eto) (0.62) [(ETAF x LA) + ((1-ETAF) x SLA)]**
 where 0.62 is a conversion factor that converts acre-inches per acre per year to gallons per square foot per year, LA is the total landscape area in square feet, SLA is the total special landscape area in square feet, and ETAF is .55 for residential areas and 0.45 for non-residential areas.

ETAF Calculations

Regular Landscape Areas

Total ETAF x Area	(B)
Total Area	(A)
Average ETAF	B ÷ A

Average ETAF for Regular Landscape Areas must be 0.55 or below for residential areas, and 0.45 or below for non-residential areas.

All Landscape Areas

Total ETAF x Area	(B+D)
Total Area	(A+C)
Sitewide ETAF	(B+D) ÷ (A+C)

Temporary Tree and Plant Protection (Copy)

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Requirements to preserve, protect, and prune as necessary existing trees and shrubs, and other vegetation indicated to remain.
- B. All trees and plant materials to remain on site shall be protected from all trades working on the job, and it shall be the Contractor's responsibility to insure that all subcontractors are aware of and held responsible for any damage to existing trees and plant material. In addition, Contractor shall be held responsible to insure that following protective measures are carried out throughout the entire construction period.
- C. Maintenance: Throughout the life of the construction project, the Contractor shall be responsible for overseeing the watering, fertilizing, pruning, and other measures necessary to protect all existing trees, lawns, shrubs, groundcover and other plants.

1.3 RELATED REQUIREMENTS

- A. Section 01 57 00 – Temporary Controls
- B. Section 01 57 23 – Storm Water Prevention Pollution.
- C. Division 32 – Exterior Improvements: Landscaping specifications related to trees, shrubs and ground covers, as applicable.

1.4 QUALITY ASSURANCE

- A. Arborist: Contractor shall engage and pay a Certified Arborist who will be responsible for supervising implementation of tree and plant protection measures specified in this Section.
 - 1. Arborist shall be subject to acceptance by University's Representative.
 - 2. Arborist registered by the American Society of Consulting Arborists.
 - 3. Submit evidence contract with acceptable Certified Arborist prior to commencing site mobilization activities.

PART 2 - PRODUCTS

2.1 BARRIERS

- A. Barriers: As specified in Section 01 57 10 – Existing Finish Protection.

2.2 FERTILIZER

- A. Fertilizer: Unless otherwise directed by University's Representative, type and quantity of fertilizer shall be determined by soil agronomist engaged and paid by Contractor, who is acceptable to University's Representative.
 - 1. As basis for bidding, fertilizer shall be Romeo "Greenbelt" 22-14-14 tree fertilizer or approved equal at 4 lb. fertilizer dissolved in 100 gallons water.
- B. Accessory Materials: As determined by Contractor as necessary for sustained health of trees and plants, subject to acceptance by University's Representative. Accessory materials shall include mulch, tree and plant stakes and temporary covers.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protection: Prior to construction activities, especially demolition and excavation, on the site, Contractor shall submit to University's Representative evidence of a contract with a Certified Arborist who shall be responsible for supervising implementation of the following tree protection measures.
 - 1. Protect all existing trees, shrubs and ground covers from stockpiling, material storage including soil, vehicle parking and driving within the tree drip line. Restrict foot traffic to prevent excessive compacting of soil over root systems.
 - 2. Protect root systems of existing trees, shrubs, and ground covers from damage due to chemically injurious materials in solution caused by runoff and spillage during mixing, placement of construction materials, and drainage from stored materials.
 - 3. Protect root system from flooding, erosion, excessive wetting and drying resulting from de-watering and other operations.
 - 4. Above-ground surface runoff shall not be directed into the tree canopy area from adjacent areas. Ensure that sidewalks or other construction do not trap water near the tree. Coordinate with requirements specified in Section 01 57 00 - Temporary Controls.
 - 5. Protect existing plant materials from unnecessary cutting, breaking and skinning of roots and branches, skinning and bruising of bark.
 - 6. Use no soil sterilants under pavement near existing trees.
 - 7. Do not allow fires under and adjacent to existing trees or plants.
- B. Maintenance: Throughout duration of the Contract, Contractor shall be responsible for irrigation, fertilizing, pruning, and other measures necessary to protect and nurture all existing trees, plants, ground covers and lawns indicated to remain in Project.

3.2 PRUNING

- A. Engage the Consulting Arborist registered by the American Society of Consulting Arborists, or approved equal. Arborist shall direct removal of branches from trees and large shrubs, and correctional pruning and cabling of specified trees that are to remain, if required to clear new construction and where indicated. Arborist shall also direct necessary tree root pruning and relocation work.

- B. Where indicated by University Representative, extend pruning operation to restore natural shape of entire tree using only Western Chapter ISA Pruning Standards.
- C. Cut branches and roots with sharp pruning instruments. Do not break, chop, or mutilate.
- D. Pruning of existing trees shall concern itself with removing all dead wood 1/2" or greater in size, removing vines and/or sucker growth. Tree cavities existing on all oak trees are to be cleaned of wood rot. The procedure for each tree may vary and will need to be approved by the Consulting Arborist prior to commencing work.
- E. Tree limbs in the way of proposed buildings shall only be trimmed by reputable ISA Certified Arborist or ISA Certified Climber and shall approved by Owner's Representative.

