Parks Canada

Best Practices for Fire Management Operations

Prepared by:
Dwight Bourdin
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TABLE OF CONTENTS

LIST OF ACRONYMS

CEAA	Canadian Environmental Assessment Act
EA	Environmental Assessment
FMO	Fire Management Officer
FMP	Fire Management Plan
MOU	Memorandum of Understanding
PFIS	Parks Fire Information System (website)
PB	Prescribed Burn
SEA	Strategic Environmental Assessment
VEC	Valued Ecosystem Component

Title Page Photos:

Top left – Bulldozer high blading for fuel break.
Top right – Helicopter staging area.
Bottom right – Tracked harvester conducting forest thinning.
Bottom left – Cultural resource protection (Moberly homestead) with sprinkler system.

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1 INTRODUCTION

National park fire management programs are involved in conducting prescribed burns, fireguards, facility protection, and fuel management projects on a regular basis throughout the year. Each project requires an environmental assessment under the *Canadian Environmental Assessment Act* (CEAA), *Inclusion List Regulations:*

1.1 Physical activities carried out in a national park, national park reserve, national historic site or historic canal for management or scientific purposes, that involve an intent to
(a) manipulate an ecosystem function.

Many of the operational practices and mitigations implemented in the various projects are similar in nature and can be standardized across the parks. Greenfield (2006) identified 3 main benefits to formalizing a best practices document:

1. Provides consistency across the national parks for fire management projects.
2. Streamlines the analysis and mitigations of the potential impacts.
3. Reduces duplication between multiple EA's of similar type and scale by referencing the Best Practices.

The *National Fire Management Strategy Strategic Environmental Assessment* (March 2005) identified that adoption and implementation of best practices for wildfires as appropriate means to mitigate the environmental effects of suppression operations.

Development of these Best Practices is designed to provide a consistent set of written guidelines that explain what is expected and required for standardized operational practices/mitigations for wildfires[1], prescribed burns, fireguards, facility protection, and fuel management projects within National Parks. It will be used in combination with other *Standard Operating Procedures* (SOPs) for fire management forming part of the operational manual.

A strategic environmental assessment (SEA) is required for a Fire Management Plan (FMP) as per Parks Canada Directive 2.4.2 on Impact Assessment and by the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The SEA will incorporate environmental considerations into the planning at a broader scale.

Specific projects or components, such as prescribed fires, fireguards, and fuel management projects, arising from the park FMP will be subject to an environmental assessment under CEAA, typically at the screening level. The Best Practices will allow fire project EA screening to focus on the pertinent issues, valued ecosystem components (VEC's), and public concerns.

[1] Under CEAA, Section 7(1) an assessment is not required in response to an emergency. It is understood that there are constraints during wildfire emergencies and some mitigations may not be implemented.

2 BEST PRACTICES

These best practices have been developed through a review of the following documents on environmental standards and practices:

- Parks Canada fire management EAs – mitigations from various prescribed burns and fuel management projects
- Parks Canada internal standards, guidelines and practices
- Provincial standards – British Columbia Best Management Practices,
- United States - National Interagency Fire Centre, National Wildfire Coordinating Group

Best practice mitigations for environmental and cultural resources, planning and activity specific actions have been outlined in the following pages. It is intended that future assessment of specific fire projects can reference these mitigations and focus on site-specific VEC's and public concerns.

The Best Practices for Fire Management Operations may be periodically updated as new techniques, methods, equipment or technology develop. The most recent version of the Best Practices will be provided in the Parks Canada Fire Operations Manual and available on Parks Fire Information website (PFIS) and the Parks Canada intranet.

2.1 ENVIRONMENTAL COMPONENT

2.1.1 Species at Risk

1. All work will comply with the Species at Risk Act (SARA) and will be consistent with the direction outlined in any applicable Species at Risk Recovery Strategies and Action Plans.

2. Regional issues related to species at risk and fire management are to be resolved at the strategic planning level such as the Park Management Plan, Fire Management Plan, Species at Risk Recovery Plans and associated Strategic Environmental Assessments.

3. Project-specific mitigations required for species at risk are to be described in the project screening level EA as appropriate with reference to pertinent direction at the strategic planning level; the Parks Canada Guide to Compliance with the Canadian Environmental Assessment Act outlines the process and expectations for integrating the application of SARA into the EA process.

2.1.2 Wildlife

1. All food and garbage must be stored in wildlife proof containers.

2. Any problems including aggressive encounters with wildlife will be reported immediately to the park Wildlife Conflicts Specialist or designate.

