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Pacific West Region
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N 16 (PWR-NR)

February 18, 2015

PACIFIC WEST REGION DIRECTIVE: PW-062

SUBJECT: HAZARD TREE MANAGEMENT

This Directive supersedes Pacific West Region Directive PW-062, dated October 15, 2008.

INTRODUCTION

Visiting National Parks can be a special experience. It should also be a safe experience. Natural hazards are part of the environment and can include land or rock slides, floods, volcanic activity, or tree hazards among other potential dangers. Protecting visitors, park employees, and resources of the National Park System is an integral part of the National Park Service (NPS) mission.

Western parks have some of the tallest and oldest trees.¹ Tree failures in western parks have resulted in fatalities, serious injuries, and financial damage to facilities and personal property.²

On October 15, 2008, an updated Pacific West Region Directive PW-062 Hazard Tree Management was submitted and approved. A multi-disciplinary workgroup representing eight parks and the regional office prepared that directive for approval. Drafts of that revision received extensive review by parks, another regional office, the National Interagency Fire Center, the U.S. Forest Service, and the Solicitor.

Pacific West Region policy provides for the update/review of directives every five years. That review/update has been completed.

¹ Van Pelt, R. 2001. Forest Giants of the Pacific Coast. University of Washington Press.

² Smith, R. S., Jr., Bruce H. Roettgering and John Pronos. 1984. Evaluation of tree failures in Yosemite National Park. U.S. Department of Agriculture, Forest Service, Pacific Southwest Region Forest Pest Management Report No. 84-32 (and tree failure reports from MORA and SEKI).

This Directive covers the following program requirements:

- Administration
- Safety
- Prevention and Avoidance
- Surveillance/Examination
- Documentation
- Rating Systems
- Monitoring
- Abatement/Mitigation
- Alternatives for Accomplishing Mitigation
- Disposition of Felled Trees/Tree Parts
- Public Education
- Training
- Exceptions
- Compliance
- Approval Authority

This Directive provides examples of two rating systems that are used predominantly within the region: the seven-point and eight-point systems. However, it is a park's decision as to which rating system to use based on past use, vegetation type, and systems used by other agencies or network parks.

This Directive is intended as a concise, organized, stand-alone document; provides objectives, updated terminology and references; and accepts the use of any professionally recognized hazard tree rating system. This Directive provides guidance in the management of tree hazards and any other potentially hazardous vegetation which may injure people or damage property within park developed areas from the tree or parts of the tree failing. This Directive does not address invasive species, poisonous plants, or most other aspects of vegetation management. Questions pertaining to this directive may be directed to the Regional Hazard Tree Program Coordinator, Erv Gasser at (206) 220-4263.

SCOPE

The primary purpose of this Directive is safety of the visiting public and park employees, along with conservation of park resources. A program of hazard tree management is necessary to reduce the risk of injuries, fatalities and property damage due to tree failures in developed areas.

This Directive applies to all NPS units in the Pacific West Region which have trees, cacti, palms, or other large vascular plants which, in the event of failure, could cause personal injury or damage to property. The management activities identified in this Directive are to be undertaken to the fullest extent feasible and consistent with available resources while still providing for the safety of park operations.

This Directive supersedes the previous Directive dated October 15, 2008 and the “1993 Western Region Guidelines for Managing Hazardous Trees” and any subsequent guidelines.

Excluded from this Directive are:

1. The failure potential of any tree or large plant having no outwardly visible defects. This category of failures is often referred to as “green tree failures” or “acts of God,” and should be addressed through individual park safety or emergency preparedness plans. Exceptions to this exclusion would be human-caused predisposition to failure through direct or indirect impacts, such as adjacent clearing that results in “wind-tunnels” or construction activities that may impact tree roots.
2. The interference by any large plant (either alive or dead) with park management or visitor-related activities. These are commonly referred to as “nuisance trees.” Examples include roadside vegetation which either interferes with or obscures visibility for traffic, tree roots interfering with underground sewer lines, clearance issues with above-ground utilities, and arboricultural treatment done as part of routine landscape maintenance.

OBJECTIVES

The NPS and the Pacific West Region have a continuing concern for the health and safety of its employees and others who spend time in the parks. The objective of this Directive is:

- To provide parks with a framework for a hazard tree program that will minimize threats to life and property from the failure of hazard trees within developed areas, consistent with the NPS mission of conserving parks’ natural and cultural resources.

A park hazard tree management program provides a systematic method for mitigating tree hazards to avert injury to people or damage to property. The program should address developed areas as identified by local park managers. The program is not intended for wilderness or natural areas except for specifically identified portions of trails, designated campsites, shelters, or other sites.

AUTHORITY

The authority to issue this Directive is contained in 16 U.S.C. Sections 1-4 (the National Park Service Organic Act).

