Provincial Bark Beetle Management Technical Implementation Guidelines

Spring, 2003

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Socio-economic Basis for Bark Beetle Management

British Columbia is currently dealing with the largest mountain pine beetle infestation in the Province's recorded history. This very serious forest health issue has affected 9 million hectares of mature lodgepole pine stands and has killed over 108 million cubic meters of pine to date. It is situated across both the northern and southern interior of BC. As it continues to expand, the amount of area and volume impacted are projected to increase significantly as there is more than 1 billion cubic meters of mature pine at risk of infestation in the interior of the province.

The mountain pine beetle (MPB) infestation has been characterized as a provincial "natural disaster" and is now at risk of spreading to other provinces. The infestation has created a forest management crisis that has serious implications for continued management of our forest asset. Lodgepole pine harvest represents the single largest contribution of any species to overall provincial harvest levels and is therefore a critical part of our present and future asset base.

The provincial government has recognized the beetle epidemic warrants a unique focus. As a result, the Province embarked on a strategy with the following objectives:

- minimize the spread of beetles;
- minimize the loss of timber value; and
- minimize the loss of Crown revenue.

To address this very serious forest health issue, the Province has been working with industry and other stakeholders to aggressively manage further spread where it makes economic sense and is supported by sound forest management principles. A system for rationalizing the distribution of scarce resources allocated for bark beetle management was developed by the Ministry of Forests (MoF) that is based on the biological assumption that successful suppression of outbreaks is achieved when at least 80% of the brood are destroyed before flight. This assumption was developed from 30 years of research conducted by the Canadian Forest Service. An outbreak's spread may be slowed or held if 50 to 80% of the infestations are addressed, while anything less will not have any impact.

Objective

The objective is to provide a provincial strategy for bark beetle management based on the fundamental elements of bark beetle–host interaction and proven tactics to prevent or mitigate losses. The provincial strategy is designed to concentrate limited resources where management can have an impact and identify situations where it is not possible to have an impact on the course of infestations and tree mortality. Overall, the strategy must be biologically based to a great extent while recognizing that other resource management objectives and issues must be integrated.

Rationale

Bark beetles are the most damaging insects in mature forests in British Columbia. Outbreaks by three of the most damaging species (mountain pine beetle, spruce beetle, and Douglas-fir beetle) usually cause catastrophic losses in terms of dead trees over large areas.

Losses are usually much greater in commercial forests than would be indicated by levels of tree mortality alone. Bark beetles preferentially kill the largest diameter and most valuable trees. A large component of dead trees within a stand may make the stand uneconomical for harvest even though much less than 100% mortality of trees occurred. Infestations may affect the following:

- aesthetic values
- wildlife habitat and ecological succession
- watershed values
- multi-year management plans (e.g., Forest Stewardship Plans) through short term requirements to “chase” beetle infestations
- marketing of infested timber
- long-term sustained yield

The most effective approach to reducing losses due to bark beetles is prompt detection and immediate suppression of incipient infestations as they develop. Early intervention has the potential of avoiding large scale catastrophic losses over a landscape.

There are three approaches to bark beetle management: preventive management, direct control (suppression) and salvage of values post-outbreak. Preventive management attempts to treat the basic causes of the problem, tree and stand susceptibility. It involves various forestry practices, such as growing trees on shorter rotation, formation of age and species mosaics, type conversion,

or spacing mature pine, to prevent or reduce the chance of epidemic infestations. Prevention plays a large role in long-term beetle management. Direct control involves both single tree treatments and harvesting of infested trees to kill beetles. This beetle strategy will concentrate on addressing active beetle infestations and will provide guidance for allocation of resources for direct control. It will also provide guidance as to when a strategy of salvage (or abandoning direct control or suppression efforts) would be appropriate.