3. Observations of wildlife-vehicle collisions and discoveries of carcasses, wildlife features (e.g. dens, nests), or other wildlife encounters will be reported immediately to the Fire Management Officer (FMO), Project Manager or the Wildlife Conflicts Specialist.

4. Forwarder, skidder or harvester trails should be laid out to avoid habitat trees and snags > 25 cm DBH wherever possible. Known habitat trees will be flagged by Parks Canada.

5. To reduce noise and disturbance impacts defined flight paths (to, from, within) the project area will be established with Parks Canada and the helicopter contractor.

2.1.3 Aquatics & Hydrology

1. All work and activities will comply with the *Fisheries Act*.

2. Fish bearing streams used for pump sites during prescribed burn operations will be assessed for spawning habitat and beds. Pump sites will avoid spawning beds or known spawning sites during the spawning season by providing a minimum of 30m from known spawning sites.

3. Intake hoses will be screened according to the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (Department of Fisheries and Oceans 1995).

4. Helicopter bucket dip sites will be identified in the planning stage by consulting the Parks Canada Aquatic Biologist. Where possible, avoid of fish spawning habitats and critical pools.

5. If work is required in riparian zones or to cross streams it shall be undertaken in accordance with the *Fish Habitat Manual: Guidelines & Procedures for Watercourse Crossings in Alberta* (Alberta Environment 2000), the *Standards and Best Management Practices for Instream Works* (British Columbia Environment, 2004) or relevant guides or standards for the province of jurisdiction.

2.1.4 Vegetation

1. Surveys for rare plants and communities will be conducted prior to project work during the planning stage.

2. Rare plants will be identified, mapped and if required, protected or other appropriate mitigations implemented.

3. Project activities will minimize damage to root systems of plants or trees that are to remain.

4. To minimize windthrow from thinning projects, retain strong rooted, long lived, and wind firm trees. Use tree clumping or other prescriptions to reduce windthrow.

2.1.5 Non-Native Plants

1. A weed survey will be conducted to identify occurrences of noxious or restricted weeds in the area where the activity will be undertaken.

2. Pretreatment by chemical, hand or mechanical means prior to work may be required in heavily infested weed areas to prevent the transmission of weed seed by equipment and vehicles. The cleanup equipment used in these areas must be cleaned prior to moving off the infested site.

3. All equipment shall be thoroughly cleaned and steam or pressure washed prior to entering the park so it does not introduce residual soil, seeds or vegetation from outside of the park.

4. Methods used to action weeds should follow the park Integrated Pest Management Plan or regional non-native plant guidelines.

5. Use existing or previously disturbed areas for camps, staging areas, helispots, etc…to prevent the spread of non-native plants.

6. Monitoring and treatment of weeds may be required post project activity and must be identified in the project level screening EA.

2.1.6 Soils and Terrain

1. Clearing or thinning the forest will be undertaken while the soil is frozen. This will minimize compaction, rutting, and erosion.

2. Heavy equipment will be equipped with high floatation rubber tires or low-pressure tracks with modified grousers.

3. Limit heavy equipment use on slopes where traction may be inadequate and cause spinning or rutting.

4. Use protective barriers (ex: floatation mats or mat of tree limbs) on harvesting trails to reduce soil compaction.

5. Minimize broadcast burning on highly erodible soils.

6. Minimize soil heating by pre-treatment of fuels where possible.

7. During wildfire suppression, bulldozers will high blade whenever possible and avoid grading to mineral soil. This will maintain native ground vegetation, reduce potential for weed establishment, minimize soil erosion and reduce reclamation efforts.

2.1.7 Archaeological & Cultural Resources

1. Archaeological and cultural resources within the project and associated areas will be identified and mapped with the assistance of Parks Canada archaeologists.

2. The level of awareness provided to the public about archaeological and cultural sites will depend on the site and level of sensitivity of each particular site.

3. To protect cultural resources:

    - Vehicle travel in the vicinity of known archaeological and Aboriginal ceremonial areas may be restricted or prohibited. Parks Canada will visibly mark them as "no go" zones for personnel and equipment as determined by the Parks Canada cultural/archaeological resource specialist.

    - In areas where treatments are required, all haul, forwarding and ghost trails will be pre-flagged by Parks Canada and off-trail travel is prohibited.

    - The location of new archaeological and Aboriginal ceremonial or gathering sites and the significance of them will be kept in confidence by the Project Manager, Cultural Resource Specialist and Contractor and shall not be extended to others without the prior consent of the associated cultural group and Parks Canada.

    - Sprinkler systems or other protection measures will be deployed to protect cultural sites from fire as determined by the Parks Canada cultural/archaeological resource specialist.

