Ministry of Environment and Climate Change Strategy

GUIDANCE
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Developing a Treatment Plan for Pesticide Use Permit Applications

Integrated Pest Management Act

Purpose of this document

This guide is for applicants developing a treatment plan as part of a pesticide use permit application under the *Integrated Pest Management Act* and Integrated Pest Management Regulation. It includes the following:

- required components of the treatment plan and level of detail to be included,
- elements of the 6 principles of integrated pest management to incorporate in the plan, and
- examples of activities from various industries that can be used for reference.

The examples provided throughout this document are not always necessary, nor do they represent all the possible ways to meet the ministry's expectations. However, many of these examples are standard industry practices, and if applicants choose to deviate from those practices, sufficient justification should be provided to support the reasoning. When ministry staff assess integrated pest management programs, they typically explore how the elements of integrated pest management interact to create a rational and logical program.

If you have any questions about the information provided, please contact the ministry at IPMPBC@gov.bc.ca.

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Acronyms

IPM – Integrated Pest Management

IPMA - *Integrated Pest Management Act*

IPMR - Integrated Pest Management Regulation

Definitions

Adverse Effect	Harm to humans, animals or the environment
Administrator	The administrator appointed under section 9 of *the Integrated Pest Management Act*
Injury Threshold	The point at which the abundance of pests and the damage they are causing, or are likely to cause, indicates that pest control is necessary or desirable
Integrated Pest Management	A process for managing pest populations that includes the following elements: a) planning and managing ecosystems to prevent organisms from becoming pests b) identifying pest problems and potential pest problems c) monitoring populations of pests and beneficial organisms, damage caused by pests and environmental conditions d) using injury thresholds in making treatment decisions e) suppressing pest populations to acceptable levels using strategies based on considerations of: i) biological, physical, cultural, mechanical, behavioural and chemical controls, in appropriate combinations, and ii) environmental and human health protection f) evaluating the effectiveness of pest management treatments
Invasive Plant	A prescribed species of invasive plant listed under the Invasive Plants Regulation
Noxious Weed	Has the same meaning as under the *Weed Control Act*
Pest	An injurious, noxious or troublesome living organism, but does not include a virus, bacteria, fungus or internal parasite that exists on or in humans or animals

1.0 Overview

Permit applications must present comprehensive information and demonstrate how the proposed pesticide use will not cause unreasonable adverse effects. This criterium requires evaluation of risks to human health and the environment, potential impacts to Indigenous groups, and other impacts identified by the public and stakeholders. Since the purpose of the ministry's Integrated Pest Management Program is to prevent unnecessary use of pesticides and minimize exposure to people and the environment, a treatment plan must explain how the integrated pest management principles will be used for the pest problem and demonstrate how potential adverse effects are identified and avoided or mitigated.

The development of a draft treatment plan is needed in the early stages of the application process as it provides a framework for engagement with Indigenous groups, other government agencies, the public and stakeholders. At a minimum, the treatment plan is expected to include the following information:

a) General information on where the proposed pest management will take place, the person responsible and principal contact;

b) How integrated pest management principles will be applied;
c) Operational information on safely transporting, storing, mixing and applying, disposing and spill response;

d) Environmental protection strategies such as protecting water and food sources, protecting fish and wildlife habitat, pre-treatment inspection procedures, calibrating application equipment, monitoring weather conditions; and,

e) Identification of each pesticide to be used and the method of application.

1.1 Incorporating integrated pest management into the treatment plan

Integrated pest management is composed of six elements, which must be incorporated in treatment plans:

1. **Prevention** – assessing various methods to prevent pest establishment

2. **Pest Identification** – identifying pest problems and developing management strategies

3. **Monitoring** – checking pest numbers and environmental conditions to figure out when the pest will likely surpass the injury threshold
4. **Injury Threshold** – estimating the damage likely to be caused by pests
5. **Pest Treatment Methods**

6. **Evaluation** – assessing treatment effectiveness

The integrated pest management program should be knowledge-based with a heavy emphasis on collecting and assessing information prior to making management decisions. The ministry expects that for some pests and locations, pest managers may use an iterative approach, i.e., start with simple integrated pest management and move to a more comprehensive framework as more information is obtained with time. The following goals are important when developing an effective integrated pest management program:

- Minimize risk to human health and the environment by reducing exposure to pesticides.
- Prevent unnecessary use of pesticides. If pesticides are necessary, improve their use to make them as selective and low risk as possible.
- Research and adopt new technologies and practices to ensure continual improvement in processes and more effective long-term results.

Treatment plans should include the range of likely activities that may be conducted (pesticides, method of application, IPM procedures). Any permit authorizing the use of pesticides will likely contain a condition for implementing the plan, i.e., once operations begin, you will be required to conduct work as specified in the plan. If there are situations that require an unforeseen change, it will be necessary to amend the plan and, in some cases, the permit. Therefore, it's important to develop a draft version of this plan and submit it with your permit application.

The plan should illustrate how integrated pest management principles will be implemented, and how the environment and human health will be affected when employing pesticides as part of a pest management program. The operational requirements for using integrated pest management before applying pesticides are outlined in IPMR S.68 for licensees and S.69 for confirmation holders and are expected to be met by permittees. Details of each element of the IPM program are provided further in this guidance.

1.2 Required public consultation for treatment plan

The treatment plan must be available during public consultation and the draft must include a permit application number. The purpose of consultation is to ensure that significant issues and concerns are identified, considered and addressed prior to issuance of the permit. Interested parties may comment on the plan and supply relevant information, such as location of water supply systems and particular land uses. The ministry should be assured that relevant issues brought forward by concerned parties are discussed in the finalized plan. The plan may need revisions, based on information provided during consultation. Ministry staff will review the treatment plan during the review phase of the application process and may inspect selected plans under the ministry's compliance program after the permit is issued.

The objectives, intended treatment methods and location of treatment areas outlined in a plan should be presented in plain language to effectively engage the public. Enough detail should be provided to enable identification of communities, watercourses, and other features that may be relevant.

Applicants may consider including visual depictions like maps, diagrams and photographs to improve communication.

1.3 Referencing outside documents

If outside documents are referenced in the treatment plan, it should be clear if references supply background for proposed preventative strategies or are part of the integrated pest management program. Restrict references to relevant pages only. Do not reference the entire document if some information included is not applicable. Referenced documents should be easily obtainable by staff and contractors who are working under the permit and by the ministry and the public who may review the document.

Build plans with the goal of demonstrating due diligence. All required information relating to the proposed integrated pest management program should be adequately explored and sufficiently addressed in the treatment plan. Justify decisions and explain how the proposed use will not result in unreasonable adverse impact. Checklists are useful to demonstrate due diligence, especially if licensees will be contracted to apply pesticide. While not mandatory, checklists can be used to ensure information has been conveyed or procedures have been followed. These checklists can be used by staff or a contractor involved in implementing a treatment plan to demonstrate that a permit holder has provided adequate instruction.

Further information to aid with the development a treatment plan may be obtained from references in Appendix 1.

2.0 Components of Treatment Plans in Permit Applications

2.1 Geographic Boundaries and Maps of Proposed Treatment Areas

The scale of the map or diagram outlining the proposed treatment areas should be sufficient to identify the gross boundaries of those areas (e.g., include boundaries of a regional district or mark railway lines, pipeline corridors, or industrial substation sites). They should show the relative locations of communities and major bodies of water such as lakes, rivers, and marine shoreline. The map or diagram should also include areas that may require treatment, but are yet to be confirmed (i.e. areas that require additional monitoring to determine the need for treatment). A description of the geographic boundaries may include a list of facilities with street addresses or GPS coordinates.

Maps or diagrams are to be available for viewing during the consultation period, so that a person can contact the applicant about any concerns. All areas potentially to be treated with pesticides should be identified on the map(s). If new pesticide use areas (that fall outside the original geographic boundaries described in the plan) are identified after the permit has been issued, then the permit and plan must be amended to reflect these new areas.

2.2 Contact Information

The treatment plan must identify both the applicant, who is responsible for the work, and an individual who can be contacted for details of the plan who has decision-making power regarding the development and implementation the plan.