3.3 IRRIGATION

- A. Irrigate trees and other vegetation that are to remain as necessary to maintain their health before, during and after the course of the work as directed by the Consulting Arborist. Maintain an irrigation schedule and document. Submit schedule to Owner's Representative for review and acceptance.
- B. If the soil within the drip line of the tree is compacted, then prior to watering or fertilizing trees, the area within the drip line of the tree shall be rototilled to loosely break up the top two (2) inches of existing soil.
- C. All trees shall be deep root watered by the use of an injection needle to a depth of eighteen (18) inches. Needle shall be inserted into the ground five (5) feet apart in concentric rings around the tree; each ring is four (4) feet wider than the previous one. This process shall continue out to the drip line of the tree.
- D. Trees greater than twelve (12) inches in caliper shall be watered during the first month of construction using 800 gallons of water per tree [actual amount TBD]. For trees less than twelve (12) inches in caliper, 600 gallons of water shall be used per tree [actual amount TBD]. This procedure shall be repeated every six (6) months, in addition to the normal watering schedule.

3.4 FERTILIZING

- A. All trees shall be fertilized before, during, and after construction by pumping under pressure directly 18-inches into root zone as directed by Certified Arborist.

3.5 EXCAVATION AROUND TREES

- A. Excavate within drip lines of trees only where indicated.
- B. Where trenching for utilities is required within drip lines, tunnel under and around roots of 2 1/2" diameter or larger by hand digging. Do not cut main lateral roots that are 2" or larger. Cut smaller roots that are smaller than 2" which interfere with installation of new work. Use sharp approved pruning tools. Pipes should be routed into an alternate location to avoid conflict, wherever possible.
- C. Where excavating for new construction is required within drip lines of trees, hand excavate to minimize damage to root systems. Use narrow tine spading forks and comb soil to expose roots. Relocate roots in backfill areas wherever possible. If large, main lateral roots are encountered, expose beyond excavation limits as required to bend and relocate without breaking.
- D. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately six (6) inches back from new construction. Cover cut ends with plastic sandwich bag.
- E. Do not allow exposed roots to dry out before permanent backfill is placed. Provide temporary earth cover, pack with wet peat moss or four (4) layers of wet untreated burlap and temporarily support, and protect

from damage until permanently relocated and covered with backfill. Water to eliminate voids and air pockets.

- F. Thin branching structure in accordance with Western Chapter, ISA Pruning Standards to balance loss to root system caused by damage or cutting of root system. Thinning shall not exceed 30% of existing branching structure.

3.6 GRADING AND FILLING AROUND TREES

- A. Maintain existing grade within drip line of trees unless otherwise indicated. Any grade change shall be limited to six (6) inches of cut or fill from the original grade and shall be accomplished by hand. Under all [*Campus to insert types of trees*] trees there shall be no grade change under at least the inner 50% of the tree canopy.
- B. Lowering Grades: where existing grade is above new finish grade shown around trees, carefully hand excavate within drip line to new grade. Cut roots exposed by excavation to approximately three (3) inches below elevation of new finish grade.
- C. Raising Grades: permitted only as acceptable to University Representative.
- D. If building pads or foundations are to be constructed within the fenced areas or if the existing landscape is to be altered by the addition of fill or reduced by excavation, the University Representative shall be notified prior to this work. Measures as approved by the University Representative, such as small retaining walls or subgrade aeration lines, may be required to mitigate construction procedures affecting the tree.

3.7 REPAIR AND REMOVAL OF TREES

- A. Repair and Removal of Trees: Certified Arborist and University's Representative will determine whether trees shall be restored or removed. Treat and restore trees damaged by construction operations in a manner acceptable to University's Representative. Perform restoration and pruning promptly after damage occurs to prevent progressive deterioration of damaged trees. If trees cannot be restored, equitable adjustment to Contract Sum shall be made to compensate University for loss, in accordance with the Contract General Conditions.
 - 1. Remove dead and damaged trees that are determined by Certified Arborist to be incapable of restoration to normal growth pattern.
 - 2. Contractor shall be liable for all damage and necessary restoration actions to existing trees, including trunk, branches, or roots. Restoration shall be performed under direction of Certified Arborist.

3.8 REPAIR AND REPLACEMENT OF SHRUBS AND GROUND COVER

- A. Repair shrubs and other vegetation damaged by construction operations in a manner acceptable to University Representative. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged plant.
- B. Remove and replace all dead and damaged plants that are determined by the University Representative to be incapable of restoration to normal growth pattern.
 - 1. Provide new shrubs of same size and species as those replaced or as acceptable to the University Representative.
 - 2. Plant and maintain as specified under Division 32.
- C. Repairs and Replacements of Shrubs and Ground Cover: Repair shrubs and other vegetation damaged by construction operation in manner acceptable to University's Representative.

1. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged plant. Remove and replace all dead and damaged plants up to six-inch diameter, which are determined by University's Representative as being incapable of restoration to normal growth pattern.
2. Provide new shrubs of same size and species as those replaced or as acceptable to the University's Representative.