Regulations: 29CFR, PART 1960--Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters, Subpart D--Inspection and Abatement

Sec. 1960.26 Conduct of Inspections

Sec. 1960.30 Abatement of Unsafe or Unhealthful Working Conditions

Sec. 1960.8 Agency Responsibilities

Sec. 1960.9 Supervisory Responsibilities
Sec. 1960.10 Employee Responsibilities and Rights

Management Policy:

NPS Management Policies 2006: Chapter 4.1 General Management Concepts; Chapter 8.2.5.1 Visitor Safety; Chapter 1.9.1.4 Employee Safety and Health; and Chapter 5.3.5.2.5 Biotic Cultural Resources

Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-Making

Director's Order #28 Cultural Resource Management, Chapters 2, 6, 7, and 8

Director's Order #50C Public Risk Management Program

Special Directives: 82-6, July 12, 1982, Policy on Use of Dead and Down Wood and Wood Products; and Staff Directive 78-11, November 15, 1978, Use of Wood Fiber for Heating within areas of the National Park Service

NPS-77 Natural Resources Management, Hazardous Trees, pages 349-358

DEFINITIONS

Abatement - indirect means of ameliorating the threat of a hazard tree by removing or modifying the use of the potential target area, e.g., target removal; site closure via barriers, signing, public notification; or site use conversion.

Defect - an imperfection or condition of the tree that may have been caused by growth, disease, insects, decay, fire, wind, or physical injury/wounds or environmental factors which predisposes the tree to failure, either in part or in its entirety.

Developed Areas - the portion of an NPS unit that is intensively managed, and includes actual or authorized and planned alterations, construction or improvements intended to benefit and attract park users. Developed areas may include, but need not be limited to: visitor centers, campgrounds, parking lots, picnic areas, interpretive areas, lodging, park housing, transportation corridors (designated roads and trails), and similar areas. In addition, developed areas also include backcountry or wilderness developments or resources which may have intrinsic value and/or mandates; invite or encourage use of an area; or serve as a workplace. Such areas include, but are not limited to: backcountry cabins, ranger stations, concession-run camps, and designated campsites among others. Such areas are generally designated in a General Management Plan, Master Plan, Special Use Permit, other planning documents, or an environmental compliance document.

Hazard Tree/Tree Hazard – any tree, cactus, palm, or other large vascular plant, either alive or dead, which, due to outwardly visible defects, has potential to fail (in part or in its entirety) and strike a person or property within a developed area. Some types of trees, with or without defects, may have parts that are potentially hazardous, such as pine cones, coconuts, or other naturally shed parts of a tree.

Hazard incorporates not just the condition of the tree but also the potential target. If there is no identifiable target then a tree is not considered hazardous.

Mitigation - direct control action, including removal or limbing/topping of hazard tree to reduce or eliminate a tree hazard.

Rating System - a method of evaluating a tree's hazard potential.

Surveillance/Examination - detection activities aimed at identification and evaluation of hazard trees.

Target - the object, structure, or person that potentially may be hit or impacted by a tree failure. Targets are located in a designated hazard tree management area.

PROGRAM REQUIREMENTS

Administration

A park hazard tree management program will be administered by the park superintendent or his/her designee. The park superintendent retains discretion to administer the program with available park staff and financial resources in the context of other legal requirements and other considerations. Administering the program can be accomplished through contracts, concession permits or other instruments. See Options for Accomplishing Hazard Tree Surveillance and Mitigation below.

Parks that conduct hazard tree monitoring and management should document their program in a Hazard Tree Management Plan or similar document. The program will contain the elements outlined below.

Hazard tree management is generally considered an activity that should be funded through park base, not through project funding. In exceptional circumstances parks may seek project funding from Natural Resources or other sources.

Safety

The safety of park employees and the public is a primary objective of any hazard tree management program (NPS Management Policies 2006 8.2.5.1 Visitor Safety). Individuals involved in hazard tree management, even incidentally, must be fully briefed and adequately trained. Supervisors should ensure compliance with safe practices. An operational risk assessment and Job Hazard Analysis should be completed for hazard tree activity. Employees dealing with any aspect of hazard trees should always be aware that hazard trees have the potential to fail at any time, in addition to possible dead limbs or tops that could fall. Before approaching the base of a tree, tree surveyors should inspect the canopy for dead or hanging branches or tops that could fall.

People conducting inspections must follow defined safety standards such as those identified in the American National Standards Institute (ANSI) Z133.1 Safety Standard, when working

adjacent to hazard trees. Tree surveyors must use personal protective equipment, such as hard hats or eye protection, when working near hazardous trees.

Employees managing tree hazards must be trained in proper tree removal techniques, as well as proper equipment use. Safety equipment such as hard hats, eye and ear protection and chaps must be worn.

The area where the felling or limbing will occur must be closed off to prevent injury to unaware bystanders. Spotters will be assigned to monitor the perimeter at appropriate locations. Traffic control may also be needed. Appropriate signage will be used, explaining the reason for the closure. The closure will be communicated to the other park divisions.

Prevention and Avoidance of Tree Hazards

Management activities in and adjacent to developed areas – such as maintenance of facilities, construction, fire management, and tree hazard mitigation – will attempt to minimize injury to living trees which are to be retained on the site. This includes damage to roots as well as the bole (trunk), and limbs of trees.