The applicant may be a limited company, corporation, government agency, or an individual under the jurisdiction of the government of British Columbia and in a position of responsibility for carrying out the regulated activity.

2.3 Integrated Pest Management

2.3.1 Pest Prevention

A pest prevention program must be developed, where reasonable, to minimize the need for control measures. The purpose of discussing prevention in the treatment plan is to confirm that the applicant has considered all applicable prevention methods and has decided whether they are reasonable for the particular pest to be managed. This section should also include a description of how methods will be implemented.

Pest prevention includes activities used to impede the establishment and spread, as well as minimizing impacts, of unwanted pests to prevent the need for treatment. It is important to find long-term preventative solutions to pest problems. The plan should describe prevention in enough detail for the public and the ministry to have a clear understanding of the methods that have been considered and

used. For example, if prevention is to include seeding of disturbed areas, the discussion could include how the disturbed sites will be identified, when and how they will be seeded and to what extent this should reduce the need for control options. The discussion can reference information sources in other documents that were used to prepare the pest prevention program, such as specific pages in industry technical documents, integrated pest management manuals or reports prepared by integrated pest management consultants and qualified professionals.

If no prevention methods were found to be practical, the treatment plan should include reasons why this conclusion was reached, particularly if standard industry practices are not being used. If cost is a major reason, details to support this claim must be included. The following are some examples of prevention methods that are typically considered and/or implemented for different types of vegetation management programs.

Example: Noxious Weed and Invasive Plant Management

Prevention can be an important aspect of managing noxious weed and invasive plant species, and generally involves reducing their spread. It can be difficult to reduce the spread of seeds and plant parts by natural vectors (e.g., wind, water and wildlife), but reducing human activities responsible for their introduction and spread is sometimes possible.

Examples of preventative measures for noxious weeds and invasive plants could include timely seeding of disturbed areas and inspecting vehicles when leaving infested areas to ensure weed plant materials have not become attached to the undercarriage.

Example: Industrial Vegetation Management

Prevention methods for industrial vegetation management can include minimizing the initial growth and spread of undesirable vegetation on existing sites, or steps to prevent growth of undesirable vegetation during construction or upgrading of sites. Measures to prevent vegetation impacts on industrial sites could include:

- installing surfacing materials to serve as a barrier to prevent unwanted vegetation;
- establishing stable, low-growing plant communities that prevent growth of unwanted, taller species on electrical transmission and distribution corridors; and
- eliminating seed sources, by preventing leakage of grain products during loading and transport on railways.

2.3.2 Pest Identification

Pests must be identified so that their biology can be researched and incorporated into an integrated pest management program. Some species may not cause significant impacts and are not considered pests. It is important to ensure only organisms that are actually pests are subjected to the control options. If a pesticide is needed, the target pests must also be adequately identified to ensure the

pesticide is used only on pests for which it is registered. In addition, correctly identifying species to determine if they are noxious (*Weed Act*) or invasive (*Forest and Range Act*) may affect treatment boundaries or the type of authorization needed.

It is important to correctly identify pests to be managed as monitoring methods and injury thresholds may be specific to a particular species. Furthermore, treatment options and delivery mechanisms may be influenced by the pest targeted. The level to which various pests need to be identified can vary considerably. This may depend on factors such as the potential impact of the pest, as well as the cost and effort of its identification. For example, if there are safety concerns regarding fire from vegetation, the presence of any plant in a facility may meet the threshold to trigger the need for treatment without further analysis. If identifying a pest to species level is extremely difficult or requires costly laboratory analysis, it may be sufficient to identify only to the genus if this still meets the management objectives.

In some cases, such as for noxious weed management, it may be important to accurately identify a weed to the species level because only those plants must be controlled. This may be important to reduce non-target treatment which could decrease the ability of susceptible habitat to resist future colonization of pests.

For industrial vegetation management it may not be necessary to identify plants to the species level, particularly if several commonly associated plants, together, may be the pest problem that requires treatment (e.g., impacting growth of forest crop seedlings). In such cases, the plant association or "complex" can be identified – usually by identifying a sufficient number of the most common species to uniquely characterize the complex. Reasons should be given as to why identification of plants to a particular level was considered appropriate (for example: "The target species are to include all grasses, herbaceous and woody plants colonizing the gravel bed to prevent fire hazard").

2.3.3 Monitoring Program

Monitoring is necessary to assess the distribution and abundance of the pest(s) to ensure that the treatment is applied only in areas where it was found that the pest(s) exceeded, or will exceed, the established injury threshold (see section 2.3.4 - Injury Threshold). Therefore, the monitoring program must be designed and used to achieve this objective.

The monitoring program must describe and document the following:

- Distribution and abundance of pests, whether the pest population is increasing or decreasing and whether competing species are, or will, cause significant impacts to the pest population. For example, IPMR S.77(3) requires noxious weed programs, in relation to confirmation holders and licensees, to attempt to identify sites where biological release programs are active and try to prevent harm to those organisms.
- Environmental features and conditions to help determine when or where treatment may be needed, and if required, what type of treatment may be possible (e.g., differing moisture and

soil types and the presence of wetlands or bodies of water may influence treatment decisions). Also, the collection of appropriate environmental data is expected to help assess the impacts of the treatment.

- The level of damage the pest population will cause, and whether the pest population has reached the injury threshold (the point at which the abundance of pests and the damage they are causing, or are likely to cause, indicates that pest control is necessary or desirable). Evaluating damage caused by unwanted pests is important to support injury threshold determinations. The plan should describe the criteria used to determine that the injury threshold has, or will, be exceeded, such as cover or height of plants.

The monitoring program should also include the following details:

a) **Monitoring methods**: how monitoring sites will be selected and visited (e.g., using ground patrols or aerial surveys), how levels of pest density or damage will be assessed (e.g., through density counts, height measurements or visual estimates), and how relevant environmental conditions will be measured (i.e., anemometer for wind speed).
b) **Frequency of monitoring**: how often sites will be visited to ensure adequate monitoring. If high priority or high-risk sites are visited more frequently, this should be described. Monitoring typically involves a series of observations to obtain information about a pest population and the environment, and to determine how quickly pests develop to cause significant damage, if ever.
c) **Data that will be collected**: relevant factors that will be assessed with each monitoring visit (e.g., density and height of vegetation, depth of roots, species of weeds present, species of non-target plants present, density of bio-control agents, soil type, slope, aspect, water levels in wetland areas). If relevant data will be collected by other organizations, this should be described. In many industries, there are standard practices for monitoring the density or percent cover of pests, such as sample quadrats or transects. If these practices are not used, the program should be able to justify the deviation from such practices.

Quantitative data should support the evaluation of the integrated pest management program, and an attempt should be made to collect reproducible and comparable quantitative data to provide an accurate assessment of monitoring data. Nonetheless, quantitative sampling may not always be practical, nor possible, and in such cases, it may be sufficient to collect qualitative data through a visual examination. To achieve reliable and consistent results, adopt qualitative methods that strive for standardization, make sufficient observations, and retain a person with relevant observation skills.

A system should be developed to record monitoring data to determine if treatment is called for and to evaluate the integrated pest management program. Monitoring record forms are one good way to achieve this. Such forms can be incorporated in the treatment plan to show what information will be collected. This may provide a way to easily meet the requirement without a lengthy description. A record of the injury thresholds should be made for each treatment location. An example of a monitoring form is presented on Figure 1 below.

FIGURE 1. EXAMPLE OF A MONITORING FORM

Monitoring Date:_____ Name of Monitor:_____

Location of Site (attached diagram if required):_____

Target Plant or Plant Complex	Growth Stage	Density/Percent Cover/ Height (as appropriate)	Exceeds Threshold ?

ENVIRONMENTAL CONSIDERATIONS

Soil type and moisture content: _____

Aspect: _____ Slope: _____

Water Sources or wells within 30 m of site YES NO
If yes, describe:_____

Bodies of water within 20 m of site YES NO
If yes, describe:_____

Other Environmental Features Requiring Protection YES NO
If yes, describe:_____

Recommendations for additional monitoring/treatment: _____
_____
_____

The program for pre-treatment monitoring for pest abundance and environmental baseline conditions should be designed so that it can be used together with post-treatment monitoring to assess treatment effectiveness and potential impacts on human health and the environment (see section 2.3.6 – Post-Treatment Monitoring). This may be done by establishing the same observation sites and parameters, which would be used in both, pre- and post-treatment monitoring.