3.9 COMPENSATION TO UNIVERSITY FOR LOST AND DAMAGED TREES

- A. The Contractor shall be liable for the loss in value to damaged trees and for all repair or replacement costs resulting from construction operations as determined by the University Representative. Because of the irreplaceable nature of many of the existing trees, the amount of assessment shall be determined by the University Representative, depending upon tree species, condition before damage, and location value.
- B. Designated sums shall be governed by applicable provisions of the Contract General Conditions

END OF SECTION



USDA Forest Service

NA-FR-01-95

Northeastern Area State and Private Forestry

HOW to Prune Trees

Peter J. Bedker, Joseph G. O'Brien, and Manfred M. Mielke
Illustrations by Julie Martinez, Afton, MN

Introduction

The objective of pruning is to produce strong, healthy, attractive plants. By understanding how, when and why to prune, and by following a few simple principles, this objective can be achieved.

Why Prune

The main reasons for pruning ornamental and shade trees include safety, health, and aesthetics. In addition, pruning can be used to stimulate fruit production and increase the value of timber. Pruning for *safety* (Fig. 1A) involves removing branches that could fall and cause injury or property damage, trimming branches that interfere with lines of sight on streets or driveways, and removing branches that grow into utility lines. Safety pruning can be largely avoided by carefully choosing species that will not grow beyond the space available to them, and have strength and form characteristics that are suited to the site.

Pruning for *health* (Fig. 1B) involves removing diseased or insect-infested wood, thinning the crown to increase airflow and reduce some pest problems, and removing

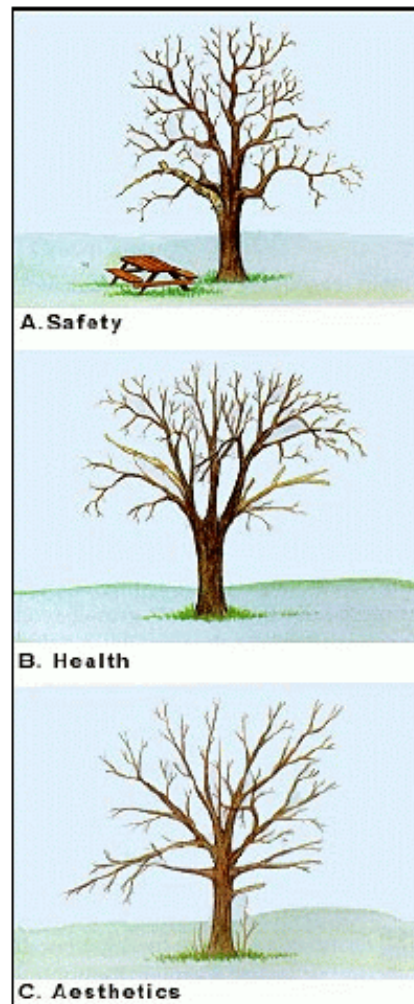


Figure 1. Reasons for pruning.

crossing and rubbing branches. Pruning can best be used to encourage trees to develop a strong structure and reduce the likelihood of damage during severe weather. Removing broken or damaged limbs encourage wound closure.

Pruning for *aesthetics* (Fig. 1C) involves enhancing the natural form and character of trees or stimulating flower production. Pruning for form can be especially important on open-grown trees that do very little self-pruning.

All woody plants shed branches in response to shading and competition. Branches that do not produce enough carbohydrates from photosynthesis to sustain themselves die and are eventually shed; the resulting wounds are sealed by **woundwood** (callus). Branches that are poorly attached may be broken off by wind and accumulation of snow and ice. Branches removed by such natural forces often result in large, ragged wounds that rarely seal. Pruning as a cultural practice can be used to supplement or replace these natural processes and increase the strength and longevity of plants.

Trees have many forms, but the most common types are pyramidal (**excurrent**) or spherical (**decurent**). Trees with pyramidal crowns, e.g., most conifers, have a strong central stem and lateral branches that are more or less horizontal and do not compete with the central stem for dominance. Trees with spherical crowns, e.g., most hardwoods, have many lateral branches that may compete for dominance.

To reduce the need for pruning it is best to consider a tree's natural form. It is very difficult

to impose an unnatural form on a tree without a commitment to constant maintenance.

Pollarding and **topiary** are extreme examples of pruning to create a desired, unnatural effect. Pollarding is the practice of pruning trees annually to remove all new growth. The following year, a profusion of new branches is produced at the ends of the branches. Topiary involves pruning trees and shrubs into geometric or animal shapes. Both pollarding and topiary are specialized applications that involve pruning to change the natural form of trees. As topiary demonstrates, given enough care and attention plants can be pruned into nearly any form. Yet just as proper pruning can enhance the form or character of plants, improper pruning can destroy it.

Pruning Approaches

Producing strong structure should be the emphasis when pruning young trees. As trees mature, the aim of pruning will shift to maintaining tree structure, form, health and appearance.

Proper pruning cuts are made at a node, the point at which one branch or twig attaches to another. In the spring of the year growth begins at buds, and twigs grow until a new node is formed. The length of a branch between nodes is called an **internode**.