4. Archaeological sites will be protected from potential erosion from nozzles, valves and pump systems by providing an appropriate buffer around the site as determined by the Parks Canada archaeologist.

5. Should archaeological or cultural features be discovered during work activities, stop work and immediately report to the FMO and Cultural Resource Specialist, who will contact Parks Canada archaeologist for advice. Site protection and re-routing of work activities may be required.

6. If wildfire threatens known sensitive cultural resources then Cultural Resources Specialist should liaise with appropriate cultural group as soon as possible.

2.1.8 Air Quality

1. Communications plan will provide public information to minimize inconvenience to park visitors regarding smoke and to promote understanding and appreciation for the role of fire in park ecosystems.

2. Impacts on human health and disturbance to populated areas from smoke will be minimized during ignition by burning when dispersion and venting conditions are good.

3. Burn more frequently so that fuels do not accumulate, resulting in fewer emissions with each burn. This technique should mimic the natural fire regime of the area.

4. Reduce the fuel load where possible through mechanical removal (thinning) or wood chipping and transporting wood chips for other uses. Alternative uses for the wood should be considered.

5. Prescribed fires and pile/slash burning will take place under atmospheric conditions that minimize the potential for inversions trapping smoke in the valley bottom.

6. Pile/slash fires will be kept hot to minimize smoke output. Burning will cease during unfavorable conditions if the smoke has the potential to affect communities or Highways.

7. Signs advising of "smoke in area" will be placed in prominent location near project work to advise and inform the public. Signs along roads or highways will be placed as recommended by the Highway manager or designate.

8. Dust abatement techniques (ex: water truck) shall be used on unpaved, unvegetated surfaces to minimize airborne dust.

9. Speed limits will be posted and adhered to reduce airborne dust.

2.2 PLANNING

2.2.1 Regulatory

1. All work conducted must be performed in accordance with the ordinances and laws set out in the National Parks Act and Regulations.

2. Execution of work is subject to the provisions in the approved Environmental Assessment Screening Report.

3. The fire management project may require other mitigation in response to any unforeseen problems, which may arise. These should be brought to the attention of the Fire Management Officer, Incident Commander, Section Chiefs, etc. to be addressed.

4. All garbage will be stored and handled in compliance with the National Park Garbage Regulations. Burning or burial of waste is not permitted.

2.2.2 Safety

1. Safety shall be the first priority for fire management activities.

2. Fire programs will comply with the Parks Canada National Fire Operation Manual (2000), the Fire Management Safety Standard and Standard Operating Procedures (SOPs).

3. All activities and operations will comply with the Canada Labour Code and/or provincial Occupational Health and Safety Act.

4. All personnel involved or fulfilling a role in a fire management project, (i.e. role in the ICS organization chart) must be qualified in the position they are tasked.

2.2.3 Communications

1. A communications plan will be in place and approved for all fire management projects and activities.

2. Fire communications will be followed as outlined in Directive 2.4.4 and include:

    - Public consultation and involvement
    - Public information and service partnerships
    - Public education and park experience opportunities
    - Stewardship

3. The fire communications specialist will be fully trained as a fire information officer.

4. The Fire Information Officer will utilize the Fire Information Officers Toolkit as provided on the Parks Fire Information System website (PFIS).

2.2.4 Public Safety

1. Closures will be put in place, as required, for trails, roads, and areas to inform and protect the public during fire or fuel management activities.

2. Closures will adhere to the park or historical site standard protocols and forms.

3. Evacuations for wildfires will follow the protocols set out in the park Public Safety Plan and any MOU or agreements with local towns or municipalities.

4. All signs are to be bilingual or symbolic in nature. Highway signs will comply with provincial standards.

5. Traffic control, flag person will be employed as required to ensure public safety.

2.2.5 Project Timing

1. Work should strive to be completed in the shortest time frame as possible to minimize disturbance.

2. Work will be scheduled during time windows that minimize impact to denning, calving, nesting, and spawning seasons when possible, particularly for sensitive species (listed Species at Risk). Consult park or regional specialists to assist in determining the appropriate timing.

2.2.6 Site Visits

1. The fire project manager and associated team members will conduct a thorough field site visit for all projects.

2. Denning sites, nesting trees, archaeological and cultural sites, and sensitive features will be identified, investigated and recorded. Consult park or regional biologists and specialists to assist identifying sites and features. Site-specific protection measures will be employed as appropriate.

3. Project boundaries will be identified using temporary non-permanent markings such as plaques and flagging that can be easily removed following project completion. Trees will not be scarred or spray-painted.