Tree hazard abatement and/or mitigation may be required when individual trees in natural or wilderness areas killed or damaged by fire management, trail construction, ecological restoration, or other management activities are within striking distance of a target, particularly if the damage leads to colonization by decay fungi or insect attack.

Stands of trees that have been damaged by broader landscape treatments such as wildland fire management will generally not be subject to tree hazard management activities in natural or wilderness areas away from managed targets.

Planning activities for facility development in forested areas should avoid, remove, or recognize the eventual need to remove trees that are most likely to be hazardous during the life cycle of the facility.

Surveillance/Examination

A park hazard tree plan will explicitly delineate the area boundaries of designated developed areas subject to – or exempted from – hazard tree management activities, such as campsites, residences, lodges, picnic areas, contact stations, road corridors, trails, power lines, etc.

Those areas generally exempted from hazard tree surveillance may include natural areas, some cultural landscapes, and designated wilderness areas, with the exception of specific developed sites as determined by local park managers.

Park boundaries should be surveyed where there are developments adjacent to the park boundary that may be impacted by park trees. Potentially hazardous trees on adjacent lands should be surveyed, in cooperation with the landowner, for trees that may affect NPS developments. Coordination and permission of the landowner is necessary to conduct a thorough survey and/or mitigation work.

Surveys/inspections of tree hazards should be made on a regular periodic basis; the frequency of surveys in each developed area should be documented in the hazard tree plan. Surveys/inspections should also be made following storms, fires, or other environmental events. There are several types of surveys/inspections. They are:

Drive-By/Windshield Survey/Inspection

This type of survey/inspection involves deliberate visual scans at slow vehicle speed. In itself, this method is minimally effective. It should be combined with follow-up inspection of all trees or tree parts noted or suspected of possessing hazard characteristics. While this may be a practical method, it is not effective unless the follow-up inspection is completed.

Monitor Survey/Inspection

Monitor surveys involve a walk-through of the survey area with a visual scan for any highly defective trees. Those trees initially perceived to be highly defective will then receive a complete evaluation and rating. Trees previously rated as moderate or above will be revisited and re-evaluated as determined by the park. Monitor surveys are intended to be faster than complete surveys, because each tree does not receive a complete inspection. For seasonal developed areas, monitor surveys should occur before a site is opened for seasonal use.

Complete Survey/Inspection

A complete survey involves a thorough inspection – up close and from a distance – of each apparently defective tree that is located within striking distance of a target. Complete surveys will occur as deemed necessary by the park.

Documentation

Whatever type of survey/inspection is accomplished, it is imperative that written documentation of the inspection be kept. Inspection data should be saved as well as documentation of treatment actions. Documentation is important to track the progress of the program, to detect trends in disease and hazard occurrence within developed areas, and to provide legal evidence should an accident occur. Year-to-year records of individual inspected trees can be useful to document whether a tree is declining, stable, or regaining vigor. Photographs may also be used to supplement the record.

Training of inspectors should also be documented.

A hazard tree evaluation form should include the names of the inspectors, date(s) of inspection, the area covered, management zone, noted or suspected hazardous trees (include location, size, and species of tree), ratings, notes on inspections of individually checked trees including description of the flaws, recommendations, documentation of scheduled follow-up actions, and treatment actions.

The park may choose to conduct a necropsy of a felled tree to evaluate the accuracy of the hazard tree rating and record it on the evaluation form.

Rating Systems

All hazard tree management programs need to have some method of objectively rating tree hazards. Hazard tree management programs of Pacific West Region parks will implement a professionally recognized, documented and quantified hazard tree rating system. A rating system must combine values of the two necessary components: potential for tree failure and potential and seriousness of damage in the case of a tree failure.

Trees are not considered hazardous and need not be evaluated if they are not within striking distance of a target.

Factors affecting selection of a rating system include: precedence of in-park use, applicability to local flora and forest pathogens, and consistency with other local NPS units and adjoining land management agencies. A rating system should consider the following:

- potential for tree failure
- potential for damage
- potential for target impact
- target value

While many professional rating systems exist, two systems commonly used in the Pacific West Region are the “Seven-Point” (Mills and Russell 1980) and the “Eight-Point” (Harvey and Hessburg 1992) systems. See the Appendix for descriptions of these two rating systems.

Regardless of the rating system used, an essential component is identification of “action thresholds.” A park hazard tree management program must consider these action thresholds based on a tree’s rating:

1. Hazardous conditions rated as low require no further immediate action
2. Hazardous conditions rated medium/moderate or above require observation so long as risk of exposure to the condition remains, and may require abatement/mitigation measures
3. Hazardous conditions rated high or above require a management action
4. Hazardous conditions rated very high require prompt actions to both notify park users and to execute abatement/mitigation measures

A park may consider the knowledge, experience and judgment of the park’s field staff in conjunction with the numerical hazard tree rating system to determine the appropriate management response for a species and target-specific hazard.

Monitoring

A park hazard tree management program must include a monitoring component to perform follow-up surveillance/examination of previously examined trees rated medium/moderate or above; to follow-up on abatement/mitigation actions; to review the status of any park closures; and to track the numbers of trees lost per acre due to abatement/mitigation actions.