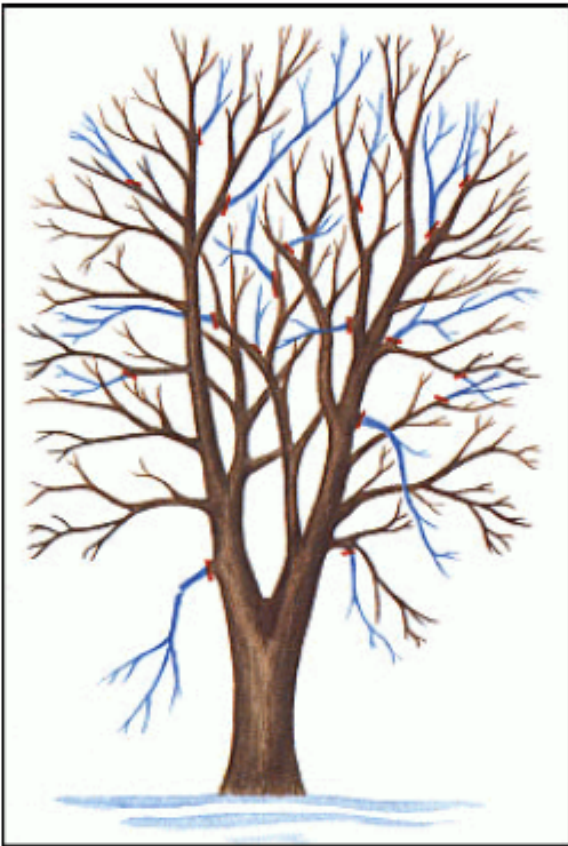


Figure 2. Crown thinning - branches to be removed are shaded in blue; pruning cuts should be made at the red lines. No more than one-fourth of the living branches should be removed at one time.

The most common types of pruning are:

1. *Crown Thinning* (Fig. 2)

Crown thinning, primarily for hardwoods, is the selective removal of branches to increase light penetration and air movement throughout the crown of a tree. The intent is to maintain or develop a tree's structure and form. To avoid unnecessary stress and prevent excessive production of epicormic sprouts, no more than one-quarter of the living crown should be removed at a time. If it is necessary to remove more, it should be done over successive years.



A. U-shaped strong union **B. V-shaped weak union**

Figure 3. Types of branch unions.

Branches with strong U-shaped angles of attachment should be retained (Fig 3A). Branches with narrow, V-shaped angles of attachment often form **included bark** and should be removed (Fig. 3B). Included bark forms when two branches grow at sharply acute angles to one another, producing a wedge of inward-rolled bark between them. Included bark prevents strong attachment of branches, often causing a crack at the point below where the branches meet. Codominant stems that are approximately the same size and arise from the same position often form included bark. Removing some of the lateral branches from a codominant stem can reduce its growth enough to allow the other stem to become dominant.

Lateral branches should be no more than one-half to three-quarters of the diameter of the stem at the point of attachment. Avoid producing "lion's tails," tufts of branches and foliage at the ends of branches, caused by removing all inner lateral branches and foliage. Lion's tails can result in sunscalding, abundant **epicormic sprouts**, and weak branch structure and breakage. Branches that rub or cross

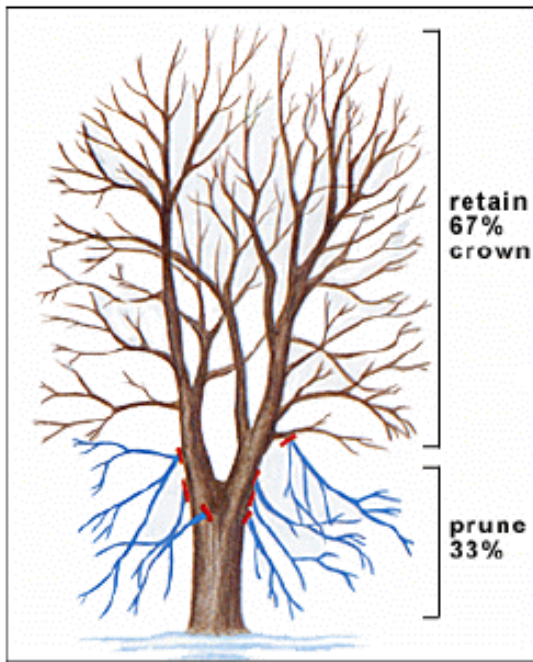


Figure 4. Crown raising - branches to be removed are shaded in blue; pruning cuts should be made where indicated with red lines. The ratio of live crown to total tree height should be at least two-thirds.

another branch should be removed.

Conifers that have branches in whorls and pyramidal crowns rarely need crown thinning except to restore a dominant leader.

Occasionally, the leader of a tree may be damaged and multiple branches may become codominant. Select the strongest leader and remove competing branches to prevent the development of codominant stems.

2. Crown Raising (Fig. 4)

Crown raising is the practice of removing branches from the bottom of the crown of a tree to provide clearance for pedestrians, vehicles, buildings, lines of site, or to develop a clear stem for timber production. Also, removing lower branches on white pines can prevent blister rust. For street trees the minimum clearance is often specified by municipal ordinance. After pruning, the ratio of the living crown to total tree height should be at least two-thirds (e.g., a 12 m tree should have living branches on at least the upper 8 m).

On young trees "temporary" branches may be retained along the stem to encourage taper and protect trees from vandalism and sun scald. Less vigorous shoots should be selected as temporary branches and should be about 10 to 15 cm apart along the stem. They should be pruned annually to slow their growth and should be removed eventually.