2.2.7 Contractors

1. Contractors and subcontractors must have or take out a valid business license.

2. All users of the National Park require a valid National Park Permit. Contractors conducting work in the park can get work permits through the business licensing office.

2.2.7.1 Selecting Contractors for Forest Thinning Projects

1. When soliciting potential contactors provide them with the project expectations, specifications, environmental mitigations, and a clear understanding of the fire protection and ecological issues for the project that will be built into the contract.

2. Conduct a thorough on-site meeting with potential bidders to, obtain first- hand familiarity with forest types and terrain, review contract terms, and inspect sites previously treated to desired thinning prescriptions.

2.2.7.2 Implementing a Forest Thinning Project

1. An initial project meeting will take place prior to work commencing as per the Briefings section.

2. Assign a Parks Canada project/surveillance officer to liaise with the contractor to allow for two-way understanding of potential issues and for pro-active problem solving.

3. Hold on-site meetings for each new forest stand to familiarize the contractor with the details of the stand prescription, unique circumstances, special values or terrain traps, and discuss operational approaches and adjustments.

2.3 ACTIVITY

2.3.1 Briefings

1. To ensure everyone is aware of the aspects for the fire management project an initial project meeting will take place prior to work commencing.

2. A briefing package will be provided to all parties including: the project manager, environmental surveillance officer, supervisors, contractors, pilots, crews and any other personnel.

3. Depending on the type of fire management project, the briefing package may include the following:

    - List of contacts with current phone numbers
    - Work schedule outlining the different stages of the project and timelines
    - Maps
    - Weather forecast
    - Fire behavior forecast and indices
    - Objectives
    - Assignments
    - A list of mitigations and discuss how and why these are to be employed
    - Communication procedures
    - Radio frequencies
    - Area closures
    - Safety and emergency procedures and messages
    - Protocols for discovery of archaeological or cultural resources

4. Depending on the type of fire management project, topics of discussion for the briefing include:

    - Review of the briefing package.
    - An overview of all safety concerns and standard safe operating procedures.
    - The tree harvesting system and related operational activities.
    - A review of sensitive environmental sites and cultural features found on the site.
    - Fuel and chemical storage, fuelling procedures and locations.
    - A review of the fire preparedness plan during harvesting operations.
    - Roads, helipads, trails, water crossings, and access routes.
    - Terrain and soil issues.
    - Public safety and area closures.
    - All critical site features should be clearly marked out in the field and on the accompanying maps before the pre-work meeting. These features include:
        - The project boundary and all treatment zone boundaries.
        - All riparian areas and ecologically sensitive areas to be avoided.
        - All ecologically sensitive features such as significant wildlife trees, rare plant communities, wetlands, fish habitats, denning sites etc.
        - All cultural/archaeological features, depending sensitivity of feature.

5. A standard pre-work form should be developed to serve as a checklist of topics to be addressed during the pre-work meetings.

6. Project personnel must sign a pre-work document indicating their understanding of the work plan. It should be strongly emphasized during the pre-work meeting that if any situations inconsistent with the work plan should arise - such as unsafe working conditions or possible environmental/cultural damage - the crew should suspend operational activities and notify the project supervisor.

2.3.2 Tactics & Strategies

1. During suppression efforts, impacts on the environment will vary depending on the tactics used when managing wildfire. Fire managers will choose the least intrusive tactic(s) whenever possible. This is commonly reffered to as *minimum impact suppression tactics* (MIST). MIST is:
    - the concept of how to suppress wildfire while minimizing the long-term effects of the suppression action;
    - using the minimum tool to safely and effectively accomplish the task (NWCG 2004).

2. The Standard Operating Procedure for Heavy Equipment Use On Wildfire Suppression Operations (currently draft) must be adhered to (Parks Canada 2000).

3. Bulldozer - high blading fuels is preferred where and whenever possible as an alternative to blading to mineral soil.

2.3.3 Fueling & Chemicals

1. Equipment will be fuelled on hardened or impervious surfaces.

2. Refueling motor vehicles and heavy equipment will be done on level terrain at least 100 m from water sources, riparian zones, and sensitive sites.

3. All fuel storage containers/tanks shall be free of leaks. Fuel nozzles will be equipped with automatic shutoffs and hoses will have breakaway couplings.

4. All fueling trucks must be equipped with adequate spill clean-up materials.

5. Fuel, lubricants, petro-gels or oils will not be stored within 100 m of streams, wetlands, or sensitive sites.

6. Stationary stores of liquid hazardous material (e.g. fuel) and stationary operating equipment with fuel tanks or hydraulic systems (e.g. pumps) will be located in a impervious secondary containment area (e.g. a bermed area with impervious liner) capable of holding 110% of the contents of the largest container in the area.