Research and field experience in mountain pine beetle control indicate that success in suppressing infestations is dependent on the strategies and tactics employed, the effort expended on the control operation, and the point in the outbreak cycle when control is initiated. The key elements of bark beetle management are as follows:

- rating stands for susceptibility and risk of depletion
- annual detection surveys and mapping of infestations
- annual assessments of rates of change in infestation levels and spread
- prompt, appropriate and thorough action on all infestations where suppression or control to some degree is feasible.

Continuity of management effort is necessary to ensure that investments are not wasted: this may imply continuing effort and multiple year treatment plans. It is also necessary to acknowledge where and when certain management actions would not be appropriate.

Approach

In the endemic state, beetle populations occur primarily in single trees or small scattered groups of trees. During the incipient (pre-epidemic) phase, the infested spots grow in size and number, and tend to coalesce into large patches. As the outbreak continues to expand, the patches extend over the landscape and small spots or individual infested trees are found at the leading edge of large outbreaks or in areas where populations are just beginning to build. Hence, the ratio of infested spots to infested patches at the landscape level can be used as a measure of the stage of an infestation. Due to the complexities of pine susceptibility at the landscape level and the many possible configurations of infestation pattern, it is difficult to give an operationally feasible but biologically complete definition of infested spots and patches. The following table is an attempt to illustrate the change in beetle infestation dynamics. These general relationships are the foundation for the broad management zones.

The overall intent of zonation and establishment of Beetle Management Units (BMU's) is to clarify where and when specific management strategies and tactics are appropriate. This planning framework is intended to allow for rational allocation of various management resources and to provide justification for not

carrying our intensive management activities where they cannot be expected to achieve stated goals.

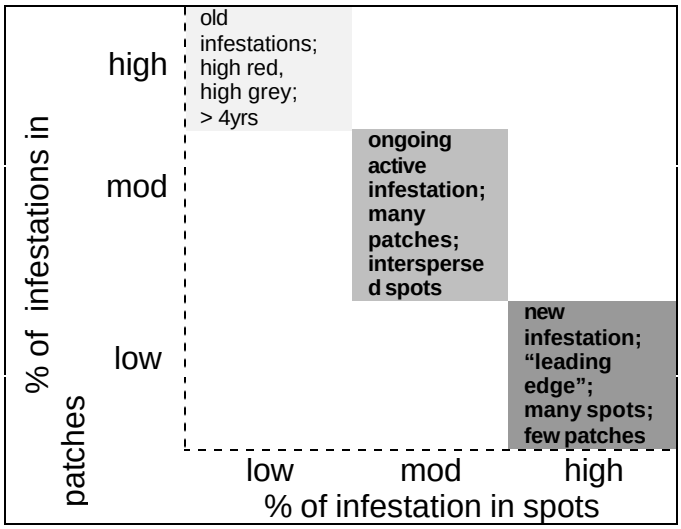


Figure 1. General infestation dynamics

Creation of Beetle Management Units

A Beetle Management Unit (BMU) is a planning and reporting unit for operational beetle management. Its purpose is to facilitate the implementation of beetle management activities. Resource management objectives should be consistent throughout the unit. Strategies should be evaluated for compatibility with adjacent BMUs.

BMU boundaries are customarily congruent with the boundaries of Landscape Units. The strategy, and, therefore, the recommended treatment options, is selected after consideration of the status of the outbreak in the BMU and the estimated feasibility of achieving specific objectives inherent in the BMU strategies available.

Classifications and Definitions

There are four (4) possible BMU strategies. These strategies are selected based on the level of outbreak in an area and the estimated effectiveness of selected treatments in achieving stated objectives.

1. **Suppression/Prevention**: This is the most aggressive strategy. It is selected when the infestation status is such that aggressive direct control actions are expected to keep an area at low level of infestation. Areas are lightly infested, and resources for direct control or harvesting and milling capacities equal or exceed the amount of infestation. The

intent of the strategy is to reduce or keep the outbreak to a size and distribution that can be handled within “normal resource capability”.