The following are some considerations for the pest monitoring to be included in a plan for different types of vegetation management.

Noxious Weed and Invasive Plant Management

Noxious weeds and invasive plants are already determined to cause damage (hence are designated under the *Weed Control Act* or Invasive Plants Regulation under the *Forest and Range Practices Act*). Thus, monitoring does not have to include observations on potential damage they cause, unless it is used in assessing the priority for treatment in an area. However, it may be desirable to include observations to assess conditions that are promoting spread of the noxious or invasive plants.

The monitoring program for a noxious weed or invasive plant management program can reference surveys and information from various sources. The assessment of distribution and rate of spread may be determined from reports by land managers or observations during earlier treatments or by follow up visits to significant sites that received treatment. Since noxious weed and invasive plant programs may have a threshold of zero, the need for a sophisticated and well described monitoring system is less important. Monitoring of noxious weed and invasive plant populations is typically done with visual observations to document the extent of an infestation, generally recorded as area infested or as a percentage cover or number of plants per unit area. The final monitoring is often done immediately before treatment of all target plants seen, or observations may be made of various factors to assess the priority for treating target plants.

The manner of recording these observations should be described in the plan (such as on maps or survey forms). If the program is using the Invasive Alien Plant database, this should be referenced with a description of how it will be used.

Industrial Vegetation

Industrial vegetation management objectives vary, and hence, monitoring programs vary. Some programs may have thresholds with a low tolerance for any vegetation, such as around gas and oil wells or electrical facilities due to legal requirements and safety considerations. In such cases, monitoring may be conducted immediately before the treatment of all vegetation observed. Other programs may require repeated observations to determine which plants are damaging and when they should be treated, if ever. In some cases, early detection of unwanted types of vegetation may be important to prevent seed production and spread to adjacent areas and to ensure a wide range of treatment methods can be used. The rationale for the type of monitoring and the record keeping system should be documented in the plan.

2.3.4 Injury Thresholds

Injury threshold is defined in IPMR as “the point at which the abundance of pests and the damage they are causing, or are likely to cause, indicates that pest control is necessary or desirable”. Injury thresholds need to be determined, and used, (in conjunction with monitoring) to ensure that control options are used only where the level of current or expected damage caused by the pest is sufficient to justify their use. The plan should outline the thresholds that will be used, how they were chosen, and how they will be operationally applied in the field. This description needs to demonstrate to the public and the ministry that reasonable thresholds were established and that treatment methods will be used only where monitoring indicates the thresholds have or will be exceeded.

Figuring out when problem pests reach thresholds of unacceptable damage can be difficult and varies for different industry sectors. Damage may include reduced economic values, reduced public safety, fire hazard, damage to equipment or facilities or impacts on native ecosystems. Often there are programs with multiple pests, different management objectives and different injury thresholds under a single

treatment plan. In such cases, it will be necessary to identify the location, physical characteristics and injury thresholds of the different management areas.

The ministry expects that a threshold is developed to meet operational needs while minimizing unnecessary pesticide use. Thresholds should be quantitative to enable clear and consistent decision making. The ministry recognizes that it is often necessary to set preliminary thresholds and then refine these as further data and experience is gained. If the threshold and its justification are well described in a reference document or guide, it is acceptable to simply reference the relevant publication and page number. Potential sources for researching thresholds could include company policies, standard industry practices, reference guides, federal and provincial legislation, and pest management experts. If the justification for setting thresholds is not referenced externally, it is expected that a detailed description is included based on sound reasoning and quality information. Note that statements such as "pests must be treated because they reach a level that will impact operational objectives" are not considered sufficient to justify treatment.

The following are some considerations for the development of injury thresholds for different types of vegetation management. Descriptions in the plan should clearly identify how pests may prevent operational objectives from being achieved.

Noxious and Invasive Plant Management

Plants are designated as noxious or invasive in BC because they can cause significant damage to agriculture, forestry, or native ecosystems. There is often no acceptable abundance of these plants. In practice, however, the degree of control that can be implemented for a specific plant in a specified area will depend on factors such as how widespread it is, how rapidly it is spreading, the degree of damage it causes and the susceptibility of the surrounding habitat to infestation. Thresholds may be based on operational capacity or the presence of established containment areas and may be influenced by the program's operational budget.

Most noxious weed and invasive plant committees have adopted a system of categorizing noxious weed and invasive plant species and the sites where they are found, to set up priorities for control programs. Systems, such as the one used by the provincial government, can be used to help justify the need for the level of program required, especially where there are several pests managed under the same treatment plan and with varying degrees of likelihood of treatment. As an example, the tables listed in Figure 2 illustrate how various combinations of plant categories and site priorities are used to establish the level of treatment priority. Ideally, the thresholds section of a plan would reference the use of such systems to confirm that there was an assessment of the need for a particular intensity of noxious weed and invasive plant management in a specified area.

Industrial Vegetation Management

Consideration of worker safety, maintenance of infrastructure (e.g., rail bed, ties), public and environmental safety (e.g., restricting site lines, risk of fire), and impeding inspections or maintenance (e.g., access, location, or markers) may be used to develop injury thresholds.

Injury thresholds may be based on the number or cover of weed species present at a site, or on the size of specific problem species such as those with deep roots or which grow too tall.

The following is an example of the format that could be used for injury threshold information based on plant height.

Example:

Issue: Tall-growing shrub and tree species must be managed to prevent reaching a specified distance from a transmission line to reduce the risk of fire, electrocution of people and power disruption.

Thresholds: The thresholds are minimum distances between the conductor and vegetation as shown in the following table:

Voltage	xxV	xxV	xxV	xxV	xxV
Minimum distance required between conductor and vegetation	xx m	xx m	xx m	xx m	xx m

How the thresholds were chosen: Thresholds were determined from the potential for electrical arcing and sagging of lines based on engineering studies and observations (provide an explanation or reference to the studies).

How the thresholds will be applied operationally: Plants will be treated if monitoring observations show they have the potential to reach the minimum distance from lines before the next site visit (this should be explained with reference to the growth rate of the plants and predicting the distance from lines before the next scheduled site visit). The plan should indicate if the threshold is based on a legal requirement or policy (e.g., legislated requirements for vegetation removal around oil and gas wells or safety orders to clear railway ballast).

FIGURE 2. EXAMPLE OF A THRESHOLD MATRIX

Noxious Weed and Invasive Plant Categories

Category 1	Category 2	Category 3	Category 4
Plants that pose extreme risk for invasion and spread into undisturbed sites, including ecologically at risk habitats. Sites < 0.5 ha, including new infestations within containment zones of other noxious weeds or invasive plant species will be considered for control.	Plants that pose a high risk of invasion and spread to undisturbed sites. Less aggressive than Category 1 plants, but pose similar threat to ecologically at risk areas. Sites less than 0.25 ha would be considered for control.	Plants that pose a moderate risk to invasion and spread into disturbed sites. These plants pose a threat to ecologically at risk sites.	Plants that pose a low to moderate risk of invasion and spread into undisturbed sites.

Noxious Weed and Invasive Plant Site Priorities

Priority	Purpose or Intent of Treatment
1. Extremely High Risk	To stop the spread of noxious weeds or invasive plants threatening non-infested, highly susceptible areas. These sites are generally less than or equal to 0.25 ha, and are widely separated by distance or physical barrier from the infestation site. These sites have a high probability of control
2. High Risk	To stop the enlargement of sites in highly susceptible areas. These sites are ≤ 0.5 ha. These sites must have a good probability of control.
3. Moderate Risk	To stop the enlargement of sites of greater than or equal to 0.5 ha. In highly susceptible areas of ≤ 0.5 ha. In moderately susceptible sites. These sites must have a good probability of control.
4. Low Risk	To stop the enlargement/contain sites in moderately susceptible areas of ≥ 0.5 ha. These sites must have a good probability of control.