7. Re-fuelling and maintenance of chainsaws shall be performed over impervious mini-berms with small (18"x 18") spill pads onsite.

8. All hazardous materials transported to or from the project area and stored on-site will comply with Transportation of Dangerous Goods (TDG) and Workplace Hazardous Material Information System (WHMIS) labelling legislation.

9. All service vehicles will carry a hydrocarbon spill kit suitable for a small spill clean-up on ground and water surfaces.

10. Fuel cans for pump sites will be secured within a mini-berm or other containment to contain potential spills.

2.3.4 Spills & Pollution

1. Contractors are required to provide a Spill Response Plan.

2. Spill kits of sufficient size to contain and clean up 110% of the site's largest possible fuel/chemical spill must be retained on site at each location of potential spills (sites where equipment is working). All personnel on site must be aware of the kits, their location and proper use.

3. Ensure all equipment is free of leaks from oil, fuel, antifreeze or hydraulic oil.

4. All fuel, lubricant, oil, hydraulic fluid, chemical or solvent spills must be contained, cleaned up and immediately reported to Parks Canada.

5. Disposal of contaminated soils and material will be outside the park at certified landfills. Documentation demonstrating proper disposal must be provided.

6. If contaminated material is encountered during project work or field visits (ex. near buildings) the park environmental manager will be notified immediately.

2.3.5 Heavy Equipment, Vehicles & ATV's

1. Ensure all equipment is properly tuned, free of leaks, in good operating order, and fitted with standard air emission control devices. Heavy equipment and vehicles should be equipped with a fire extinguisher.

2. Complete daily inspections of heavy equipment, particularly hydraulic lines, and conduct preventative maintenance.

3. Minimize idling of engines at all times to reduce air and noise pollution.

4. Heavy equipment will be equipped with high floatation rubber tires or low-pressure tracks (LGP – low ground pressure).

5. Vegetable-based oil should be used where possible.

6. Maintenance of equipment will take place at local garages or maintenance yards. Where this is not possible maintenance will be conducted on hardened or impermeable surfaces such as mini-berms.

7. Repairs requiring draining or replacement of petro-chemical based fluids will be conducted over impervious containment.

8. Heavy equipment will be parked on tarps overnight to detect and contain leaks.

9. Harvesting heads will be placed in mini-berms to catch dripping oil.

10. Used fluids and other hazardous wastes must be disposed of at approved recycling centers or transfer stations.

2.3.6 Aircraft

1. Flight watch protocols will be set-up with the local park dispatch centre or other radio control centre.

2. In accordance with the Canadian Aviation Regulations (CARs), the issuance of a NOTAM will be completed for all wildfire or prescribed fire operations where smoke and/or aircraft operations are an issue. (NAV Canada Canadian NOTAM procedures

3. Maintenance of helicopters will be conducted at hangers or helipads. Where this is not possible maintenance will be conducted on hardened or impermeable surfaces such as mini-berms.

4. Flight routes will be predetermined in the planning stage to avoid sensitive wildlife areas (ex: woodland caribou calving and rutting areas) or other areas as identified by park staff.

2.3.7 Ignition Operations

2. The *Interagency Aerial Ignition Guide* (IAIG) by the United Interagency Aviation Management Council (2004), will be followed for Parks Canada ignition operations.

3. Mixing fuel and petro-gel will take place over an impermeable surface (containment berm).

4. All spills with-in the containment berm will be immediately cleaned-up and disposal procedures followed.

5. Helitorch testing:
    - Testing should be done a minimum 100m from riparian zones, water bodies, and sensitive sites.
    - Use the existing or previously disturbed sites where possible for testing and minimize the size of the testing spot.
    - Remove contaminated soil after ignition operations and follow disposal procedures.

2.3.8 Camps & Staging Areas

1. Existing or previously disturbed areas (ex: gravel pits, backcountry campgrounds) will be used as camps or staging areas.

2. All sites (tents, buildings, washrooms, privies) will be maintained in a sanitary condition.

3. Camps will be located, constructed, equipped and maintained free from any condition that may endanger the health or safety of the workers.

4. All food, garbage and litter must be stored in wildlife proof containers. Consult the Wildlife Conflicts Specialist to determine if a bear fence is necessary for certain camp areas.

5. Portable toilet facilities will be provided, regularly maintained and emptied at approved treatment facilities.

6. Recycling of drink containers, cardboard, paper, plastic etc. will be completed. Note: Recycling programs vary by region.