2. **Holding**: The intent of this strategy is to maintain an existing outbreak at a relatively static level. It is a delaying strategy until adequate resources are available or access created that allow for a more aggressive approach, or to reduce overall loss while waiting for a killing climatic event. This is appropriate in areas with chronic beetle infestations that are too large to deal with using single tree treatments or where access is poorly developed for directed harvesting.
3. **Salvage**: Applied to areas where management efforts would be ineffective in substantially reducing the beetle populations and subsequent levels of damage. Such areas have extensive outbreaks covering a large proportion of susceptible stands. The objective in this case is to salvage affected stands and minimize value loss. This strategy may also apply to areas containing small volumes of pine or areas where the pine is marginally economic – that is, where control is not worth the effort that would be expended and the objective is to salvage whatever values are there.
4. **Monitor**: This strategy is applied to areas where management efforts would be ineffective in substantially reducing the beetle population and subsequent levels of damage, or where there is no short term (less than 5 years) possibility of salvaging dead timber. This may be due to management constraints such as wilderness area, Park or ecological reserve, or because access cannot be put in place before substantial merchantable degradation of the dead material occurs.

Objectives for beetle population removal for BMU strategies:

Strategy	**% of Current Infstd To Treat[1].**	**Comments**
Suppression/Prevention	~80	Address all current attack within two years, stand proofing, other actions. The intent is to “control” the outbreak in that area and stop spread
Holding	50-70	Address the largest proportion of the new infested material, at at least close to the rate of expansion. The intent is to maintain beetle populations at a level that can be dealt with annually without huge expansion
Salvage	<50	The priority is to salvage timber previously attacked to minimise value loss. Relevant in areas where suppression or holding actions are no longer appropriate or feasible.
Monitor	0	No action is required beyond monitoring and recording. This is most appropriate in Parks and Ecological Reserves and in inoperable areas where the outbreak has peaked, salvage is not possible, and there is no chance for any mitigation of further loss.

1.Based on estimates from most current annual aerial overview.

Characteristics

Examples of characteristics of BMU's under various strategy designations are as follows:

	Strategy			
Factor	Supp/Prev	Holding	Salvage	Monitor
% current infstn to treat	~=80	~50-70	~=50	0
Hazard Rating	All	Mod – High	Mod – High	All
Road Access	Required	Need in short term	Short term or planned	Not necessary
Infestation status	Light – low outbreak	Low outbreak to outbreak	Extensive outbreak or collapsed	N/a
Spot:patch	H	H-M	L	N/a
Est chance of controlling beetle	H	M	Nil – Low	N/a

Appropriate Actions

Different actions are appropriate in different BMU strategies. In the Suppression/Prevention strategy, all possible treatments and treatment combinations are valid in addressing infestations. The most appropriate treatment should be selected based on the specific circumstances. The range of appropriate treatments becomes more and more constricted as the aggressiveness of the strategy declines. See Appendix II for a list of possible activities.

Funding priority matrix for mountain pine beetle within a beetle management unit by activity. Numbers represent relative weights of no (0), low (1), medium (2), and high (3) priority.

	BMU Strategy			
Activity	Suppres'n	Holding	Salvage	Monitor
Aerial Overview	3	3	3	3
Detailed Aerial Survey	3	3	1	0
Ground Survey	3	2	1	0
Grid/stand Baiting	3	3	0	0
STT **	3	2	0	0
Planning/Research	3	3	2	1