Abatement/Mitigation

Once an area has been surveyed, any sites which contain trees or tree parts with a very high hazard rating will be considered for immediate temporary closure until further

abatement/mitigation options are explored. Decisions for short term closure will be made by the park superintendent or his/her designee.

Trees with a high or very high hazard rating will require some type of abatement/mitigation. Prior to any action, a review of resource issues should be made considering the various environmental laws and the resources potentially impacted. Abatement/Mitigation options include but are not limited to:

- Remove the target
- Permanent site closure (may require management approval)
- Temporary site closure– the site is closed until the hazard tree fails– or until the hazard is mitigated
- Prune the defective parts of the tree
- Support the tree, such as through bracing or cabling
- Reduce the height of the tree below striking distance of target
- Tree removal

Target removal may apply to targets which can be easily moved, such as picnic tables. Permanent site closures may require Park Management Team recommendation and park superintendent approval.

Trees that contribute either individually to a historic property, or are considered part of the immediate setting that helps define a historic property, should be managed in a way that recognizes their historic value and utilizes guidance provided in the “Secretary of the Interior’s Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes.” In instances where trees are considered historic resources, consideration should be given to taking a conservative approach which reduces the identified threat while trying to stabilize the tree and ensuring that the tree and its historic character is retained, if feasible. Removal of historic trees should include documentation and replacement strategies consistent with the treatment/management of the historic property.

Options for Accomplishing Hazard Tree Surveillance and Mitigation

The hazard tree management workloads may exceed the capacity of park staff, particularly following a storm, fire, or other event. Options to accomplish needed hazard tree surveillance, inspections, and mitigation/abatement work may include:

- Inter-divisional in-house efforts
- Inter-park details
- Inter-agency agreements (e.g. Forest Service "Enterprise" teams, or neighboring BLM forester)
- Service contracts: Be aware of the potential for conflicts of interest if the same party is conducting surveillance/inspections and mitigation work (See Contracting Instruments for Biomass Treatments below.)
- "No-cost" (surplus property) sales (see Contracting Instruments for Biomass Treatments below)

Some activities may be required of others through specific clauses in Concession Operating Plans, Special Use Permits, Easements, and Right-of-Way Agreements.

Disposition of Felled Trees/Tree Parts

Biomass resulting from tree hazard mitigation will be recycled through the ecosystem when practicable (NPS Management Policies 2006, § 8.8). Whenever possible, consideration should be given to recycling felled hazard trees into the ecosystem in place, except where the trees will inhibit use of the area, create unacceptable fuel loads, will contribute to unacceptable pest infestations, are incompatible with the historic scene, or where they have been approved for use in maintenance projects. Lopping, burning, or chipping may facilitate recycling of biomass into the ecosystem.

Sections of a tree creating an obstacle within a campsite or developed area should be moved to the edge of the site.

Felled trees may be bucked, if it is necessary, to move or remove them from the site, to conform to the ground surface, or to accelerate decomposition. Consideration should be made to make the cut ends less visible to visitors. Tree stumps should be flush cut as close to the ground as possible and scored to hasten decomposition.

In situations where large numbers of trees have been felled, some trees may need to be removed while some are left on the site. When mitigation results in volumes of woody debris that exceeds the amount that can reasonably be recycled naturally in place, site rehabilitation requires disposal of the excess. This can entail lopping and scattering limbs on site, piling and burning on site, broadcast chipping, chipping and hauling, hauling woody debris to a burn pit for burning, administrative use, donation to Tribal or other appropriate organizations, sale as firewood, or sale as saw logs (16 U.S.C. Section 54 (Sale of matured, dead, or down timber)).³

Wood and wood products are permitted to be removed as the result of approved development, construction, or resource management activities, or where removal is necessary due to a hazard or obstruction, or in historic, recreational, or development zones for: (a) maintenance of historic scenes, (b) maintenance of recreational environments, (c) rights-of-way, (d) vista clearing, or other approved reason. In such instances, the wood shall be disposed of as follows:

1. Quantities associated with work or activities incidental to, or the result of a contract should be removed by the contractor. The reasonable net value of the wood should be calculated in the contract cost.
2. Wood and wood residue remaining from normal park operations may be allocated for park uses, such as heating public buildings and offices, and remote back country stations and for park interpretive campfires. Surplus wood and wood products, however, shall not be supplied to concessioners for facilities or activities, nor to residents, nor to employees for residential heating inside or

³ 16USC Section 3 and 54; Special Directive: 82-6, July 12, 1982, Policy on Use of Dead and Down Wood and Wood Products; and Staff Directive 78-11, November 15, 1978, Use of Wood Fiber for Heating within areas of the National Park Service.

outside the park, nor for use in government quarters. Wood may be obtained, however, under paragraph three for such purposes.

3. Wood and wood products available in quantities or under circumstances beyond those needed for park operations functions described in paragraph two shall be sold at fair market value pursuant to 16 U.S.C. 3.