Treatment Rationale by Species Category and Site (Injury Thresholds)

Plant Category	Site Priority	Program Level
1 1 2	1 2 1	**Initial Attack** (prevent new species from becoming established)
1 2 2	2 2 3	**Containment** (prevent current infestations from expanding)
3 3 3	1 2 3	**Full Program**

2.3.5 Pest Treatment Options

This section of the treatment plan is expected to include:

a) a description of the pesticide and non-pesticide treatment methods for controlling pests that may be used,
b) the rationale for selecting the treatment methods,
c) the benefits and limitations of each treatment method identified, and
d) a description of how a decision to use treatment methods will be made.

The rationale for selecting methods should consider IPMR S.68(1)(e), which requires demonstrating that the method selected considered:

(i) practical alternatives to pesticide use; and

(ii) risk reduction and protection of human health and the environment.

In other words, operators that apply for a permit will be expected to demonstrate they have considered application technology options to minimize unnecessary introduction of pesticides into the environment. If several treatment methods could be used, it should be outlined how a decision will be made to use each method.

2.3.5.1 Principles for Selection of Treatment Methods

A logical sequence would be to describe each treatment method that may be used, followed by its benefits and limitations, and then, if it is to be used, the rationale for selecting it. Review the ministry's guidance documents outlining the approach to determine Best Achievable Technologies. A Guide for Sea Lice Managers Using Pesticides is also based on the Best Achievable Technologies approach and is a useful tool for sea lice permit applicants. Using this framework can result in a significant reduction of pesticide use to ensure the protection of the environment, and to promote continual improvement of air, land, and water quality.

The following principles use Best Achievable Technologies and should guide the choice of treatment options:

- Look for long-term solutions to pest problems.
- Collect and use information about pest characteristics to find treatment methods that maximize selectivity and effectiveness.
- Identify treatment methods that are appropriate for the management objectives.

- Use alternatives to pesticides whenever practical, both chemical and non-chemical options should be discussed.

- Remove technically infeasible options. This may be due to environmental conditions that prevent adoption in the application area (e.g., water temperature).

- Incorporate the cost-effectiveness of each possibility. Financial implications to adopting new technology or practices may be considered.
- If pesticides are necessary, make an ongoing effort to improve pesticide selectivity and to use products and application methods that reduce risk to human health and the environment (e.g., using reduced-risk pesticides, lowest effective application rates, and application methods that minimize off target drift).

- Strive for continual improvement. Scan for new pesticides and treatment technology during the life of the plan. The description of non-chemical methods that may be used would include considering all manual, mechanical, cultural, and physical control options commonly used in the industry.

Examples of treatment methods that are alternatives to pesticides for different industry sectors include:

- **Forest vegetation management:** Cultural controls include prescribed burning, use of sheep grazing and planting genetically improved stock.

- **Noxious weed and invasive plant management:** Cultural and biological control methods include grass seeding of disturbed areas, livestock grazing and release of parasitic insect species.

- **Industrial vegetation management:** Physical techniques include landscape fabrics and use of asphalt and other paving materials. Cultural and biological control methods include seeding areas with grass and retention or planting of low-growing shrubs.

If no alternatives to pesticides are identified, the reasons should be discussed, particularly if standard industry practices are not used. If cost is a major reason, provide details to support this claim.

2.3.5.2 Selection of Pesticides

Descriptions of treatment methods should include the product names and application methods for each proposed pesticide. The pesticides and application methods should be consistent with environmental protection strategies described in the plan.

The identifying information for each pesticide should include its trade name, active ingredient and PCP number as registered under the federal *Pest Control Products Act*. The registration number is a unique identifier for each product which allows retrieving the most current label information through the Pesticide Label Search on the Health Canada website. This number is also useful for seeking technical

information from the manufacturer and/or Health Canada through the National Pesticides Call-line and Pest Management Information Service.

Rationale for selecting pesticides should consider the following:

- Is there a registered reduced-risk pesticide that could be used in place of a conventional one?
- Is there a registered bioherbicide with a plant pathogen active ingredient, which could be used in place of a conventional one?
- What is the best product formulation (lowest risk, most effective) for a proposed active ingredient?
- Does the label of a proposed pesticide allow treatment of all the target plants and the proposed treatment method?
- Are the environmental characteristics of the proposed pesticide, such as leachability, time it takes to break down and toxicity to terrestrial and aquatic organisms, suitable for the area for where it is to be used?

2.3.5.3 Description of Treatment Methods

The description of application methods must specify ground or aerial treatment, include techniques that may be used, and relate these to the pesticides identified.

The following are considerations that should be discussed in the rationale selection:

- ability of the specific treatment method to achieve the pest management objectives (e.g., maintaining safety standards to staff and the public on rail lines);
- expected efficacy of the method (e.g., whether it will meet operational requirements and objectives, or whether expected results will be long or short-term control);
- cost-effectiveness;
- importance of combining pesticide and non-pesticide methods to increase effectiveness or reduce impacts;
- benefits/limitations regarding the protection of environmental features such as bodies of water, riparian areas, species at risk, or wildlife forage and habitat (e.g., benefits of girdling trees include feasibility of application on steep terrain and minimal impact on non-target vegetation that may be forage for wildlife. The limitations of girdling include labour intensiveness, difficulty to carry out in dense brush and safety hazard from the dead trees that remain standing);
- protection of sources of drinking water for humans or livestock;
- urgency of the required treatment based on monitoring results and observed or potential pest impact, and the consequences of not taking any action;

- how the species or types of pest limits treatment options (e.g., stem density and height of problem vegetation can limit the application equipment used for herbicide treatments);
- location of and accessibility to the pest (e.g., terrain, slope, remote areas); and
- potential impact of the treatment method on adjacent property owners.

To minimize release of pesticide to the environment and risk of environmental impact you may consider more specific questions such as:

- What is the lowest possible application rate that achieves efficacy objectives?
- Can target-specific treatments be used rather than broadcast foliar applications? (e.g., what is the potential to use infrared "weed seeking" vegetation detection and treatment equipment for railway ballast weed control, cut stump vs. broadcast, etc.)
- What is the availability of equipment that reduce the potential for drift for foliar applications?
- What would be optimal parameters such as nozzle sizes, pressure, spray pattern and droplet size to reduce drift?
- For large scale programs, how can GPS and GIS technologies during application be used to confirm the location of areas to be treated and environmental features to be protected?
- What is the optimal treatment timing to maximize effectiveness and minimize impact on non-target organisms such as biological control insects?

Often there are areas with different management objectives and characteristics to be dealt with. In such cases it will be necessary to discuss the rationale for selection of treatment methods for each area. These may be the same management areas or operating zones for which the different injury thresholds were discussed. Multiple pests covered in a plan may each require a separate section discussing treatment method selection.

2.3.5.4 Decision on Treatment Methods

The method of application is selected based on factors such as the target pest, the site of application, the specific pesticide to be used, as well as the cost and efficiency of alternative methods. Clearly describe how the proposed techniques will be used and what criteria will determine the operational selection.

If several treatment methods are to be used (e.g., non-pesticide, pesticide or several pesticides), describe the decision process for deciding when or where they will be used. The decision process can be described in a flow chart or similar diagram that incorporates the monitoring steps, treatment thresholds and environmental parameters.

An example of a decision process:

Immediately before treatment, the target plant distribution will be surveyed; plants greater than 10 m away from bodies of water will be treated with xx herbicide using back-pack sprayers; plants between 10 to 5 m from bodies of water will be selectively treated with glyphosate using stem injection; plants closer than 5 m to bodies of water will be treated by manual girdling.

Information about the risk of pesticides can be obtained from the Pesticide Management Regulation Agency Reduced Risk Initiative. This initiative uses an expedited registration process to encourage the use of reduced-risk products. These pesticides may be chemical or biological. A reduced risk categorization may be based on properties inherent with the product or comparisons with commonly used alternatives in the marketplace.

Other helpful information regarding assessing risk of pesticides can be obtained on the US Environmental Protection Agency Pesticide Science and Assessing Pesticide Risks website.

2.3.6 Post-Treatment Monitoring

The post-treatment monitoring program is expected to assess effectiveness of the treatment on the pests and to check environmental impact. The evaluation should provide information for improving treatments to be as selective, low impact and effective as possible. Evaluations should be used to guide future decision making on similar pest problems and to provide recommendations for continual improvement of the integrated pest management program.