** Single Tree Treatment: F&B/MSMA, heli-logging, tree extraction

Provincial Zonation

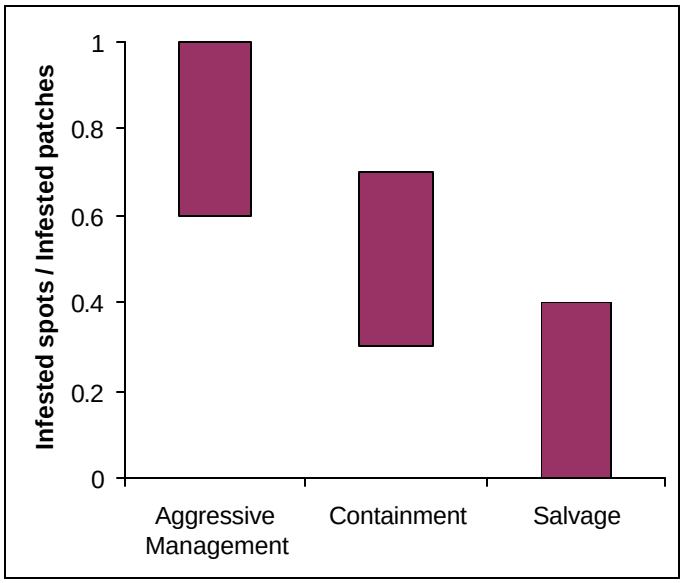
Strategy assignment occurs on two levels: broad provincial zonations and landscape level beetle management units (BMUs). Provincial bark beetle management zones allow rational allocation of resources to support aggressive actions in areas where management will have the greatest impact.

Management zones are based on the consideration of the following factors:

- Host availability and other resource information
- Provincial status of infestations based on overview survey
- Infestation trends
- Existing or potential access
- Management objectives and non-timber values and considerations

Management zones are also identified by the Provincial Bark Beetle Co-ordinator to determine where special operations and regulations are applicable. These broad classifications are useful in high-level allocation of resources.

A generalized idea of when the three zones are appropriate (based on the stage of outbreak) is given below:



Classifications and Definitions

There are 3 provincial bark beetle management zones reflecting different levels of infestation and management effort:

1. **Aggressive Management**: Aggressive application of all treatment options to all infestations within a 2 year period can be expected to achieve a substantial reduction in infestation size and spread. Typically, this zone is characterized by a few large infestations and a high spot to patch ratio. Infestations are on the leading edge of expanding large outbreaks or are individual infestations. High amounts of moderate to high hazard stands remain uninfested. Suppression BMU's are the majority of BMU's in this zone, although a few lower intensity areas may be present under some circumstances. All beetle management strategies and tactics (including detailed aerial surveys and single tree treatments) are applicable in the appropriate situation. Typically, this zone has the highest level of single tree treatment and small patch harvesting.
2. **Containment**: With vigorous directed harvesting and limited single tree treatments it is biologically feasible to at least hold infestations static. Primary management activity will be directed harvesting (large and small blocks) of currently infested stands; containment baiting would be utilized wherever appropriate. Only limited use of direct control methods such as single tree treatment would be contemplated.
3. **Salvage and/ or Limited**: No suppression or containment of bark beetle populations, but salvage/rehabilitation of affected stands as possible within management objectives. Management action is expected to have minimal impact on beetle population intensification or spread; the infestation has outstripped management resources and management cannot make an impact on beetle. Infested stands receive the highest priority for harvesting if harvesting capacity is available. Typically, infestations within this zone would be at least 3 to 5 years old with more than 20% of susceptible stands infested as patch infestations. Management activities would be restricted to salvage of dead material. Little or no single tree treatments or probing for green attack would be applied. Infested stands (based on levels of red attack) would receive priority for harvest.

Characteristics

In many cases, the boundaries of the appropriate zone are determined from the aggregate BMU's and their associated strategies. For example, the following chart indicates the type of BMU's to be found within the broad management zones:

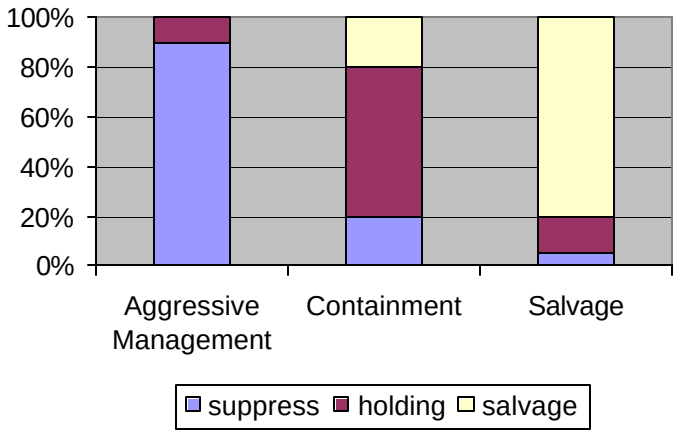


Figure 4. Possible distribution of BMU strategies within provincial management zones

Examples of infestation characteristics within provincial bark beetle management zones.

Factor	Zone		
	Salvage/Limited Activity	Containment	Aggressive Management
Outbreak age	> 3 yrs	1 – 2 yrs	New infestation or leading edge
Patch : spot ratio	High	Moderate	Low
Level of grey attack	High	Moderate	Nil to low
Level of red attack	Low to Moderate	Moderate to High	Low
Level of green attack	Low	Moderate to High	Low to Moderate
% of Susceptible stands remaining	Nil to Low	Moderate	High

Critical aspects in determining a management zone are the overall size and spatial distribution of the infestation as quantified by the spot : patch ratio (Fig. 3).

Appropriate Actions

Appropriate management activities are dictated by the specific strategy or strategies selected within the component BMU's of the zone.

In general, application of special operations and allowances, or specific bark beetle regulations intended to minimize spread of the insect would only be applied in the Aggressive Management Zone.

Prioritization of Beetle Management Units

Management zones and BMU strategies are developed following completion of annual and consistent aerial overview surveys to establish infestation status over management areas. Strategies are reviewed and modified annually.

The general principles of resource allocation are defined by the following priorities:

- Priority 1: Overview surveys and BMU planning
- Priority 2: Conduct suppression activities in the Aggressive Management Zone in Suppression/Prevention BMU's
- Priority 3: Commit resources to non-suppression BMUs in the Aggressive Management Zone
- Priority 4: Activities in the Containment Zone

If resources are inadequate to cover all activities in Aggressive Management zones, resources should be allocated according to the criteria described in the following section.

Funding Process for Suppression Activities

General Principle

Once BMU's have been delineated and strategies assigned based on infestation characteristics and likely probability of successful treatment to threshold levels, BMU's can be ranked in general order of priorities. This is most appropriate when there are inadequate resources to deal with all BMU requests.

Method of Ranking

In general, a the beetle status within a suppression BMU can be described in terms of the total number of green attacked trees, the total number of infested spots (regardless of size) and the amount of susceptible area remaining. There are eight combinations assuming that each of the factors (#green attack, #spots and susceptible area) can be rated as High or Low based on listing all potential BMU's and dividing by using the median value for the factor to identify high and low. These eight combinations are shown in the following table. These combinations have been ranked by a consensus process among a wide spectrum of experienced forest entomologists familiar with bark beetle management.

Order of Ranking

The rankings (1= High and 8= Low) indicate which BMU's should be addressed in order of importance.

Beetle Infestation Priorities:

Code[1]	# Green Attack	# infested spots	Susceptible Area	Ranking
GsA	High	Low	High	1
gSA	Low	High	High	2
gsA	Low	Low	High	3
GSA	High	High	High	4
Gsa	High	Low	Low	5
gSa	Low	High	Low	6
GSa	High	High	Low	7
gsa	Low	Low	Low	8

1. G = high levels of green attack; g = low levels of green attack; S = high numbers of infested spots; s = low numbers of infested spots; A = large amount of susceptible area; a = low amounts of susceptible area

Parks and Protected Areas

The Ministry of Forests will continue to be responsible for planning (in co-operation with B. C. Parks) and implementation of bark beetle management activities in Provincial Parks and Ecological Reserves and other non-DFAM lands. The principlesof co-operative planning and "good neighbour" policies will apply. The process and intent are included in Appendix I: a Memorandum of Understanding regarding bark beetle management between the Ministry of Forests and B. C. Parks.