Superintendents may not authorize the collection or use of dead and down wood or wood products except (a) where salvage wood is available under circumstances described above. (Special Directive 82-6)

The Department of the Interior allows and encourages contractors to remove and use woody biomass from project areas when: (1) The biomass is generated during land management service contract activity; and (2) Removal is ecologically appropriate (48 CFR Part 1437).

Contracting instruments for biomass removal include:

- Timber Sale (value of biomass removed subsidizes work and results in payment to U.S. Treasury)
- Stewardship Contract (value of biomass removed subsidizes work; excess value may be applied to other stewardship contracts)
- Personal-Use Permits (allow for gathering of marginal-value biomass such as firewood, posts and poles, etc.; permits may be free or low-cost)
- Service Contracts (economic value of biomass treated insignificant; contractor paid for efforts; should maintain the option for contractor removal of woody biomass (48 CFR 1437.7202), where ecologically appropriate.)

Public Information

The park will provide reasonable public information (via interpretive media, safety messages, and other suitable communications) about the known potential for risk of exposure in the park to hazard tree conditions. The intent is to make the public aware of potential tree hazards that are known to exist in developed areas within the park or sections of the park. This information/public outreach should be on a level commensurate with other public safety information, e.g., avalanche potential, lightning, fire, road hazards, etc.

Training

Standards for training have not been established. Hazard tree inspections and surveillance should be done by inspectors who are trained and have demonstrated competence in:

- Tree identification
- Basic tree biology/engineering
- Condition assessment process
- Recognition and evaluation of tree hazards
- Hazard tree rating and associated systems
- Hazard mitigation options
- Documentation/report writing

- Threatened/endangered/sensitive species
- Environmental resources (wildlife, aquatics, hydrology, soils, fuels, etc.)
- Cultural resources (archeology, landscapes, etc.)

Training is often available from U.S.D.A. Forest Service, Forest Health Protection offices, state cooperative extension or other state agencies, some universities, or private sources, which may be found via the International Society of Arboriculture (ISA).

The National Wildfire Coordinating Group (NWCG) training course “S-212 Chainsaws” is a basic chainsaw course that can familiarize staff sufficiently to be able to limb, buck, and fell smaller trees. More technical tree work requires the expertise of experienced personnel, who are often not available in parks and may need to be contracted. ISA may be able to provide references.

Exceptions

Park areas subject to a hazard tree management program are typically developed areas and other areas where the park has encouraged public visitation, or areas for administrative/public use.

Natural areas, some cultural landscapes, some park-specific management zones, and designated wilderness areas may be excepted from a hazard tree management program as determined by the park, whether or not developments exist within these areas. In such areas, visitors are expected to know that they are responsible for their own safety. Public education and/or warning procedures should be implemented by parks to inform visitors of natural hazards inherent within parks. Parks will document such decisions in their hazard tree program files.

Where wilderness or backcountry campsites or other developments are designated and assigned by the NPS, e.g., permitted campsites, these areas should be identified for inclusion in the hazard tree management program, and such sites should be surveyed and hazards abated/mitigated.

Other exceptions include:

1. A park may designate particular specimens, complete stands of vegetation, or even entire “showcase” species exempt from direct physical mitigation of hazards; in making such exemptions, the park superintendent will provide for risk abatement through compliance with all other provisions of this Directive.
2. A park may designate or declare sensitive park landscape resources exempt from direct hazard mitigation activities. This may occur in areas where cultural landscape values will be impaired by the removal of trees.

Compliance

It is the responsibility of the park superintendent to ensure the compliance of park programs with all federal laws, including National Environmental Policy Act, Endangered Species Act, Migratory Bird Treaty Act, Wilderness Act, and National Historic Preservation Act among others.

In most instances, the abatement/mitigation work of a hazard tree management program can be considered as routine vegetation maintenance, removal of a hazard, and/or maintenance of cultural resources, which are considered a Categorical Exclusion. Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-Making provides further guidance on compliance activities such as when U.S. Fish and Wildlife Service consultation is necessary when there is a potential to impact threatened or endangered species or when consultation is necessary with the State Historic Preservation Officer as provided by Section 106 of the National Historic Preservation Act.

Approval Authority

As an action plan primarily prepared by park staff, the approval authority for any park hazard tree management plan rests with the park superintendent. In some instances an Environmental Assessment (EA) may be developed for a hazard tree management program. An EA will require the review and approval of the Regional Director. Subsequent amendments to the plan will have the same review/approval as the original document.

ROLES and RESPONSIBILITIES

Park Superintendent

It is the responsibility of each park superintendent to determine the need for and, as appropriate, to develop, implement, and keep up-to-date a hazard tree management program, documented in an action plan. The superintendent must designate the person (or him/herself) to be responsible for the necessary hazard tree inspections/mitigations. The superintendent is also responsible for ensuring that park staff receives appropriate training to safely carry out their hazard tree management responsibilities.

Regional Director

The Regional Director should ensure that each park has an adequate hazard tree management program.