Post-treatment monitoring takes two general forms:

1. Comparison with pre-treatment monitoring data to assess efficacy (see section 2.3.3 on pre-treatment monitoring program). This comparison should help identify any treatment-related issues and changes necessary in the integrated pest management program such as threshold establishment, treatment method, pesticide selection and application timing.
2. Monitoring to assess environmental protection strategies employed. Examples of this type of monitoring could be an assessment of buffer size to protect Pesticide Free Zones, and pesticide selection to assess mobility off site.

2.3.6.1 Monitoring Methods

This section of the plan should clearly describe the evaluation methods such as random plots, line transects and spray drift cards. For some programs, these methods may include initial aerial overview surveys that can identify visible issues and identify sites for secondary ground monitoring efforts. The efficacy evaluation must include post-treatment observations that can be directly compared with pre-treatment observations used to determine treatment necessity.

Environmental protection evaluation methods may vary among sites with different management objectives or treatment prescriptions. For example, water quality monitoring may be employed where there are repeated treatments with a residual herbicide next to fish bearing water. An example of an environmental protection strategy assessment would be a project to evaluate buffer decisions in protecting non-treatment areas. This type of evaluation activity differs from the treatment efficacy assessment in that the goal is to ensure protection strategies are adequate to prevent offsite movement and unreasonable adverse effects, as opposed to assessing the success of reducing pest numbers below the threshold.

2.3.6.2 Frequency of Monitoring

This section should describe the timing for observations and sampling, and if needed, how many, how often and why the selected schedule is appropriate. The frequency of monitoring will depend on factors such as site permanence and the nature of sensitive environmental features that may be present. The evaluation process should ideally include observations and recommendations by applicators at the time of treatment. For example, for evaluation of herbicide treatment effectiveness, monitoring should include the time when herbicide damage to target and non-target plants can be most easily observed. Sufficient observations at different sites should be made, and samples obtained, to ensure an accurate assessment of all treated areas.

2.3.6.3 Monitoring Data

Both the quantitative and qualitative data are expected to be collected to evaluate treatment effectiveness and impacts (e.g., the efficacy data is collected to evaluate whether free-growing requirements for forestry crop trees has been achieved, or whether safety standards have been achieved or sight lines restored). Examples of environmental data could include water quality samples to evaluate risks to aquatic organisms, or vegetation samples to assess impacts on traditional plants harvested by Indigenous Peoples.

Post-treatment observations for each treatment area may include:

- a review of whether all targets were treated;
- information about whether the application was appropriate in the circumstances (i.e., rate, method, pesticide selection, buffers, etc.); and
- information about whether the targeted pest was affected by the control chosen and if the level of control was acceptable (i.e., whether treatment objectives were met).

Post-treatment observations should be completed when the treatments have had time to noticeably affect targets. The optimal timing will depend on the species treated, the pesticide used, the season, and industry sector.

To evaluate environmental impacts, start monitoring as soon as possible following treatment to ensure serious issues are identified and addressed prior to further treatments. The ministry understands there may be some delay to capitalize on treatment efficiencies with future inspection schedules, however, certain aspects of assessing environmental protection strategies may require site visits before target impacts are clear (i.e., water quality monitoring to assess buffers chosen). It may be useful to have applicators record some information immediately after treatment (i.e., if some target plants were not treated and why, problems with the application equipment, observed drift outside of the treatment zones, etc.) that could help assess any reduced efficacy or any environmental impacts that may be discovered later.

Generally, the effectiveness data should be quantitative, such as number, cover, height or presence/absence of pests per unit area. Examples of data collection methods include:

- counting/estimating cover of pest plants before and after treatment in the same sites used for monitoring or in a representative sample of treatment locations for comparison with pre-treatment data; and
- taking photographs of sample sites before and after treatment for comparison, including written interpretation of the photos.

Sample areas should be selected where there are sensitive features to be protected or efficacy concerns are suspected based on feedback, history or land use. A representative sample of treatment locations should be sufficient to adequately assess efficacy and potential impacts of proposed use.

The types of data for monitoring environmental impacts could include visual impacts on non-target organisms or their habitat or forage next to target areas. Data to evaluate these effects should consider organisms which will be looked at and the nature of the observations. Habitat assessments will require knowledge of the organisms that need protection; it is expected that personnel retained for these assessments will be qualified in wildlife or aquatic biology.

Examples of evaluations include:

- pesticide impact in pesticide-free zones adjacent to water bodies;
- impacts on any selected non-target species that are to be protected in the treatment area (e.g., selected wildlife browse species or plants collected for human use). Such observations may be made using drift cards during pesticide application and/or examination of foliage for effects; and
- evaluating the adequacy of buffer zones used around wildlife features to be protected.

This data collection will be part of strategies to protect fish and wildlife, riparian areas and wildlife habitat from adverse effects of pesticide use (see section 2.10). Permit holders conducting evaluations

should develop a system to document observations, such as evaluation record forms, and ensure staff are trained to record the required information. These forms can be included in the plan. An example of a form used for recording is provided in Figure 3.

FIGURE 3. EXAMPLE OF A TREATMENT EVALUATION FORM

Date of Treatment: _____ **Date of Post Treatment Evaluation** _____

Target Plants Treated (species or complexes): _____

Treatment Location (attach map or diagram if needed) _____

Total Area treated: _____

Non-Chemical Treatments Used: **YES** ☐ **NO** ☐

Treatment Method: _____

Pesticide Applied: **YES** ☐ **NO** ☐

Product Name	**Active Ingredient**	**PCP Number**	**Application Rate (L/ha)**
_____	_____	_____	_____

Application Method and Type of Application Equipment: _____

EVALUATION

Evaluation Site Location and Features (e.g., slope, aspect, soil type): _____

Applicator Observations at Time of Treatment: (e.g., equipment problems, uniformity of treatment, drift): __

Post-treatment Data on Abundance of Pest Plants: (e.g., counts or estimates per unit area): _____

Pest Control Results: (e.g., reduction in % cover/density of unwanted plants compared to pre-treatment conditions): _____

Conclusions on Success of Treatment: _____

Recommendations to Improve Effectiveness: _____

Features/biota Examined for Non-target Impacts: _____

Environmental Impacts Observed: _____

Recommendations for Environmental Protection: _____

2.4 Procedures for Safely Transporting Pesticides

It's important to develop and use safe transport procedures that provide an acceptable degree of protection for people and the environment. IPMR section 33(2) specifies that applicants transporting, or authorizing transport, of pesticides must ensure it is done in a manner that prevents pesticide escape, discharge, unauthorized removal from the vehicle, and contamination of items for animal or human use. Section 65(1) of IPMR outlines specific requirements on how pesticides must be stored and labeled, and details on how the applicant plans to meet these requirements are expected to be included in the treatment plan.

Information on pesticide transportation may be obtained from pesticide product labels, pesticide Safety Data Sheets, the Pesticide Applicator's Handbook, material from WorkSafeBC and other publications on pesticide safety procedures. It is expected that you review this material prior to developing transportation procedures and ensure those involved have access to the information. You should also be aware of the *Transport of Dangerous Goods Act* and Regulation to understand in which situations pesticides are considered dangerous goods, and subject to additional requirements for transportation.

Safe transport procedures that should be reflected in a plan include:

- minimum standards for containers used in transport (e.g., no leaking or damaged containers) and how they will be transported (e.g., upright and secured);
- conditions for dry formulations and pesticides in paper or cardboard boxes to be protected from moisture and rain during transport;
- a description of how IPMR 33(2) will be met; and
- a description of the personal protective equipment and spill clean-up kit contents adequate for the products and volume transported that will be carried in the transport vehicle (see section 2.8 – Procedures for Responding to Pesticide Spills).

A checklist for safe transport of pesticides may be necessary to confirm that staff or contractors are following the procedures. This checklist may be included in the plan. Vehicles used to hold pesticides overnight are considered mobile storage facilities and are also subject to storage regulations (see section 2.5 – Procedures for Safe Storage of Pesticides). Pesticides unsecured in a facility, trailer or vehicle are considered resting in storage and should meet the requirements of any storage facility.