Summary

The above strategic document describes the approach being taken to bark beetle management in British Columbia and presents guidelines and criteria for determining relevant area specific strategies and the beetle management unit and zone level of planning.

It must be pointed out, however, that the above approach is based heavily on the biology and dynamics of mountain pine beetle and its host. It does not specifically address other major bark beetle species such as spruce beetle and Douglas-fir beetle. These beetle species should be planned for in similar fashions, though it will likely be unnecessary to plan at a zone level to address these insects.

Further, the recommendations arising from the application of these guidelines and criteria are based on biological principles and should direct resources to areas where an impact on infestations can be made. However, other resource management imperatives, economics or logistics may well overlie these recommendations and modify priorities. The priorities set by use of this document, however, should serve as a basis of discussion to provide a consistent and rational approach to beetle management across the province.

Appendix I – Memorandum of Understanding Between Ministry of Forests and B. C. Parks.

Memorandum of Understanding

Between

Ministry of Forests

and

Ministry of Water, Land and Air Protection
Environmental Stewardship Division

Regarding

Bark Beetle Management in Parks and Protected Areas

I. Introduction:

Forested areas in British Columbia are subject to various insect disturbances and insects move freely through forested landscapes. While insect infestations are considered part of a natural forest renewal process in protected areas, they may require management in crown forests allocated for timber production. Since insects do not recognize jurisdictional boundaries, they will move from protected area forests into crown forests or conversely, from crown forests into protected area forests. Prevention of insect spread across boundaries may necessitate management actions within crown forests to maintain protected area values or within protected areas to protect timber values in adjacent crown forests.

The current mountain pine beetle epidemic presents a situation where the management of beetle infestations to prevent spread of beetles across boundaries is a high priority. The effective management of the mountain pine beetle epidemic requires a coordinated program between the Ministry of Water Land and Air Protection, Environmental Stewardship Division (MWLAP, ESD) and the Ministry of Forests (MoF). This MOU establishes the foundation for a coordinated beetle management program between ESD and MoF.

II. Purpose:

As a result of the mountain pine beetle epidemic in British Columbia, government has initiated a multi-year program directed at reducing losses to both crown forests managed for timber production, and other resources, caused by mountain pine beetles. Priority treatment of spruce and Douglas-fir beetle may also be required in some areas. MoF and ESD are co-operating in management of bark beetle issues in areas of common interest.

This MOU has been jointly developed by MoF and the Parks and Protected Areas Branch of ESD. The purpose of this Memorandum of Understanding is to facilitate the management of bark beetles in priority areas to reduce current or projected impacts on the forest land base, regardless of administrative authority. This MOU is intended to define the structure and process of a co-operative program for bark beetle management.

III. Other Agreements

This MOU is not meant to replace or affect other agreements currently in place with BC Parks (now ESD, MWLAP) or other agencies.

IV. Term:

The term of this MOU shall begin on the date of signing and may be terminated upon mutual consent of the two parties.

V. Annual Review:

This MOU will be reviewed annually or updated as required to incorporate new government direction or changes to forest or protected areas management policy.

VI. General Principles:

1. The objective of insect management in forests outside of parks and protected areas is to minimize losses to resource values.

2. The objective of insect management inside parks and protected areas is to allow natural process to prevail; however, to maintain protected area values or prevent of cross boundary spread of insects to adjacent crown forests, insect management in parks and protected areas may be required.

3. ESD and MoF, subject to current legislation and their management policies and with respect to the goals and objectives of each Ministries mandate, will cooperatively manage insect infestations to prevent cross boundary spread of insects. In some cases infestation management actions may be limited by social, economic or ecological considerations.