7. Camps must be supplied with potable water and in sufficient amount to adequately meet the needs of persons working or residing at the camp for drinking, food preparation and personal hygiene purposes.

8. Where federal regulations are not available, camps will be subject to the Public Health Act and Regulations for the province of jurisdiction.

2.3.9 Tree Removal

2.3.9.1 General

1. Safety of the workers and the public is the first priority during all operations.

2. Fallers should be aware of the locations of all treatment boundaries and riparian zones, as well as the locations of sensitive ecological features.

3. All trees should be felled away from, and no limbing and bucking should take place within, creeks, riparian zones or other sensitive ecological areas.

4. Trees should be cut flush to the ground. A variety (number and distribution) of stump heights may be left as wildlife trees if determined and specified in the tree removal prescription.

5. Felling breakage should be minimized where possible, but not at the expense of the remaining stand and site ecology. For example, a tree should not be felled into an ecologically sensitive area or into the residual stand simply to avoid breakage.

6. If specified in the tree removal plan some trees can be girdled to create standing wildlife trees, conditions permitting.

7. As specified in the tree removal plan, as much of the coarse woody debris and organic matter from the tree removal procedure should remain on the site and used to improve wildlife habitat. The quantity and distribution of slash remaining on the site should be calculated strategically so as not to impede wildlife movement, create a significant fire hazard or cause an excessive nutrient flush.

8. Fallers should assess each tree individually. If a tree contains critical wildlife features not yet identified by the environmental impact assessment (ie: Raptor's nest) it should be left or assessed by a wildlife biologist.

9. An environmental monitor should be present on-site during stand alteration and tree removal operations.

10. All trees should be limbed and bucked to meet the specified end use for the log. This may include non-commercial purposes such as providing woody debris for stream and terrestrial rehabilitation projects.

11. The logs should be cut to shorter lengths if it will significantly help reduce site impacts or damage to residual stems during yarding and loading.

2.3.9.2 Manual Falling

1. All fallers should be well trained and have at least 5 years of experience.

2. Fallers must be especially cautious to fall the trees in a direction, which causes the least impact to the understory plant community, residual trees and other sensitive ecosystem components, such as streams and riparian areas.

3. Chainsaws should be kept in good working condition and free of oil and fuel leaks.

4. Where possible chain oil should be vegetable-based.

5. Fueling of chainsaws should take place in designated fueling areas outside of riparian areas and other critical ecological features.

2.3.9.3 Mechanical Falling

1. Mechanical falling can be used where it is determined that machines will cause minimal site degradation, due to suitable soil conditions, or on a site that is to be developed for future access or facilities.

2. Worker safety is usually elevated with mechanical falling as the faller works from the confines of an enclosed cab. For this reason, mechanical falling may be preferable on sites with numerous hazard trees to be retained for their habitat values.

3. Mechanical falling equipment can also be used to direct fallen trees away from environmentally sensitive areas and with less soil disturbance, as compared to manual falling.

2.3.9.4 Falling Near Power Lines

1. Work adjacent to power lines is to be done in consultation with local power companies.

2. Certified utility tree workers/fallers will be required for tree removal adjacent (1.5 tree lengths) to power lines.

3. Leave selected habitat trees that are technically within striking distance of the power line but leaning away from the line and highly unlikely to strike the line.

4. Instead of removing selected habitat trees completely, remove the top so that they miss the power line if they do topple.

5. Retain strong rooted, long lived and wind firm trees in the thinned forest adjacent to the power line to reduce the probability of line strikes.

2.3.9.5 Ground-based Yarding Systems

1. Skidding should be completed when the soil is dry, frozen or covered with snow. This can be further enhanced by using woodchips, sawdust, or slash on the skid trails or temporary roads.

2. Skidders should be restricted to areas with slopes less than 35%.

3. All site impacts caused by ground-based transportation should be rehabilitated according to the tree removal prescription.

4. All machines should use low pressure distribution, accomplished by wide tires and wide track pads.

5. In general, track skidders are preferable to wheeled machines as they generally have lower ground pressure, cause less compaction and do not require bladed trails. Flexible track systems are preferred over rigid track machines as they minimize any "pressure points" and cause less site degradation.

6. Road systems designed for skidding should use fewer access roads and rely on longer skidding distances than those in traditional forestry.

7. The layout of skid trails should be designed to minimize their overall length, avoid straight lines, avoid sharp turns, and to avoid all ecologically sensitive areas.