2.5 Procedures for Safe Storage of Pesticides

To ensure pesticide storage provides an acceptable degree of protection for people and the environment, the IPMR sets certain requirements for all users. For example, IPMR sections 33, 65 and 66 describe how pesticides must be transported, stored and labeled. Details on how you will meet these requirements should be included in the treatment plan.

Consider the following:

- How will pesticide storage areas be separated from habitation, food, utensils, lunchrooms, washrooms, cleanup facilities, offices, maintenance shops, personal protective equipment, gasoline or propane storage, animal feed or seed?
- How will the pesticides be stored to prevent surface runoff contamination if water is used to fight a fire at the storage facility?
- What are the procedures for inspecting for leakage, corrosion, breaks, tears or other damage to pesticide containers, and how will the issue be remedied?
- How will stored pesticides be protected from extreme hot or cold temperatures?
- Will the applicant maintain access to up-to-date Safety Data Sheets for each pesticide being stored?
- How will an accurate and up-to-date inventory be kept for all pesticides in storage?
- What are the procedures for safely storing pesticides at field sites (e.g., ensuring spray tanks are empty at the end of the day)?

To ensure the procedures are followed it may be necessary to prepare and include in the plan a checklist of the procedures for safe storage of pesticides to be used by staff or contractors.

It should be noted that although some applicants will not store any pesticide and will contract this service to a licensee, the minimum conditions that permit holders will require of licensees should be included in the plan.

Additional Sources of Information

Further information on storing pesticides may be obtained from references 1, 15, and 20 in Appendix 1.

2.6 Procedures for Safely Mixing and Loading

IPMR S.70 requires applicants to avoid contaminating water when using containers or equipment for the purposes of pesticide loading, mixing, or applying. Outline relevant safe procedures that provide an acceptable degree of protection for people and the environment, and should consider the following:

- Directions for employees to review pesticide labels and Safety Data Sheets to determine the required protective clothing and other safety precautions and how this information will be made available.
- Emergency facilities, including washing facilities, first aid equipment and phone numbers that will be available at the mixing or loading sites.
- Conditions that will be required for mixing pesticides (e.g., mixed in good light, with adequate ventilation, and preferably outdoors under low wind conditions and upwind to minimize airborne exposure).
- Directions to mixers on safety considerations when pouring pesticides (e.g., below eye level, use of a closed mixing/ loading system).
- The minimum distance mixing sites will be located from bodies of water to reduce risk of contamination.

Mixing pesticides may be an especially dangerous activity because the product is concentrated. Therefore, discuss additional procedures for safe pesticide application in other sections of the plan, e.g., under the following headings:

a) protecting watersheds and other domestic and agricultural water sources (see corresponding section 2.9);

b) protecting fish and wildlife, riparian area and wildlife habitat (section 2.10); and

c) preventing contaminating food with pesticide (section 2.11).

2.7 Safe Disposal of Empty Pesticide Containers & Unused Pesticides

Legal requirements in BC for the rinsing and disposal of pesticide containers and disposal of waste produced by cleaning of pesticide application equipment are specified in the Hazardous Waste Regulation of the *Environmental Management Act* (EMA). Familiarity with the Hazardous Waste Regulation is important to ensure pesticide containers and unused pesticides are effectively managed and detailed in a treatment plan. The Hazardous Waste Regulation also describes pesticide containers and unused pesticides which are not considered hazardous waste.

The Hazardous Waste Regulation describes mandatory rinsing of empty pesticide containers that are not labelled 'domestic' by the manufacturer before disposal. Instructions for triple rinsing rigid containers and single rinsing paper or plastic bags are discussed, as well as mandatory rinsing directions including minimum volumes of appropriate solvent to use.

Waste produced by cleaning pesticide application equipment or from rinsing pesticide containers is to be disposed of, if practicable, by adding it to the pesticide spray mix; or if this is not practicable, by applying the waste to land provided:

1) it is in the area to which the product contained in the waste has been applied for purposes of pest control;

2) it is flat ground, not a swale, and at least 200 m from surface water or any well; and

3) it does not consist of gravel, sand or other similarly porous material.

Examples of procedures that may be incorporated into a plan include the following:

- Rinsed containers are to be disposed of by taking them to an approved return collection facility if available (contact the pesticide dealer or Croplife Canada (www.croplife.ca) or if no return collection program is available, by taking them to an approved landfill.
- Puncture or break non-recyclable containers so they cannot be reused.
- Unwanted or obsolete pesticide product is to be disposed of through a waste disposal company approved for disposal of pesticides.

Prior to developing this section, you should also review each pesticide label which may have disposal directions.

2.8 Procedures for Responding to Pesticide Spills

To minimize risk to the environment, the plan should have an outline of procedures for responding to a pesticide spill. These procedures must reflect the applicable regulatory requirements. Under certain conditions, pesticide spills must be reported as identified in the Spill Reporting Regulation under the *Environmental Management Act*. This regulation outlines when pesticide spills are reportable and what notifications must be performed.

Information on responding to pesticide spills and preparing spill response plans can be obtained by accessing the Environmental Emergency Program website. The spill response plan should, at a minimum, describe the following:

- procedures to stop the source of the spill, how spilled material is to be prevented from spreading (i.e., by creating a dam or ridge), and how the liquid will be absorbed (if applicable);
- how the absorbent material and contaminated soil is to be collected and how it is to be disposed of (i.e., by an approved waste management company);
- how employees and contractors will protect themselves when responding to a pesticide spill;
- when and how spills will be reported;
- where a copy of the spill response plan will be located (i.e., at each work site); and
- spill kit equipment available at mixing, loading and application sites and in transport vehicles.

Contents of spill kits should be adequate to manage a spill and should account for the volume and nature of pesticide kept by the applicant, and should at least include:

- personal protective equipment to be worn by responding staff, as recommended on the pesticide labels;
- absorbent material (type and volume to ensure a sufficient amount is present);
- neutralizing material such as lime or washing soda; and
- waste collection equipment and a sealed waste-receiving container.

2.9 Strategies for Protecting Domestic and Agricultural Water Sources

The treatment plan is expected to include strategies to protect community watersheds and other domestic and agricultural water sources from adverse effects of the proposed pesticide use. In carrying out a pesticide use, precautions should be taken to ensure that domestic water sources, agricultural water sources and soil used for agricultural crop production are protected for their intended use. The requirements in Section 71(3) of IPMR are expected to be met unless a specific rationale is provided, i.e., at least a 30m no-treatment zone around a water supply intake or well used for domestic or agricultural purposes and strategies on how these operational requirements will be met.

The BC Drinking Water Protection Act and Regulation include prohibitions against contaminating drinking water. A person must not "introduce anything or cause to allow anything to be introduced into a domestic water system, a drinking water source, a well recharge zone or an area adjacent to a drinking water source." It is important to be familiar with the requirements relevant to treatment options.

Water sources to be protected should be described in the treatment plan. It is recommended that community watershed maps be obtained to determine if proposed treatments are within a community watershed and, if so, to determine the location of water intakes. Community watersheds are defined in the *Water Act,* and information on specific watersheds can be found on the Community Watersheds website.

Also, the Groundwater Wells and Aquifers webpage should be consulted to ensure the applicant is aware of risks of groundwater contamination in the area of the proposed pesticide use. Note that this database may not be complete for certain areas, and further effort may be required to identify wells that could be affected. For instance, property owners and local water purveyors could be consulted to locate wells and water intakes. Additionally, requests for information on location of wells and water intakes in a specified area can be advertised in conjunction with the permit consultation. Where treatments are proposed near domestic water sources it is important for applicants to consult with the regional health authorities about proposed protection strategies. More information can be found on the Drinking Water Quality website.

When developing strategies for protecting domestic and agricultural water sources you should ask the following questions:

- How will pesticides be stored (timelines and standards) within a community watershed including restrictions on preventing unnecessary storage prior to their use and when they will be removed from the watershed following application?
- How will licenced water intakes within a community watershed be protected?
- How will the no-treatment zone be established and maintained?
- Which treatment methods and pesticides will be used in the vicinity of intakes or wells? For example, only use selective treatment methods, pesticides that have minimal leaching and runoff potential, or use pesticides on soils that are not porous, or water saturated.