4. To coordinate management of beetle in areas of mutual interest, ESD and MoF will share information, knowledge, expertise and resources required to maintain both agencies insect management objectives.

5. MoF and ESD will cooperate on funding submissions for beetle management activities as well as on planning, research and communication initiatives.

VII. Funding of Management Programs

1. Provincial Program Funding

- When appropriate, MoF Headquarters and ESD Parks and Protected Areas Branch will cooperatively apply to government for Provincial beetle management programs.

- Beetle management program funding will be allocated to appropriate MoF or ESD regions for high priority treatment programs in protected areas and crown forests based upon mutually agreed criteria as required to meet cooperatively defined provincial beetle management objectives.

- Beetle program funding associated with protected areas management may be applied to high priority planning, mapping, research or long–term management activities as agreed upon by MoF and ESD Parks and Protected Areas Branch.

2. Regional Beetle Management Programs

- Funding will be allocated to MoF or ESD Regions by MoF HQ based on prioritized treatment units and strategic management goals for both protected areas and adjacent forests.

- MoF and ESD regional staff will cooperatively determine regional protected area beetle management goals and treatment activities, however, treatments in parks and protected areas will follow BC Parks Conservation Program Policies and will not be conducted without ESD regional staff approval. Protected area treatment funding submissions will be included in all regional MoF treatment funding submissions.

- Beetle management activities in protected areas may require a higher level of planning and management to maintain protected area values.

- Research activities related to mountain pine beetle management may be undertaken in protected areas where appropriate under an approved park use permit.

VII. Beetle Management Activities

The objective of beetle management in both forest lands and protected areas is to reduce the impact of bark beetles and to prevent cross boundary spread of insects. Successful beetle management will require both short-term control activities and long-term management activities.

Short-term control activities include all management actions undertaken to reduce current beetle populations in protected areas and adjacent forests (i.e.: beetle control/management actions). Long-term management actions in protected areas include all activities undertaken to vary forest types by age and species composition (i.e.; beetle habitat reduction).

1. Short-term management activities:

The BC Parks Conservation Program Policies define acceptable beetle management options for protected areas as[1]:

1. Allow natural process to prevail (i.e. do not treat)
2. Pheromone baits and insect trap trees
3. Individual tree fall and burn on site
4. Large-scale prescribed burn
5. Skid, pile and burn on site with low impact machinery (over snow is the preferable method, no access roads will be constructed, where remedial work is necessary the policy for restoration management will be followed.)

Note: Other treatment or management options such as the use of MSMA will be considered by the ESD Parks Regions and Parks and Protected Areas Branch on a case by case basis.

In general the annual treatment program will be implemented as follows:

- MoF HQ will undertake provincial overview mapping and identification of all areas affected by bark beetles on an annual basis. This program is funded from the provincial forest health budget. The information from the overview mapping will be made available to both Regional and Provincial ESD staff.

- Regional ESD and Regional and District MoF staff will be responsible for cooperatively identifying regional management priorities and planning and coordinating short-term regional beetle management programs for both protected areas and adjacent forests.

- To utilize economies of scale and operational efficiencies, most beetle control activities undertaken in protected areas including: detailed aerial

[1] The complete conservation program policies are available at: http://wlapwww.gov.bc.ca/bcparks/conserve/cpp_p1/index.htm

mapping, ground probing, and treatment activities will be managed as a part of the MoF District/Regional beetle management program in which the protected area is located. Funding for protected area beetle management will be taken from provincial beetle management funding.

- ESD regional staff will conduct appropriate impact assessments, and administer and monitor permit requirements.

- Prior to the initiation of each yearly program, MoF HQ and ESD Parks and Protected Areas Branch, and, MoF and ESD regional staff respectively, will meet to review previous programs, set provincial treatment goals and plan funding allocations.

Approved survey and treatment methods are listed in appendix 1, page 8.