3. Crown Reduction (Fig. 5)

Crown reduction pruning is most often used when a tree has grown too large for its permitted space. This method, sometimes called **drop crotch pruning**, is preferred to topping because it results in a more natural appearance, increases the time before pruning is needed again, and minimizes stress (see drop crotch cuts in the next section).

Crown reduction pruning, a method of last resort, often results in large pruning wounds to stems that may lead to decay. This method should never be used on a tree with a pyramidal growth form. A better long term solution is to remove the tree and replace it



Figure 5. Crown reduction - branches to be removed are shaded in blue; pruning cuts should be made where indicated with red lines. To prevent branch dieback, cuts should be made at lateral branches that are at least one-third the diameter of the stem at their union.

with a tree that will not grow beyond the available space.

Pruning Cuts

Pruning cuts should be made so that only branch tissue is removed and stem tissue is not damaged. At the point where the branch attaches to the stem, branch and stem tissues remain separate, but are contiguous. If only branch tissues are cut when pruning, the stem tissues of the tree will probably not become decayed, and the wound will seal more effectively.

1. *Pruning living branches* (Fig. 6)

To find the proper place to cut a branch, look for the **branch collar** that grows from the stem tissue at the underside of the base of the branch (Fig. 6A). On the upper surface, there is usually a **branch bark ridge** that runs (more or less) parallel to the branch angle, along the stem of the tree. A proper pruning cut does not damage either the branch bark ridge or the branch collar.

A proper cut begins just outside the branch bark ridge and angles down away from the stem of the tree, avoiding injury to the branch collar (Fig. 6B). Make the cut as close as possible to the stem in the **branch axil**, but outside the branch bark ridge, so that stem tissue is not injured and the wound can seal in the shortest time possible. If the cut is too far from the stem, leaving a branch stub, the branch tissue usually dies and woundwood forms from the stem tissue. Wound closure is delayed because the woundwood must seal over the stub that was left.

The quality of pruning cuts can be evaluated by examining pruning wounds after one growing season. A concentric ring of woundwood will form from proper pruning cuts (Fig. 6B).

Flush cuts made inside the branch bark ridge or branch collar, result in pronounced development of woundwood on the sides of the pruning wounds with very little woundwood forming on the top or bottom (Fig. 7D). As described above, **stub cuts** result in the death of the remaining branch and woundwood forms around the base from stem tissues.

When pruning small branches with hand pruners, make sure the tools are sharp enough

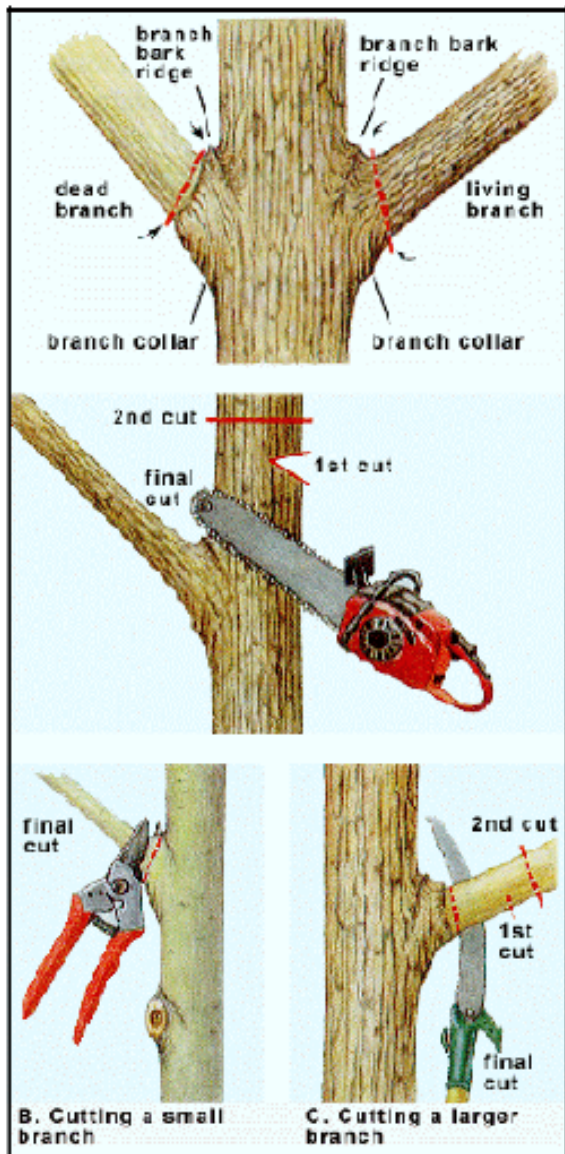


Figure 6. Pruning cuts

to cut the branches cleanly without tearing. Branches large enough to require saws should be supported with one hand while the cuts are made. If the branch is too large to support, make a three-step pruning cut to prevent bark ripping (Fig. 6C).

1. The first cut is a shallow notch made on the underside of the branch, outside the

branch collar. This cut will prevent a falling branch from tearing the stem tissue as it pulls away from the tree.

2. The second cut should be outside the first cut, all the way through the branch, leaving a short stub.
3. The stub is then cut just outside the branch bark ridge/branch collar, completing the operation.