- How will protective measures be assessed? Will monitoring be conducted to ensure applicants are not introducing pesticide into a water supply that is to be protected?
- What measures will be undertaken if pesticide residues or pesticide breakdown products are detected at a community watershed water intake (i.e., discontinue pesticide use, communication plan, incidence response plan)?

2.10 Strategies to Protect Fish and Wildlife, Riparian Areas and Wildlife Habitat

This section of the treatment plan should describe:

- wildlife species and/or habitats that require protection and steps that have been taken to determine them;
- steps taken to identify and map bodies of water and riparian areas; and,
- strategies to protect identified fish and wildlife, riparian areas and wildlife habitat from adverse effects of pesticide use.

In addition, IPMR S.71(2)(c) requires avoiding the application of pesticides over visible wildlife and domestic animals, while Section 71(10) requires applying herbicide in such a manner as not to cause erosion of a stream bank or debris from entering a stream. The plan should be consistent with these and other regional, provincial and federal requirements and provide assurance that there will be no unreasonable effect on the environment. Proposed activities should complement and be relevant to higher level plans and land use strategies and objectives, which can be referenced in the treatment plan.

Consider obtaining the services of professionals with experience and training in wildlife and habitat biology to conduct the assessments and provide recommendations for the strategies to avoid unreasonable adverse effects. In some cases, environmental protection strategies are based on company procedures and/or practices agreed to by government agencies – these can be referenced in the plan; an example is the intergovernmental Approved Work Practices for Managing Riparian Vegetation.

Some examples of habitat protection strategies include:

- A pesticide-free zone (in metres) should be established and maintained around all wildlife trees showing active use (i.e., nesting birds, active feeding).
- Preferred foraging areas of bears are to be avoided or manually treated when there are signs of active bears.
- Avoiding direct pesticide application on ungulate winter forage when conducting ground-based spot treatments, unless it is in direct competition with crop trees (specify the radius) or posing a

safety concern as determined in the plan. Key species to avoid include *Ceanothus spp*., Douglas maple, red osier dogwood, Saskatoon, mountain ash, *Rosa spp*., *Salix spp*., and *Vaccinium spp*.

Consider establishing schedules or operating zones where habitats of varying importance are assigned different injury thresholds that could balance operational objectives and the risk to wildlife. See Section 2.6 for more information about injury thresholds.

The BC Plants, Animals & Ecosystems website is a resource with information about mapped wildlife habitat data, species and ecosystems at risk, as well as conservation and wildlife management strategies. The management strategies specify forest and range practices and include restrictions on pesticide use and silviculture activities for protection of specific plants and animals.

Be familiar with other relevant legislation such as the federal *Species at Risk Act*, the *Migratory Birds Convention Act,* the *Fisheries Act* and the *BC Wildlife Act*.

Further information may be obtained from references in Appendix 2 which lists applicable federal and provincial legislation, sources for best management practices, guidelines, and other resources available to aid in fish and wildlife assessment.

2.11 Strategies to Prevent Pesticide Contamination of Food Intended for Human Consumption

The treatment plans are expected to describe strategies to prevent pesticide contamination of food intended for human consumption.

Foods may include commercial agricultural crops of vegetables, berries or fruit and may also include domestic vegetable gardens and fruit trees, bee keeping areas, forage crops, beef and milk production and areas where wild berries or medicinal plants may be collected. Pre-treatment inspections of the proposed treatment areas and consultation with Indigenous groups and the general public will help identify those areas.

For the purpose of this section, strategies should consider the following:

- How are areas of food growing and gathering identified?
- What mapping efforts will occur and how will areas be flagged in the field prior to pesticide use?
- What inspections did/will occur prior to pesticide use to locate sites within or adjacent to the treatment area that are used for growing/gathering food?
- What no-treatment zones will be maintained adjacent to food growing/gathering sites during pesticide application? The distance for each treatment method and site conditions should be specified.
- What drift reduction methods will be employed?
- How will pesticide treatments be timed to minimize impacts on food plants (e.g., before the food plant is picked or after the picking season has finished)?
- How will information be posted or provided to inform the public about the treatment near food crops or in food gathering areas? What precautions should be taken (e.g., signs for not picking food plants or following the days-to harvest label requirement if pesticide is registered for use on food)?
- How will applicants protect milk and beef production from cattle foraging on or adjacent to treatment sites?

2.12 Pre-Treatment Inspection Procedures for Identifying Treatment Area Boundaries

The pre-treatment inspection of a treatment area is expected to be described in the plan to confirm that the boundary and site characteristics are identified. This will ensure that pesticides are only applied where required based on established injury thresholds and proposed treatment methods. It is important to demonstrate that pesticide treatment boundaries are assessed, confirmed and communicated. Inspections should ensure that proposed activities will only treat pests exceeding established thresholds and necessary adjustments are made regarding achieving operational objectives while affording adequate environmental and human protection. This also provides an excellent opportunity to identify and layout Pesticide Free Zones and features requiring protection.

The inspection description should include:

a) Details on the timing of the inspection. The inspection of treatment boundaries may occur immediately before treatment or following initial inspections of the management area to identify the boundary of features to be protected. The timing of pre-treatment inspection should be as close as possible to the treatment date, so that there will be minimal change in targeted population or features to be protected before treatment.

b) Features to be identified and assessed to protect human health and the environment, such as the location of wells, property boundaries, bodies of water, wetlands and areas set aside for wildlife and adjacent properties.

   For this part, you should consider relevant IPMR sections, such as S.71(6) requiring a no-treatment zone to adjacent properties and S. 77(3) requiring *reasonable efforts to:*

   (i) identify sites where biological weed control organisms have been released, and

   (ii) prevent harm to those organisms.

c) The procedures to be followed. The description should indicate the minimum knowledge or qualification standards to determine the treatment boundaries if there are requirements to identify critical wildlife protection issues.

After pre-treatment inspections, identify whether changes to the treatment area are to be made and how this information will be recorded.

It will be important to describe whether results from the inspection may involve adjusting the treatment boundary (including the width of no-treatment zones) to protect features, updates of operational maps relating to such adjustments, and how applicators will be informed of the boundaries. Identification of how applicators will be informed of the results is especially important where third parties are retained to perform applications who have not been involved in the development of the plan and inspection of the treatment site.

Different industry sectors may have varying systems in which pre-treatment inspections are scheduled, such as:

- for many noxious weed management programs, potential treatment sites are based on conducting annual inspections in established management areas and responding to calls within a “seek and destroy” system. Specific treatment area boundaries and features to be protected can be identified immediately prior to treatment; and
- industrial vegetation management programs on facility sites or rights-of-way may begin with an initial inspection to identify features that must be protected, and may be consistent over the duration of the plan. The boundary of some pesticide-free zones could be permanently marked (such as with stakes or posts). Treatment area boundaries for each year’s operations may be determined by inspections of target vegetation, just prior to treatment.

2.13 Procedures for Maintaining & Calibrating Pesticide Application Equipment

Describing maintenance and calibration procedures in the treatment plan is expected to confirm that risk of harm to applicators and the environment from faulty equipment is minimized and to ensure application rates are consistent with label directions. Information in the plan should reflect how IPMR sections such as 35(3) and 71(1)(b) prescribing maintenance, calibration and record keeping requirements will be achieved.

The description of procedures should include:

- types of equipment (backpack sprayer, quad-mounted boom, etc.) to be used, and if they maintain such equipment, with the general maintenance and calibration requirements;
- a schedule for each one and records to be kept; and
- if contractors are employed, the applicants should indicate how they will ensure that contractors are using equipment and applying pesticides properly.

Maintenance and calibration considerations

Consider the following questions for the maintenance and calibration section of the treatment plan:

- When are hoses, valves, pumps and connections to be checked (i.e., at the beginning of each season, at weekly intervals during the spray season)?
- When will sprayers be calibrated (i.e., for new equipment, when nozzles or pumps are changed, when changing application rates and otherwise after xx hours of use)?

- When will spray droplet size and the spray pattern be assessed?
- What records will be maintained on the maintenance and calibration performed on each applicator unit?