/s/Christine S. Lehnertz
Regional Director, Pacific West Region

Attachment

RESPONSIBLE OFFICE: Natural Resources, Pacific West Region

DISTRIBUTION: Directorate, Program Chiefs, Superintendents, Pacific West Region

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586 DM 1 Timber Management
http://elips.doi.gov/app_dm/act_getfiles.cfm?relnum=2045

Forest Pathology Hazard Trees (by James J. Worrall, Plant Pathologist, USFS-R2)
<http://forestpathology.org/hazard.html>

International Society of Arboriculture
<http://www.isa-arbor.com/home.aspx>

International Society of Arboriculture, PNW How to Recognize & Prevent Tree Hazards
<http://www.pnwisa.org/HazTree.pdf>

International Society of Arboriculture, Trees are Good, Recognizing Hazard Trees
<http://www.treesaregood.com/treecare/hazards.aspx>

NWCG Hazard Tree Safety:

http://www.nwcg.gov/teams/shwt/http/training_education.html

National Park Service, Olmsted Center

<http://www.nps.gov/oclp/>

NPS PWR, Potential Funding Sources

<http://classicinside.nps.gov/documents/Funding%20sources%2009-03.doc>

<http://inside.nps.gov/regions/custommenu.cfm?lv=2&rgn=64&id=484>

USFS, Northeastern Area, Hazard Tree Publications and Factsheets

http://na.fs.fed.us/fhp/hazard_tree/pubs.shtm

USFS/BLM/Oregon OSHA, Field Guide for Danger Tree Identification and Response

http://www.osha.oregon.gov/pdf/pubs/reserve_trees.pdf

APPENDIX

Rating Systems

Two professionally accepted rating systems that are well documented and have been commonly used in Pacific West Region parks are the “7-point” and “8-point” systems.

7-Point Hazard Tree Rating System:

The rating is comprised of two components incorporating the following factors: (1) **tree failure potential**; (2) **target damage potential**; (3) **target impact potential**; and, (4) **target value**.

The **Tree or Defect Rating Value** component represents an estimation of the tree's relative potential for imminent failure and its damage potential based upon an evaluation of tree condition (defect), including site factors, plus size and height of the potentially hazardous portion of the tree. There are three possible ratings, 1-3, with three representing the highest failure/damage potential.

An additional point may be added for severe lean, which increases the likelihood of failure. Thus, 4 is the maximum defect rating possible, and represents a very defective (and/or predisposed to failure) tree with a severe lean which has great potential for damage and/or injury/death.

Defect ratings for high, medium, and low ratings are usually assigned and/or modified on a local/regional basis and reflect variations in species and environmental factors. The following is provided as an example and may need to be revised for local conditions:

High (3)--Significant Visible Defect/Damage (Predisposed to failure w/in 3 years or before next scheduled inspection)

- Conifer crown > 70% dead; hardwood crown >50% dead
- Dead limbs 4-6” diameter > 40% of crown
- Dead limbs 6-8” diameter > 20% of crown
- Dead limbs > 8” diameter
- Live limbs with visible signs of rot or splits
- Hangers ≥ 2” diameter
- Heart rot/hollow > 70% diameter
- Multiple conks ≥ 6” wide on bole or limbs, indicating extensive heart rot
- Catface/canker > 50% circumference
- Shallow rooting/soil saturation; obvious signs of uprooting (e.g. mounding, cracking)
- Conks or mushrooms of root decay fungi at root crown, or loose bark at ground level, indicating root rot
- Characteristics (e.g. slabbing bark, extensive decay, etc.) which could result in unsafe deferred removal

Medium (2)--Moderate Visible Defect/Damage (Failure unlikely within 3 years or before next scheduled inspection.)

- Reduced growth; flattened conifer tops
- Numerous scattered dead/dying limbs
- Conifer crown 30-70% dead; hardwood crown 30-50% dead
- Dead limbs 4-6" diameter 20- 40% of crown
- Dead limbs 6-8" diameter 10- 20% of crown
- Live limbs with rot, hollow, or dead areas
- Heart rot/hollow 30-70% diameter
- Single conk < 6" wide on bole or limbs
- Catface/canker 30- 50% circumference
- Proximity to identified root rot center

Low (1)--Limited Visible Defect

- Reduced growth; rounded conifer tops
- Discolored and/or sparse foliage
- Conifer crown < 30% dead; hardwood crown <30% dead
- Dead limbs 2-4" diameter <20% of crown
- Dead limbs 4-6" diameter <10% of crown
- Heart rot/hollow <30% diameter
- Catface/canker <30% circumference
- Proximity to suspected root rot center

The second component is the **Target Rating** and represents impact potential and target value (monetary or possibility of injury/death). The ratings for this element are similarly rated 1-3, with 3 being the highest. A target rated 3 is one which has a high value (property or person) with a high likelihood of being impacted in event of failure. These ratings are usually more standardized with following an example:

High (3)--Overnight Exposure

- Campgrounds
- Lodges, hotels, dormitories
- Residences
- 24-hour visitor service facilities

Medium (2)--Daytime Exposure

- Paved trails
- Interpretive sites, such as amphitheaters, kiosks
- "High use" road networks where occupancy is "constant"
- Roadside attractions, such as vista points or historic stops
- Information stations, visitor centers, fee collection portals
- High-use facility designated parking areas; designated trailhead parking areas
- Utilities, infrastructure
- "High-use" areas with "constant" occupancy, such as plazas, staging areas, commercial sites
- Picnic areas

Low (1)--Transitory Exposure

- Highway corridors
- Unimproved roads
- Turnouts
- Bicycle paths
- Structures with sporadic occupancy, such as restrooms associated with parking areas, storage buildings

The **Total Hazard Rating** is the **sum** of the **Defect Rating** and **Target Rating**.

