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**TREE HAZARD POLICY AND MANAGEMENT PLAN
(1997)**

FOR

DENALI NATIONAL PARK AND PRESERVE

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Submitted by:

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environmental and site factors, includes potential failures throughout the year, not just season of use.

The probability of target impact is determined by both the chance of a failure striking a specific area and the likelihood of that area being occupied. Probability of an accident then, is the product of the probabilities of failure and impact. Accident loss is determined by the ability of the failure class to inflict damage and the target value.

The **desired future condition** of the vegetation in developed areas is a vigorous vegetative community that approximates the “natural” state, given the constraints of past and present human intervention, while providing a relatively safe environment for human use and enjoyment. “Safe” is defined as an environment in which there is a 0% rate of accidents (property damage, injury, and death) due to tree failures.

II. PROGRAM DIRECTION AND AUTHORITIES

A. Program Direction

The 1988 National Park Service *Management Policies* do not specifically address the management of tree hazards but do state in Chapter 8:5 under “Visitor Safety and Protection” that:

“The National Park Service...will seek to provide a safe and healthful environment for visitors and employees. The Park Service will work cooperatively with other federal, state, and local agencies, organizations, and individuals to carry out this responsibility. However, park visitors assume a certain degree of risk and responsibility for their own safety when visiting areas that are managed as natural, cultural, or recreational environments.”

“The National Park Service will strive to identify recognizable threats to the safety and health of persons and to the protection of property...”

Chapter 4:9, Cultural Zone paragraph 2, vaguely refers to removing hazardous trees:

“An individual tree...that poses a safety hazard...will be removed...”

The 1988 NPS-50, *Loss Control Management Guideline* (Chapter 5, p.1) states the need for Inspections and an Abatement Process:

“Every NPS facility, operation and/or worksite, including employee housing, shall be formally inspected annually...The term ‘inspection’ means a comprehensive survey of all or part of a workplace in order to detect safety and health hazards.”

held liable for failure or negligence with respect to visitor protection. Most interpretations of tort law make the landowner responsible for taking reasonable care to avert harm to visitors. Reasonable care may take the form of action and/or warning. The government as a landowner is required to have superior knowledge of dangers which would not be obvious to the invitee if such dangers are discoverable in the exercise of due care.”

III. PARK POLICIES

A. General Program Management

- 1) Future Park developments should be located, to the extent possible, in areas where potential tree hazards will be minimized.
- 2) New development sites should be surveyed to identify potential tree hazards. Identified potential high priority (as defined below) tree hazards should be removed prior to construction by contract or by Park Service personnel.
- 3) Management activities within developed areas, including, but not limited to, maintenance of facilities, construction, prescribed burning, and tree hazard removal, should attempt to minimize injury to living trees. This includes damage to roots as well as the bole (trunk) and limbs of trees. Visitor information should be provided to educate the public on tree hazards, their causes, and prevention.
- 4) The Park is responsible for inspection and mitigation of “assigned lands” as the concessionaire properties.
- 5) Hazardous trees may be felled and removed by private contract to expedite removal.
- 6) Tree hazards may be made available to Park use (cabins, historic st. etc.), to the public for campground use, and for general out-of-park use.

B. Planning

- 1) An Annual Performance/Work Plan, identifying attainable annual goals and outputs for surveillance and mitigation, should be prepared by May 1. This Plan will be prepared by the Plant Ecologist after consultation with the Park Safety Officer and review by other appropriate individuals (i.e. Cultural Specialist). This Plan should be revised annually, as necessary, to reflect work levels which actually will be accomplished.
- 2) The annual project control documents will be prepared and reviewed annually by the Chief of Research and Resource Preservation.

c. priority 7 tree hazards will require immediate (within 48 hours) public notification/temporary closure plus development/approval of plan within 10 working days specifying subsequent action.

3) Tree hazard mitigation, site cleanup, and rehabilitation should be done in such a manner as to protect residual trees, other resource values, and human developments. (See Appendix D, Hazard Tree Mitigation).

Alternatives include, but are not limited to:

- a. leaving high value specimen trees and abating hazard by site closure; or moving the target to a new location,
- b. topping rather than tree removal, creating a reduced stob (with “naturalized” cut) for wildlife habitat; pruning branches,
- c. leaving down woody debris for nutrient cycling and habitat, and,
- d. remove the tree.

4) Tree hazard management should be accomplished according to the following prioritized minimum standards subject to limitations posed by budget/staffing constraints and other contingencies:

- a. inspect and treat high priority (6 and 7) tree hazards in sites containing structures occupied year-round annually;
- b. inspect and treat high priority (6 and 7) tree hazards in each developed site within the Park at least once every three years;
- c. inspect and treat high priority (6 and 7) tree hazards in backcountry administrative sites (patrol cabins) and designated historic structures at least once every five years;
- d. inspect and treat high priority (including 5 w/4 defects) tree hazards on roadsides (primary, paved, year-round) at least once every five years; and,
- e. ensure that sites are completely cleaned-up and returned to “natural-appearing” conditions.