2.14 Monitoring Weather Conditions

The treatment plan must outline how weather conditions will be monitored and strategies for modifying pesticide application methods for different weather conditions. Weather conditions at the time of, or immediately before, treatment need to be measured and recorded to minimize off target spray drift or runoff, to meet pesticide label requirements and, if necessary, to evaluate treatment effectiveness or impacts that may be related to weather. Minimizing off-target pesticide movement can be critical to protect people, water intakes and wells, bodies of water and riparian areas and to avoid reduced efficiency of the pesticide.

Modifying pesticide application methods may be necessary when weather conditions are expected to result in off-target movement of pesticide or reduce its effectiveness. Modifications could include stopping a treatment, increasing the size of no-treatment zones, directing sprays away from treatment boundaries, changing from broadcast sprays to selective treatment or using shrouds over nozzles.

Note that the IPMR has several weather-related requirements that are expected to be met by permit holders, including the following:

- Section 37(1)(e) requires keeping records of temperature, precipitation and wind measurements for each treatment location and day of use;
- Section 71(7) specifies that a person must not engage in broadcast spraying or foliar spraying outdoors if the wind speed exceeds 8 km an hour (except on railways);
- Section 71(9)(a) specifies that a person must not use a residual pesticide on water saturated soil, during heavy rainfall or if heavy rainfall is imminent; and
- Section 71(9)(b) specifies that a person must not spray a pesticide on foliage covered by ice or frost or if water is flowing on the foliage.

The plan, therefore, should include the weather-related monitoring program describing:

a) Weather parameters that will be measured. Parameters that can be critical for pesticide application include wind, precipitation, temperature and humidity;

b) Time and duration of measurements;
c) Measuring equipment to be used. Use of portable instruments including an anemometer to measure wind and a thermometer to measure temperature is expected. When necessary, given the label directions or site conditions, use a sling psychrometer to measure relative humidity;

d) Location of the measuring equipment. Measurement of weather conditions should occur at or near the treatment site, ideally at the point of pesticide release from application equipment. Use of data from distant monitoring stations is not adequate; and

e) How application methods will be modified in response to weather changes.

Applicators must be trained to measure and record the parameters. To monitor and measure weather conditions, it is expected that applicators:

- measure before treatment begins at each treatment site;
- re-measure during the day if changes in weather occur; and
- note the presence or absence of precipitation and its relative intensity in qualitative terms (e.g., heavy rain, light drizzle, etc.).

Design and conduct weather monitoring activities to ensure the preservation of Pesticide Free Zones. Excellent sources of information are the Drift Mitigation webpage of Health Canada and the British Columbia Field Sampling Manual for selecting air monitoring sites.

APPENDIX 1: Information Resources and References

1. *Canadian Pesticide Education Program Applicator Core Manual*. British Columbia Edition. 2011. BC Ministry of Environment. A copy can be obtained at https://www.crownpub.bc.ca/Product/Listing/13533_PESTICIDES?WT.ac=hpsl_Pesticides#/?statesave=true

2. Supplementary Information for Industrial Vegetation and Noxious Weed Control Pesticide Applicator Certification. 2011. BC Ministry of Environment. A copy can be obtained at: http://www.env.gov.bc.ca/epd/ipmp/pest_certification/study_materials.htm https://www.crownpub.bc.ca/Product/Listing/13533_PESTICIDES?WT.ac=hpsl_Pesticides#/?statesave=true

3. *Seven Steps to Managing Your Weeds: A Manual for Integrated Weed Management in British Columbia*. BC Ministry of Agriculture, Food and Fisheries. https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/guidance-resources/7stepstomanagingyourweeds.pdf

4. *Guide to Weeds in British Columbia*. BC Ministry of Agriculture, Food and Fisheries https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/guidance-resources/guidetoweeds.pdf

5. *Field Guide to Noxious and other Selected Weeds of BC*. 2019. Invasive Species Council and Inter-Ministry Invasive Species Working Group. https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/publications/field_guide_to_noxious_weeds_10th_edition_32619.pdf

6. BC Ministry of Agriculture, Food and Fisheries. Weed Management Website. https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops/plant-health/weeds

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8. Stocking and Free Growing Surveys Procedure Manual – Forest Practices Branch. 2002. http://www.for.gov.bc.ca/hfp/publications/00099/Surveys/Silviculture%20Survey%20Proc

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APPENDIX 2:
Sources of Information for Developing Strategies for Protecting Fish and Wildlife, Riparian Areas and Wildlife Habitat

Federal Legislation and Agencies

Current federal legislation can be accessed through the Justice Laws website of the Department of Justice Canada. https://laws-lois.justice.gc.ca/eng/

Fisheries Act establishes criteria for the protection of fisheries and fish habitat from pesticides.

Food and Drugs Act describes restrictions on pesticide use on livestock forage, and where livestock will be consumed by humans.

Migratory Birds Convention Act describes the requirements to protect migratory birds from pesticides.

***Pest Control Products Act* and Regulations** regulates the registration, labeling and handling of pest control products that are sold and used in Canada.

Pest Management Regulatory Agency (PMRA) is a division of Health Canada, responsible for the regulation of pest control products in Canada, development of pest management guidelines and compliance under the ***Pest Control Products Act*** (PCPA). The PMRA has an electronic label search available through the following web site: http://www.hc-sc.gc.ca/cps-spc/pest/registrant-titulaire/tools-outils/label-etiq-eng.php

Species at Risk Act protects endangered or threatened wildlife species from activities including pesticide use. Its purpose is to prevent wildlife species from being extirpated or becoming extinct, to support the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened. https://laws.justice.gc.ca/eng/acts/S-15.3/

Provincial Legislation

BC Riparian Areas Protection Act – protects fish and fish habitat by limiting licences in water short regions and providing directives for residential, commercial and industrial development. https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/00_97021_01

BC Wildlife Act establishes criteria for the protection of wildlife and wildlife habitat, regulates hunting, and declares and protects endangered species. https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96488_01

Resources on Biodiversity and Ecosystems

Important Bird Areas (IBA) identified under the Canada's Important Bird and Biodiversity Areas Program provide information and maps of important bird habitat. http://www.ibacanada.ca/

Plants, Animals & Ecosystems, BC Ministry of Environment and Climate Change Strategy. The website is a gateway to detailed information on ecosystems and biodiversity, fish, plants and wildlife, species and ecosystems at risk, invasive and alien species, conservation data and conservation strategies. https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems

BCME, Species and Ecosystems Explorer is a valuable provincial search mechanism that identifies known locations of species, ecological communities, Red and Blue listed species and ecological communities by Forest District and Biogeoclimatic unit. Results identify species and ecological community status, legal designation, distribution, life histories, conservation needs, recovery plans and provide direct links to relevant publications. http://a100.gov.bc.ca/pub/eswp/

EcoCat Ecological Reports Catalogue provides access to reports on ecological activities in British Columbia, plus related files such as maps, data sets and published inventories when available. Subject areas include aquatic species and habitats, terrestrial species and habitats, floodplain mapping, reservoirs, ground water and vegetation. https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/libraries-publication-catalogues/ecocat

Riparian Areas Protection Regulation (RAPR) website provides links to protecting riparian fish habitat, while facilitating urban development that exhibits high standards of environmental stewardship for ensuring healthy fish populations. https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/fish/aquatic-habitat-management/riparian-areas-regulation

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Species and Habitat Management Recommendations, Washington State Department of Fish and Wildlife; identifies needs for protection of fish and wildlife based on the best available science and provides guidelines for their incorporation in management decisions. https://wdfw.wa.gov/species-habitats/at-risk/phs/recommendations

Ducks Unlimited Canada describes wetland and wildlife conservation in BC. https://www.ducks.ca/places/british-columbia/

BC Geographic Data and Services. The website provides direct access to authoritative, geographic data through a wide variety of web applications and services.
https://www2.gov.bc.ca/gov/content/data/geographic-data-services

Approved Work Practices for Managing Riparian Vegetation. An intergovernmental guide for incorporating riparian environmental concerns into the protocol agreement for work in and around water.
https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/bctc_documents/work_practices_riparian.pdf

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