Hazard Rating

2-3

4-5

5 (w/3 defects)-6

7

Treatment Priority

Low

Medium

High

Very High

TREE HAZARD EVALUATION FORM

(7-Point System)

PARK _____ RECORDER _____

AREA _____ EXAMINER(S) _____ DATE _____

Tree No.	Tree			Defect	Site	Rating									Action				Comments									
	Species	DBH (in)	Height (ft)	Defect 1 (Type)	Defect 2 (Type)	Defect 3 (Type)	Category	Use	Site Description	Rating History	Tree			Top/Limbs			Rating Date			Rated By	Recommended	Completed	Completion Date			Completed By	Difficulty	
											Tree	Target	Total	Top/Limbs	Target	Total	Month	Day					Year					

8-Point Hazard Tree Rating System:

A. Potential for Tree Failure

1 = *Very low failure potential*: Sound trees that lack indicators of failure that are not leaning or not exposed to wind or snow load.

2 = *Low failure potential*: Trees with only minor defects, including internal decay that does not approach or exceed the 1/3 rind thickness rule and are not leaning or not exposed to wind or snow load.

3 = *Medium failure potential*: Trees with moderate defects (e.g., at or near the threshold of acceptable rind thickness) or that are growing in shallow soil or exposed to a high water table, or highly defective trees in areas well-sheltered from weather and wind extremes; or highly defective trees in areas exposed to weather extremes (e.g., heavy snow loads) only in the off-season.

4 = *High failure potential*: Highly defective trees in unsheltered areas; trees with root anchor age limited by erosion; dead trees; trees with obvious root disease.

B. Potential for Damage

(This factor combines the last three factors mentioned above: potential for striking a target; potential for damaging a target; and target value.)

1 = *No damage*. Target impact will only involve very small tree or parts of tree; or there is no chance tree will cause damage when impact on target.

2 = *Minor damage*. Failure of only small tree or parts of tree; damage is likely to occur when target is not occupied; target value is low.

3 = *Medium damage*. Failure involves small trees or medium-sized parts of trees; impacts will likely occur in areas with targets; impacts will be direct; and damage will likely be moderate; target value is moderate.

4 = *Extensive damage*. Failure involves medium to large tree parts or entire trees; impacts will be direct in areas with targets; target value is high; damage to property will likely be severe; or serious personal injury or death is the likely result.

Tree hazard rating score = Potential for Failure + Potential for Damage

This would yield a score from 2 to 8 for each tree.

The next step is to evaluate the tree rating scores for a developed area, which can then be helpful to prioritize which trees need treatment and in which order when resources are not available for treating all higher risk trees.

Hazard Rating Score	Treatment Priority
2-5	Low
6	Moderate
7	High
8	Very High

HAZARD TREE EVALUATION FORM (8-Point System)

Observer name(s) _____ Date _____

Tree ID # _____ Location _____

Species _____ DBH _____ Height _____ Reference _____

Bearing _____ Distance _____

Shell thickness _____ Possible origin of damage _____

EVALUATION OF TREE CONDITION: 1 POINT IF ANY CONDITIONS LISTED BELOW ARE PRESENT

- ☐ large scar (2-4 sq ft), frost cracks, hollow butt, bole flattening
- ☐ fruiting bodies, or punk knots on hemlock
- ☐ callus tissue at base, stem cankers
- ☐ tree declining or possible root rot
- ☐ cut/exposed roots (>25% of root mass), bad rooting, shallow or wet soil
- ☐ dead top, large dead limbs (>5" dia), crooks, forked top, volunteer top, any large limbs (>8" dia) on hardwoods
- ☐ insect frass or pitch tubes
- ☐ mistletoe cankers or brooms
- ☐ woodpecker holes
- ☐ tree dead

TOTAL: _____

ADD 1 POINT IF ANY OR ALL CONDITIONS BELOW ARE PRESENT:

- ☐ old bole scars (>15 years), scars 2 sq ft (4 sq ft on PSME), open tension or frost cracks, swollen butt, stem decay, hollow/rotten trunk (remaining wood < Wagener's minimum safe shell thickness)
- ☐ >5 conks of *F. pini*; any conks of *F. officinalis*, *E. tinctorum*, *F. applanatus*, *F. annosus*, *P. weinii*, or *A. mellea*
- ☐ root disease diagnosed by fading or chlorotic foliage, thinning crown, distress cone crop, tip dieback, or resin flow at base of tree
- ☐ cut/exposed roots (>50% of root mass), or visible soil cracks around roots with shallow rooting or water-saturated soil
- ☐ dead, broken or crooked top with large dead limbs, large dead limbs (>8" dia) on hardwoods
- ☐ carpenter ants/wood boring beetles present (not bark beetles), with extensive boring
- ☐ mistletoe stem cankers with 1/2 circumference of swelling dead
- ☐ split bole, longitudinal cracks in bole
- ☐ tree dead