8. Repeated use of the same skid trail should be avoided to prevent rutting and soil compaction.

9. Avoid building bladed skid trails if possible.

10. Back spar trails and bladed trails should only be constructed in specific locations as indicated in the approved plan.

11. On steep slopes, set skid roads and trails at least 30m away from streams, ponds and marshes.

12. Locate skid roads off the tops and toes of banks and slopes.

13. Where a skid trail is required, temporary crossings should be constructed at all stream channels, springs, seeps, sinkholes and other wet areas.

14. Where possible, keep skid trail grades at less than 15%. When steep grades are unavoidable, break the grade, install drainage structures and use soil-stabilization practices to minimize runoff and erosion.

15. If practical, position skid trails along the contour to reduce soil erosion.

16. Skid trails should be planned to minimize damage to the residual stand.

17. Skid trails should be covered with logging slash and organic debris (wood chips) to further reduce site degradation. This debris should be concentrated adjacent to the landing site and in areas where skidders must turn around.

18. Floatation mats can also be considered in areas where debris does not provide adequate protection.

19. The lead end of the log(s) should be elevated during skidding to minimize gouging of the skid trail.

20. Skidders should not operate in ecologically sensitive areas. Aerial or skyline systems should be implemented to remove logs in these areas.

2.3.9.6 Skyline/Cable Logging

1. When choosing which type of cable systems to implement, the priority should be the reduction of ecological impacts as opposed to cost efficiency. Skyline systems are preferred over high lead systems because:

    - They generally require the fewest number of roads and landings (although landings tend to be much larger);

    - They cause less log dragging and subsequent soil disturbance;

    - They are useful in selective logging where logs can be lifted clear of the stand, minimizing damage to residual trees and understory vegetation;

    - They allow for logs to be lifted over streams and ecologically sensitive areas.

2. Slash debris or mats should be placed adjacent to the landing to avoid heavy soil disturbance.

3. Back spar trails should be constructed to minimize soil disturbance.

4. Yarding distances should be longer to minimize the required number of access roads and landings.

5. Uphill yarding is preferred over downhill because there is more control over the unsuspended end of the log. This will reduce "rubbing" of residual trees in partial cut situations and help avoid the convergence of water runoff down the dragging tracks.

6. In wide right of ways, line loaders are preferable to hydraulic loaders because of the reach of the machine.

7. During the engineering phase, only landings with suitable guyline anchors should be proposed.

8. For safety reasons, unless there is sufficient space for logs to come to a standstill within the landing area, downhill yarding should not be used.

2.3.9.7 Helicopter Logging

1. Where possible/feasible use helicopter logging over ground or cable systems. Helicopter logging represents one of the best systems for removing trees with the least amount of environmental impacts. It is ecologically beneficial because tree removal areas can be accessed with minimal construction of road networks. The logs are not dragged across the site, thereby, minimizing the impacts to the ecology and residual stand.

2.3.9.8 Log Loading & Transportation

1. Landings should be as small as possible while accommodating skidding activity and truck loading. The activities on the landing should be managed carefully and efficiently so the smallest area possible is disturbed.

2. The number and distribution of landings should be minimized and the roadside used where possible.

3. Landings will be located in existing disturbed areas, along rights-of-ways, existing forest openings and openings created as part of thinning.

4. Landings will be chosen and marked by Parks Canada in consultation with contractors, but will avoid all ecologically and culturally sensitive sites.

5. Logs can be sorted at a secondary location, off-site, to help reduce the size of landings.

6. Equipment for loading and hauling should be chosen primarily to ensure that logs can be safely removed while decreasing the area impacted.

7. Swing loaders are recommended because they can operate on smaller landings, whereas front-end loaders require more space for sorting, storing and loading logs.

8. Where possible, use rubber-tired loaders as they can pick up logs from scattered locations along the road.

9. Choose transportation methods, which reduce the required road access footprint. If it will significantly decrease environmental impacts, the road should be designed to carry smaller trucks with lower load-carrying capability.

10. Loading from landings adjacent to highways will require cautionary traffic signs and flag person(s).

11. Transport of logs on public highways will be in accordance with Provincial Highway Traffic Acts and applicable forestry regulations.

2.3.10 Road Design and Engineering

Although it is not a preferred activity for fuel management, if projects require roads to access areas for forest thinning, the *Best Management Practices for Tree Removals in Parks and Protected Areas: Road Design and Engineering* (Diamond Head Consulting 2004) will be used to guide road development in national parks. Since Parks Canada does not use road development as a common technique to access forest stands for fuel management and due to the size of the document, the best practice contents will not be repeated here.