2. Long-term management activities

Long-term forest health activities in protected areas will be based on ecosystem management principles to vary the forest matrix in protected areas by both age and species composition where necessary to emulate the long-term range of natural variability of the area. Planning for these programs will be the responsibility of ESD, however, MoF may be consulted regarding forest health or other natural resource considerations. In some cases, forest ecosystem management activities such as undertaking prescribed burns; completing protected area beetle assessments; developing ecosystem management plans; or, mapping and inventory to support long-term management activities may be cooperatively undertaken by ESD and MoF.

VIII. Communications

To ensure consistency, communication with or information requests from media or other interest groups regarding park or protected area management of beetle infestations will be directed by MoF staff to either ESD Parks and Protected Areas Branch or ESD Regional Staff. Accordingly, all communications or requests for information to ESD staff regarding forest management in areas outside of parks or protected areas will be directed to appropriate MoF HQ or regional staff.

IX. Research

ESD and MoF will coordinate research activities regarding beetle management or forest health in general on both a provincial level through Parks and Protected Areas Branch and MoF HQ and at a regional level through MoF and ESD regional staff.

X. Conflict Resolution

As a matter of principle both ESD and Forests desire to resolve any disputes that arise related to the management of the issues covered in this MOU at the lowest possible management level. This being the case, every effort will be made by senior field staff of both agencies to jointly explore and find mutually acceptable solutions to operational problems that may occur from time to time.

When all attempts to resolve a dispute at the field level fail, the issue will be forwarded to ESD Parks and Protected Areas Branch and MoF Headquarters for consideration and resolution by respective Ministry executives.

Appendix II – Approved Survey and Treatment Methods

The following general guidelines should be followed in budgeting and spending of funds allocated to the bark beetle program. The objective of operations in both forest lands and protected areas is to reduce the impact of bark beetles on resource values and to prevent cross boundary spread of insects. Approved activities will be directed to this objective and will include those actions which detect and quantify beetle populations, evaluate beetle spread potential, and directly reduce localized beetle populations and subsequent spread.

The following principles shall apply:

- ◊ treatments should address critical issues and will be prioritized to achieve strategic goals;
- ◊ treatments should be co-ordinated within a logical planning unit; the plan and co-ordination should be evident in any submission(s). Treatment planning for affected areas near protected area boundaries will be undertaken cooperatively between regional MoF and ESD staff.
- ◊ treatment plans should have inter-agency and stakeholder support; joint interagency sign-off may be appropriate in some cases.
- ◊ sanitation activities take precedence over salvage outside of protected areas. Inside of protected areas, treatment actions will be planned to protect specific protected area values or control or reduce beetle spread across protected area boundaries to adjacent forests. Treatments will be limited to those approved under protected areas management policies.
- ◊ treatments are for bark beetle control only and for the purposes of this program, acceptable management actions are:

- aerial overview surveys, digital mapping (and necessary software), summaries and report production;
- detailed aerial surveys in priority areas;
- ground probes and reconnaissance mapping;
- periodic large scale normal colour aerial photography when required;
- preparation of operational beetle management plans, including beetle management planning and treatment impact assessments in parks and protected areas;
- pheromone purchase and placement;
- MSMA purchase and use;

- trap tree deployment and removal / treatment;
- single tree fall and burn;
- small scale sanitation (*e.g.* brood removal) harvesting - such as helicopter removal outside of protected areas;
- prescribed burns (limited in area) inside protected areas designed to reduce beetle populations or alter that age class distribution to make forests less susceptible to infestations;
- other activities as approved by MoF HQ and WLAP ESD Parks and Protected Areas Branch (in consultation with MoF and ESD regions); and,
- project management, monitoring and audit (Regions and Branch only)
- no road and /or bridge construction, reactivation or maintenance
- research to be funded at headquarters after consultation with the Regions
- no capital purchases
- training and travel costs specific to bark beetle program are acceptable

Note: It can be expected that program and project expenditures will be audited, therefore, documentation of all management activities must be complete and accurate.