2. Pruning dead branches (Fig. 6)

Prune dead branches in much the same way as live branches. Making the correct cut is usually easy because the branch collar and the branch bark ridge, can be distinguished from the dead branch, because they continue to grow (Fig. 6A). Make the pruning cut just outside of the ring of woundwood tissue that has formed, being careful not to cause unnecessary injury (Fig. 6C). Large dead branches should be supported with one hand or cut with the three-step method, just as live branches. Cutting large living branches with the three step method is more critical because of the greater likelihood of bark ripping.

3. Drop Crotch Cuts (Fig. 6D)

A proper cut begins just above the branch bark ridge and extends through the stem parallel to the branch bark ridge. Usually, the stem being removed is too large to be supported with one hand, so the three cut method should be used.

1. With the first cut, make a notch on the side of the stem away from the branch to be retained, well above the branch crotch.

2. Begin the second cut inside the branch crotch, staying well above the branch bark ridge, and cut through the stem above the notch.
3. Cut the remaining stub just inside the branch bark ridge through the stem parallel to the branch bark ridge.

To prevent the abundant growth of epicormic sprouts on the stem below the cut, or dieback of the stem to a lower lateral branch, make the cut at a lateral branch that is at least one-third of the diameter of the stem at their union.

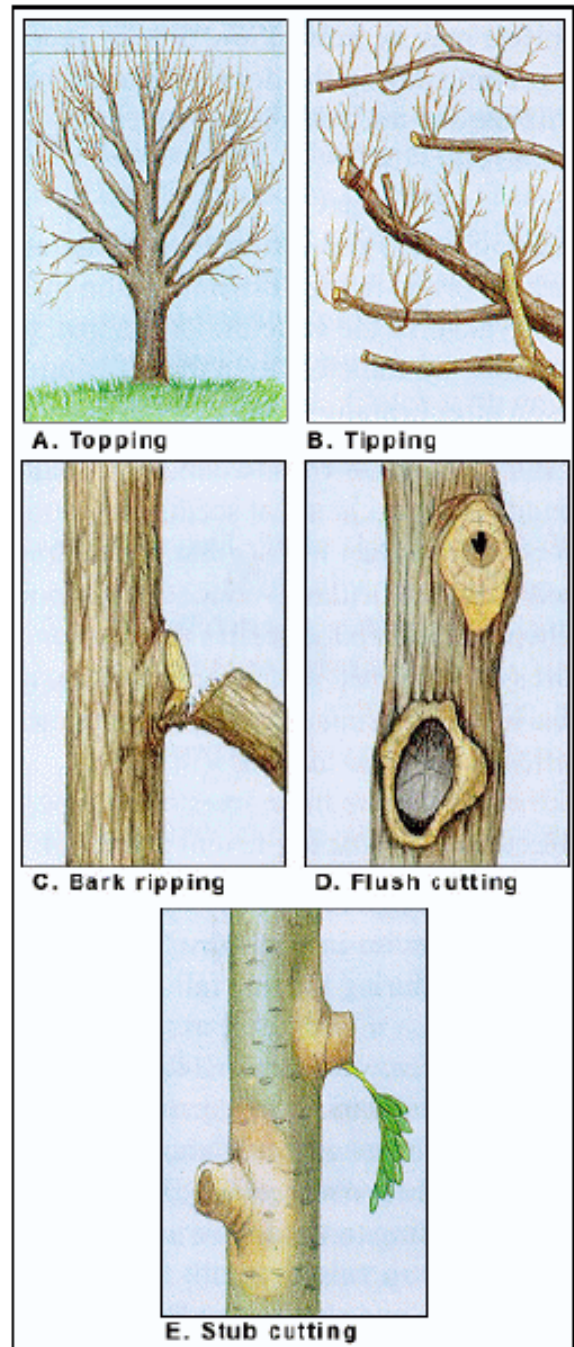
Pruning Practices That Harm Trees

Topping and tipping (Fig. 7A, 7B) are pruning practices that harm trees and should not be used. Crown reduction pruning is the preferred method to reduce the size or height of the crown of a tree, but is rarely needed and should be used infrequently.

Topping, the pruning of large upright branches between nodes, is sometimes done to reduce the height of a tree (Fig. 7A). **Tipping** is a practice of cutting lateral branches between nodes (Fig. 7B) to reduce crown width.

These practices invariably result in the development of epicormic sprouts, or in the death of the cut branch back to the next lateral branch below. These epicormic sprouts are weakly attached to the stem and eventually will be supported by a decaying branch.

Improper pruning cuts cause unnecessary injury and bark ripping (Fig. 7C). Flush cuts injure



stem tissues and can result in decay (Fig. 7D). **Stub cuts** delay wound closure and can provide entry to canker fungi that kill the cambium, delaying or preventing woundwood formation (Fig. 7E).

When to Prune

Conifers may be pruned any time of year, but pruning during the dormant season may minimize sap and resin flow from cut branches.

Hardwood trees and shrubs *without showy flowers*: prune in the dormant season to easily visualize the structure of the tree, to maximize wound closure in the growing season after pruning, to reduce the chance of transmitting disease, and to discourage excessive sap flow from wounds. Recent wounds and the chemical scents they emit can actually attract insects that spread tree disease. In particular, wounded elm wood is known to attract bark beetles that harbor spores of the Dutch elm disease fungus, and open wounds on oaks are known to attract beetles that spread the oak wilt fungus. Take care to prune these trees during the correct time of year to prevent spread of these fatal diseases. Contact your local tree disease specialist to find out when to prune these tree species in your area. Usually, the best time is during the late fall and winter.