TOTAL: _____

ADD 1 POINT IF ANY OR ALL CONDITIONS BELOW ARE PRESENT:

- ☐ large open tension or frost cracks, hollow/rotten trunk (remaining wood < Wagener's minimum safe shell thickness)
- ☐ >15 conks of *F. pini*, or any large conks >8" dia, or conks of *F. pini*, *F. pinicola*, or *E. tinctorum* within 20 ft of ground or covering more than 25 ft of stem, or a single conk of *F. officinalis*
- ☐ root disease present, with conks of *F. annosus*, *P. weinii*, *A. mellea*, *P. schweinitzii*, and/or advanced decay present in roots and/or butt of tree and/or mycelial fans
- ☐ cut/exposed roots (>50% of root mass), or root mass lifting on one side or disturbed soil showing
- ☐ large sections of loose bark, large detached limbs or broken limbs present
- ☐ tree dead

TOTAL: _____

ADD 1 POINT IF ANY OR ALL CONDITIONS BELOW ARE PRESENT:

- ☐ tree leans >5% (uncorrected), is highly susceptible to wind, has saturated soil or shallow rooting
- ☐ fresh longitudinal cracks in bole
- ☐ forked top with evidence of crotch weakening

TOTAL: _____

TREE CONDITION TOTAL: _____

EVALUATION OF TARGET (circle one)

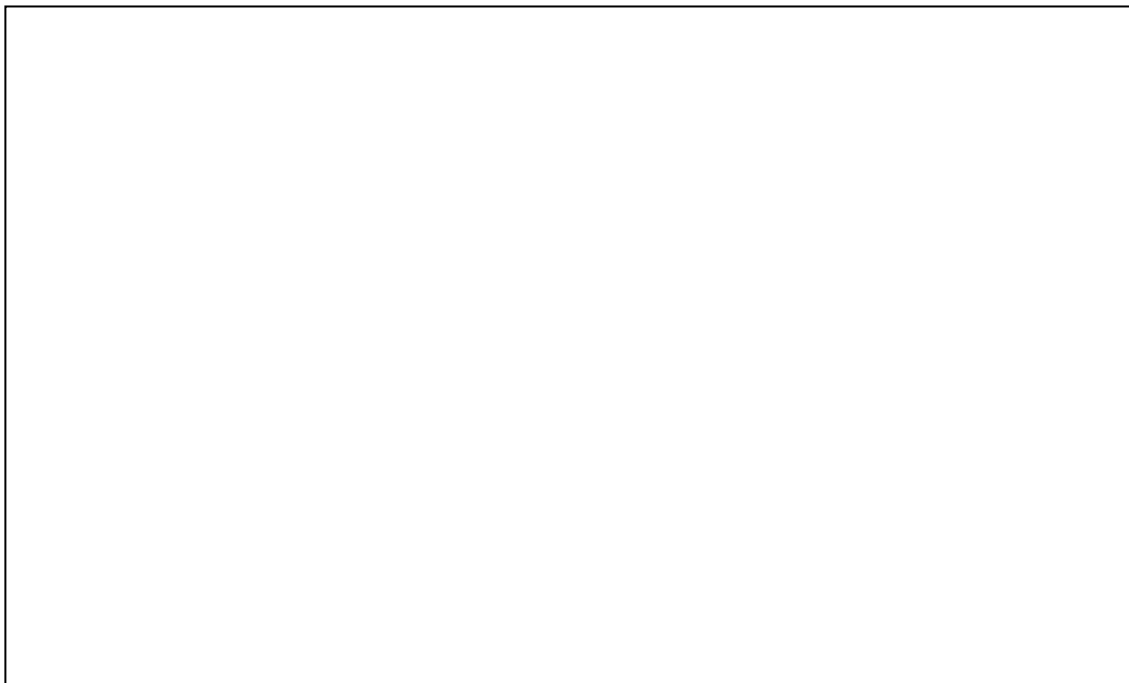
- 1 = No damage or injury any area used intermittently
 roadside pullouts
 no structures
- 2 = Minor damage day-use picnic areas, parking spurs
 developed nature trails
- 3 = Moderate damage campsites
 major road bridges
 primary utility structures
- 4 = Extensive damage permanently occupied structures
 concentrated use in season
 high value improvements-houses, restrooms
 campsites open year-round, power lines, etc.

TARGET VALUE: _____

Add Tree Condition Total and Target Value = **TREE HAZARD SUMMARY RATING:** _____

Observer comments: _____

Tree location map:



~~~~~  
**Recommended action:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
**Treatment taken:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.