2.3.11 Retardant & Foam Application

1. The application of water will be the priority over the use of fire chemicals (short and long-term retardants) whenever possible.

2. Since fire chemical concentrates and solutions contribute to slippery conditions, all spills must be cleaned up immediately.

3. Minimize the likelihood of retardant chemicals entering a stream or other waterbody by:

    - Informing field personnel of the potential danger of fire chemicals, especially foam concentrates, in streams or lakes during training or briefings.

    - Locating mixing and loading points where contamination of natural water, especially with the foam concentrate, is minimal.

    - Maintaining all equipment and using properly operating check valves where appropriate to prevent release of foam concentrate into any body of water.

    - Establishing dip operations to avoid run-off of contaminated water back into the stream.

    - Where possible, dip from a tank rather than directly from a body of water, to avoid releasing any foam into these especially sensitive areas.

- Using a pump system equipped with check valves to prevent flow of any contaminated water back into the main body of water.

- Avoiding direct drops of retardant or foam into wetlands, rivers, streams, lakes, or along shores. Use alternative methods of fire line building in sensitive areas.

- Notifying proper authorities (ex: FMO, IC, Operations Chief, Safety Officer) promptly if any fire chemical is used in an area where there is likelihood of negative impacts.

- Ensuring the fire manager requesting aerial retardant drops has evaluated the necessity for aerial retardant over environmental impacts, i.e. potential fish kill versus values at risk. The park FMP zones (Instensive, Intermediate, or Extensive Zone) will provide guidance on the use of retardant.

4. Where possible, retardant drops should not be within 100m radius of any known active raptor or other sensitive bird nest.

2.3.12 Sprinkler Systems

1. Sprinkler systems will be monitored to prevent soil erosion, slumping, soil saturation, and weakening tree roots.

2. Sprinkler systems employed for facility protection and cultural resource protection will be monitored for potential water damage to buildings and foundations.

2.3.13 Reclamation

1. Reclamation of disturbed sites will start as soon as practical following a wildfire or project to reduce loss of soil, reduce weed establishment, and promote native re-vegetation.

2. The *Reclamation Manual – Concerning Impacts Caused By Wildfire Suppression* (Dallyn 2002) should be consulted and/or any other reclamation practices or manuals.

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APPENDIX A

FIRE MANAGEMENT BEST PRACTICES
ENVIRONMENTAL BRIEFING FORM

Project Name: **Date:**

Include a map indicating any environmental features.

Wildlife
- ❑ Dens - bear, wolf, coyote
- ❑ Nests – raptors, woodpeckers
- ❑ Wildlife Reminders:
  - Bears – storage of food & garbage, safety info
  - Elk – calving, rutting season
- ❑ Report all bear sightings in project area
- ❑ Report all aggressive encounters with wildlife

Aquatics
- ❑ Fish spawning sites
- ❑ Sensitive wetlands/riparian zones
- ❑ Use of foam & retardant

Vegetation
- ❑ Rare plant sites – protection if required
- ❑ Park on roads or designated sites

Species At Risk
- ❑ Identify species at risk and any mitigations

Weeds
- ❑ Pressure wash all equipment before entering the park
- ❑ Heavy equipment to minimize ground disturbance

Air Quality
- ❑ Signs – Smoke in Area, Prescribed Burn in Progress
- ❑ Monitor: atmospheric venting, winds
- ❑ Keep pile/slash fires hot to reduce smoke
- ❑ Dust control on roads, helispots, staging areas if required

Soil & Terrain
- ❑ Identify sensitive terrain features (ex: hoodoos)
- ❑ Identify highly erodible or easily compacted soils
- ❑ Stream bank erosion

Archaeological & Cultural
- ❑ Archaeological & cultural sites identified – protection if required
- ❑ Monitor sprinkler systems for potential water damage or erosion.

Public Safety
- ❑ Area Closures – posted for trails, roads, area
- ❑ Signs on roads & Hwys
- ❑ Traffic control – flag person, pilot vehicles
- ❑ Report any incidents with public

Fueling & Spills
- ❑ Inspect fuel containers, equipment, & vehicles for leaks or damage
- ❑ Storage of all fuel on a containment berm
- ❑ Spill kits – onsite, vehicles, heavy equipment
- ❑ Report all spills
- ❑ Clean up spills immediately

Ignitions & Mixing
- ❑ Mixing over containment berm
- ❑ Identify the helitorch testing site

Staging Area
- ❑ Identify portable toilet site
- ❑ Maintain site clean & tidy
- ❑ Recycling

Helicopters
- ❑ Identify flight routes to avoid sensitive wildlife areas