Flowering trees and shrubs: these should also be pruned during the dormant season for the same reasons stated above; however, to preserve the current year's flower crop, prune according to the following schedule:

- Trees and shrubs that flower in early spring (redbud, dogwood, etc.) should be pruned immediately after flowering (flower buds arise the year before they flush, and will form on the new growth).
- Many flowering trees are susceptible to fireblight, a bacterial disease that can be spread by pruning. These trees,

including many varieties of crabapple, hawthorn, pear, mountain ash, flowering quince and pyracantha, should be pruned during the dormant season. Check with your county extension agent or a horticulturist for additional information.

- Trees and shrubs that flower in the summer or fall always should be pruned during the dormant season (flower buds will form on new twigs during the next growing season, and the flowers will flush normally).

Dead branches: can be removed any time of the year.

Pruning Tools

Proper tools are essential for satisfactory pruning (Fig 6). The choice of which tool to use depends largely on the size of branches to be pruned and the amount of pruning to be done. If possible, test a tool before you buy it to ensure it suits your specific needs. As with most things, higher quality often equates to higher cost.

Generally speaking, the smaller a branch is when pruned, the sooner the wound created will seal. Hand pruners are used to prune small branches (under 2.5 cm diameter) and many different kinds are available. Hand pruners can be grouped into by-pass or anvil styles based on the blade configuration. Anvil style pruners have a straight blade that cuts the branch against a small anvil or block as the handles are squeezed. By-pass pruners use a curved cutting blade that slides past a broader lower blade, much like a scissors. To prevent unnecessary tearing or crushing of tissues, it is best to use a

by-pass style pruner. Left- or right-handed types can be purchased.

Slightly larger branches that cannot be cut with a hand pruner may be cut with small pruning saws (up to 10 cm) or lopping shears (up to 7 cm diameter) with larger cutting surfaces and greater leverage. Lopping shears are also available in by-pass and anvil styles.

For branches too large to be cut with a hand pruner or lopping shears, pruning saws must be used. Pruning saws differ greatly in handle styles, the length and shape of the blade, and the layout and type of teeth. Most have tempered metal blades that retain their sharpness for many pruning cuts. Unlike most other saws, pruning saws are often designed to cut on the "pull-stroke."

Chain saws are preferred when pruning branches larger than about 10 cm. Chainsaws should be used only by qualified individuals. To avoid the need to cut branches greater than 10 cm diameter, prune when branches are small.

Pole pruners must be used to cut branches beyond reach. Generally, pruning heads can cut branches up to 4.4 cm diameter and are available in the by-pass and anvil styles. Once again, the by-pass type is preferred. For cutting larger branches, saw blades can be fastened directly to the pruning head, or a separate saw head can be purchased. Because of the danger of electrocution, pole pruners should not be used near utility lines except by qualified utility line clearance personnel.

To ensure that satisfactory cuts are made and to reduce fatigue, keep your pruning tools sharp and in good working condition. Hand pruners,

lopping shears, and pole pruners should be periodically sharpened with a sharpening stone. Replacement blades are available for many styles. Pruning saws should be professionally sharpened or periodically replaced. To reduce cost, many styles have replaceable blades.

Tools should be clean and sanitized as well as sharp. Although sanitizing tools may be inconvenient and seldom practiced, doing so may prevent the spread of disease from infected to healthy trees on contaminated tools. Tools become contaminated when they come into contact with fungi, bacteria, viruses and other microorganisms that cause disease in trees. Most pathogens need some way of entering the tree to cause disease, and fresh wounds are perfect places for infections to begin. Microorganisms on tool surfaces are easily introduced into susceptible trees when subsequent cuts are made. The need for sanitizing tools can be greatly reduced by pruning during the dormant season.

If sanitizing is necessary it should be practiced as follows: Before each branch is cut, sanitize pruning tools with either 70% denatured alcohol, or with liquid household bleach diluted 1 to 9 with water (1 part bleach, 9 parts water). Tools should be immersed in the solution, preferably for 1-2 minutes, and wood particles should be wiped from all cutting surfaces. Bleach is corrosive to metal surfaces, so tools should be thoroughly cleaned with soap and water after each use.

Treating wounds

Tree sap, gums, and resins are the natural means by which trees combat invasion by pathogens. Although unsightly, sap flow from pruning wounds is not generally harmful; however, excessive "bleeding" can weaken trees.

When oaks or elms are wounded during a critical time of year (usually spring for oaks, or throughout the growing season for elms) – either from storms, other unforeseen mechanical wounds, or from necessary branch removals – some type of wound dressing should be applied to the wound. Do this immediately after the wound is created. In most other instances, wound dressings are unnecessary, and may even be detrimental. Wound dressings will not stop decay or cure infectious diseases. They may actually interfere with the protective benefits of tree gums and resins, and prevent wound surfaces from closing as quickly as they might under natural conditions. The only benefit of wound dressings is to prevent introduction of pathogens in the specific cases of Dutch elm disease and oak wilt.

Pruning Guidelines

To encourage the development of a strong, healthy tree, consider the following guidelines when pruning.