(Note: Above standards are listed in descending order of priority. On occasion, it may be necessary to defer lower priority actions in order to complete higher priorities.)

E. Public Notification of Site Closure

2) Tree failures occurring during season of use in developed areas where potential for accident (property damage and/or injury) existed, but did not occur, should be reported to the Plant Ecologist. Incidents with or without damage or injury require Form 10-343 (Case Incident Record) and Form DI-134 (Report of Accident/Incident).

H. Evaluation and Reporting

1) An Annual Report summarizing accomplishments should be completed by the end of the fiscal year by the Plant Ecologist.

2) A briefing of the Park staff will be conducted annually in the fall on the accomplishments of the Tree Hazard Management Program.

I. Interpretation and Environmental Education

1) Interpretive, ranger, and resource staff should be provided training in tree hazard identification and reporting procedures.

2) Interpretive staff should incorporate potential tree hazard information into any forest ecology program and brochures.

APPENDIX A

Denali National Park and Preserve Prioritized Sites Subject to Tree Hazard Management

I. Year-Round Occupied Structures and Employee Housing:

Requires inspection **ANNUALLY**

- A. Entrance Area/Nenana River Corridor
 - 1) Hotel/Employee Housing
 - 2) Post Office

- B. Headquarters/C-Camp
 - 1) C-Camp
 - 2) Park Headquarters
 - 3) Dog Kennels
 - 4) Permanent Housing Areas

- C. Savage River Area
 - 1) Savage Cabin

- D. Teklanika Area
 - 1) Sanctuary Cabin
 - 2) Igloo Creek Cabin

- E. Toklat to Eielson Visitor Center Area
 - 1) Toklat Housing and Maintenance Area
 - 2) East Fork Cabin

- F. Wonder Lake Area
 - 1) Wonder Lake Ranger Station and Cabins
 - 2) Moose Creek Cabin
 - 3) Gallup Cabin

- G. Talkeetna Area
 - 1) Housing Area and Visitor Center

II. Developed Sites Not Occupied Year-Round:

Requires inspection **EVERY 3 YEARS**

- A. Entrance Area/Nenana River Corridor
 - 1) Airstrip
 - 2) Railroad Depot
 - 3) Visitor Center
 - 4) Riley Creek Campground

APPENDIX B

Denali National Park and Preserve Tree Hazard Rating System

This **Seven Point Rating System** originated in Yosemite National Park in the early 1960's. It was adopted for use by the Western Region of the National Park Service in 1993. Tree hazard is based on the following factors, which are considered in deriving the hazard rating:

- 1) **failure potential** - tree failure probability within a given inspection period.
- 2) **damage potential** - probability of the tree striking a target.
- 3) **target impact potential** - damage potential of failure.
- 4) **target value** - the value of the target.

- A. The **Tree value (1,2,3)** 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 potentially hazardous portion of tree.

There are three possible ratings, 1 - 3, with 3 representing the highest failure/damage potential. An additional point may be added for severe lean, which increases likelihood of failure. Thus, 4 is the maximum defect value possible, and represents a very defective (and/or predisposed) tree hazard with a severe lean which has great potential for damage and/or injury/death.

Indicators for low, medium, and high ratings are usually assigned and/or modified on a local/regional basis and reflect variations in species and environmental factors.

- B. The second component is the **Target value (4)** and represents impact potential and target value (monetary or possibility of injury/death). The values for this element are similarly rated 1 - 3, with 3 being the highest. A tree hazard rated 3 is one which possesses a high likelihood of impacting a high value (property or person) target in event in failure. These ratings are usually more standardized as presented in the following example from NPS Western Region Guidelines for Managing Hazardous Trees (1993):

Highest Level (3)--Overnight Exposure

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

Medium Level (2)--Daytime Exposure

- Interpretive sites, such as amphitheaters, kiosks

HAZARD TREE RECORD FORM
Denali National Park and Preserve

Park Area: _____ Park District: _____ Site Name: _____
 Tree ID#: _____ Tree Species: _____
 Reference Point: _____ Distance (ft): _____ Azimuth (29 declin)= _____ degrees

RISK RATING														Initials
Date	DBH (in)	HT (ft)	Crown	Root	Butt	Stem	Scar	RIND (in)	Tree Value	Target Value	Total (2-7)	Treatment Date	Next Exam	

COMMENTS:

FOOTNOTES:

- 1 Crown: THIN (dying, off color foliage), DB (dead branches), BROOM (mistletoe broom), DTOP (dead top)
- 2 Root: SCAR (exposed wounds on roots), UND (undercut root system), COMP (substantial soil compaction)
- 3 Butt: SCAR (first 10' of bole), ROT (insect rot), SAP (excessive seepage)
- 4 Stem: LEAN (leaning tree), BROKE (broken top), FORK (forked, multiple top), FUNGUS (decay fungi)
- 5 Scar: SCAR (at x ft. high), SEAM (bark seam or frost crack)
- 6 Rind: Inches of sound wood from inner bark radially to decay (or pith). Measure on backside if tree scarred.
- 7 Risk Rating: Target Value: 1 thru 3 AND Tree Value: 1 thru 4 EQUALS Total: Target plus Tree Values = (2-7)
- 8 Recommended treatment: FELL, TOP (lop at ft ht.), PRUNE (branches), MOVTAR (move target), EXCL (exclude visitors)

APPENDIX C

Denali National Park and Preserve Hazard Tree Evaluation - Signs and Symptoms

1. **LEAN** - leaning trees or large branches do not always indicate high potential for failure. Is the lean associated with unstable soils or cracks in the tree?
2. **ROOT DAMAGE**, including root disease - many trees in Alaska have shallow root systems due to cold soils and excessive moisture. Damaged root systems are more susceptible to windthrow and wood decay fungi.

- Poor growth in recent years
- Crown decline -- thinning and chlorosis
- Distress cone crop in conifers
- Slow decline of tree, revealed by flattening top and poor vigor
- Fruiting bodies on base of tree or in soil under tree
- Resinous -- resin or pitch soaked bark and soil around base
- Wet looking bark at base of tree
- Broken rotted roots
- Windthrow of surrounding trees
- Fungus mycelium growing on roots or just under the surface

Trees with root rot are the most serious hazard a recreation area can have and should be removed immediately.

3. **CRACKS** - cracks may or may not indicate substantial amounts of internal wood decay. Cracks near major branch unions may indicate failure without heart rot. Careful evaluation using an increment borer will help indicate extent of associated decay.
4. **TOP DAMAGE**, dead top, forked top - dead tops can result from root disease and soil problems. Look for cracks or other signs on forked tops to assess failure.
5. **INTERNAL DECAY** - heart rot is common in all tree species in Alaska, especially Hemlocks, cottonwood, poplar, and aspen. Indicators of heart rot can be:
 - a) conks (fruiting bodies of the decay fungi)
 - b) large exposed wounds
 - c) broken or dead tops
 - d) cracks, frost cracks
 - e) gradual decline of crown
 - f) old wounds and fire scars
 - g) hollows, hollow center

12. LIGHTNING SCARS - lightning scars often spiral around the tree. Lightning can cause seemingly unexplainable group mortality over up to several acres when trees are attached to each other by root grafts.
 13. CANKERS - cankers not only weaken the tree, but provide an excellent entrance for decay fungi. When present on the main trunk of a tree and when the width of the dead face exceeds half the circumference of the canker swelling, breakage is likely.
 14. INSECT DAMAGE - insect damage is not a hazard by itself, but may indicate the presence of other problems, particularly root rot.
 15. CONSTRUCTION DAMAGE - tree roots are often damaged by soil compaction, changes of grade, trenching, and other construction activities.
 - soil compaction is caused by heavy equipment, horses, bikes, human traffic, etc. Tree in campsites which show signs of decline should be rehabilitated, moved, or closed for a few years.
 - raising the grade or back filling can suffocate the roots, creating an impervious layer where roots cannot breathe.
 - surfacing near trees can cut off the water and oxygen supply to a tree's roots.
 - lowering the grade can lead to root injury since most of the root system is in the top 18 inches of soil.
 - changing vegetation such as thinning and clearing tends to create increased wind action in the stand promoting windthrow.
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Tools Used in Hazard Tree Evaluations:

- increment borer
- binoculars
- sounding axe
- tree diameter tape
- measuring tape
- clinometer
- data forms
- tree tags and flagging

Prune conifer if:

- the limb has defects such as decay or cracks.
- the limb size is greater than 3 inches in diameter and 6 feet in length.
- the limb has a high probability of falling on people or property.

Prune hardwood if:

- the limb size exceeds 2 inches in diameter and 4 feet in length.
- the limb has a high probability of falling on people or property.

However, all dead branches should be removed when practical to promote rapid closure and minimize the entrance of microorganisms.

Responsible Parties for Mitigation:

Mitigation efforts will be the responsibility of the Maintenance division under the direction of the Plant Ecologist. Maintenance crews performing any saw work must be appropriately certified. All field workers will wear the appropriate personal protective safety gear.