General

- Prune first for safety, next for health, and finally for aesthetics.
- Never prune trees that are touching or near utility lines; instead consult your local utility company.
- Avoid pruning trees when you might increase susceptibility to important pests (e.g. in areas where oak wilt exists, avoid pruning oaks in the spring and early summer; prune trees susceptible to fireblight only during the dormant season).
- Use the following decision guide for size of branches to be removed: 1) under 5 cm diameter - go ahead, 2) between 5 and 10 cm diameter - think twice, and 3) greater than 10 cm diameter - have a good reason.

Crown Thinning

- Assess how a tree will be pruned from the top down.
- Favor branches with strong, U-shaped angles of attachment. Remove branches with weak, V-shaped angles of attachment and/or included bark.
- Ideally, lateral branches should be evenly spaced on the main stem of young trees.
- Remove any branches that rub or cross another branch.
- Make sure that lateral branches are no more than one-half to three-quarters of the diameter of the stem to discourage the development of co-dominant stems.

- Do not remove more than one-quarter of the living crown of a tree at one time. If it is necessary to remove more, do it over successive years.

Crown Raising

- Always maintain live branches on at least two-thirds of a tree's total height. Removing too many lower branches will hinder the development of a strong stem.
- Remove basal sprouts and vigorous epicormic sprouts.

Crown Reduction

- Use crown reduction pruning only when absolutely necessary. Make the pruning cut at a lateral branch that is at least one-third the diameter of the stem to be removed.
- If it is necessary to remove more than half of the foliage from a branch, remove the entire branch.

Glossary

Branch Axil: the angle formed where a branch joins another branch or stem of a woody plant.

Branch Bark Ridge: a ridge of bark that forms in a branch crotch and partially around the stem resulting from the growth of the stem and branch tissues against one another.

Branch Collar: a "shoulder" or bulge formed at the base of a branch by the annual production of overlapping layers of branch and stem tissues.

Crown Raising: a method of pruning to

provide clearance for pedestrians, vehicles, buildings, lines of sight, and vistas by removing lower branches.

Crown Reduction Pruning: a method of pruning used to reduce the height of a tree. Branches are cut back to laterals that are at least one-third the diameter of the limb being removed.

Crown Thinning: a method of pruning to increase light penetration and air movement through the crown of a tree by selective removal of branches.

Callus: see woundwood.

Decurrent: a major tree form resulting from weak apical control. Trees with this form have several to many lateral branches that compete with the central stem for dominance resulting in a spherical or globose crown. Most hardwood trees have decurrent forms.

Epicormic Sprout: a shoot that arises from latent or adventitious buds; also known as water sprouts that occur for on stems and branches and suckers that are produced from the base of trees. In older wood, epicormic shoots often result from severe defoliation or radical pruning.

Excurrent: a major tree form resulting from strong apical control. Trees with this form have a strong central stem and pyramidal shape. Lateral branches rarely compete for dominance. Most conifers and a few hardwoods, such as sweetgum and tuliptree, have excurrent forms.

Flush Cuts: pruning cuts that originate inside the branch bark ridge or the branch collar, causing unnecessary injury to stem tissues.

Included Bark: bark enclosed between

branches with narrow angles of attachment, forming a wedge between the branches.

Pollarding: the annual removal of all of the previous year's growth, resulting in a flush of slender shoots and branches each spring.

Stub Cuts: pruning cuts made too far outside the branch bark ridge or branch collar, that leave branch tissue attached to the stem.

Tipping: a poor maintenance practice used to control the size of tree crowns; involves the cutting of branches at right angles leaving long stubs.

Topping: a poor maintenance practice often used to control the size of trees; involves the indiscriminate cutting of branches and stems at right angles leaving long stubs. Synonyms include rounding-over, heading-back, dehorning, capping and hat-racking. Topping is often improperly referred to as pollarding.

Topiary: the pruning and training of a plant into a desired geometric or animal shape.

Woundwood: lignified, differentiated tissues produced on woody plants as a response to wounding (also known as callus tissue).

References

ANSI Z133.1. 1994. Safety standards. American national standard for tree care operators. Washington, DC: American National Standards Institute.

ANSI A300. 1995. Standard practices for tree, shrub, and other woody plant maintenance. Washington, DC: American National Standards Institute.

Fazio, J. R. ed. 1992. Don't top trees. Tree City USA Bulletin No. 8. Nebraska City, NE: The National Arbor Day Foundation.

Harris, R.W. 1994. Clarifying certain pruning terminology: thinning, heading, pollarding. Journal of Arboriculture 20:50-54.

ISA Performance Guidelines Committee. 1994. Tree-pruning guidelines. Savoy, IL: International Society of Arboriculture.

Ryan, H.D.P. III. 1994. Arboricultural pruning methodologies. Arborist News Volume 3(4):33-38.

Shigo, A. 1991. Modern arboriculture. Durham, NH: Shigo & Trees, Associates.

Shigo, A. 1989. Tree pruning: a worldwide photo guide. Durham, NH: Shigo & Trees, Associates.

“How to Prune Trees” was written to help people properly prune the trees they care about. If you doubt your ability to safely prune large trees, please hire a professional arborist. Information in this publication can be used to interview and hire a competent arborist.
