



REGIONAL DISTRICT OF NORTH OKANAGAN

**Duteau Creek Watershed
Assessment Response Plan**



April 2014

Prepared by the Regional District of North Okanagan



REGIONAL DISTRICT OF NORTH OKANAGAN

Duteau Creek Watershed Assessment Response Plan

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Executive Summary

The following Duteau Creek Watershed Assessment Response Plan (DCWARP) provides detailed and specific responses to each recommendation presented within the Duteau Creek Watershed Assessment (DCWA). As a condition on Permit to Operate, the DCWARP outlines the assessment recommendations, the work details since the completion of the assessment plan, and a forward look at further actions to be completed by GVW, other users (stakeholders) and regulators responsible for water source protection.

It is important to note that GVW is not a regulator in water source protection. GVW does not have authority related to land use practices on Crown land or land within municipal boundaries. GVW relies on Federal and Provincial Acts, Regulations, Stewardship Plans, best management practices and Local Government bylaws and policies to protect the water resource from the impacts of land use in the watershed.

Three main high risk activities that occur within the watershed include Forestry, Range and Recreation. These activities contribute to the majority of the associated risks and hazards that occur within the watershed. In an effort to minimize these, and other associated risks identified in the DCWA, GVW has established a stakeholder Technical Advisory Committee (TAC). The TAC group regularly meets to review progress of risk mitigation, and endeavours to identify roles and responsibilities within the watershed. This Plan identifies how GVW and other TAC members have responded to the risks, hazards and recommendations identified in the 2008 DCWA report.

Although a considerable amount of progress has been made by GVW and other TAC stakeholders to address DCWA recommendations, there is still a significant level of effort needed to continue the work. This plan identifies specific action items that will be undertaken by GVW and other responsible organizations. The estimated time and cost to GVW is provided along with background information to provide insight and rationale used for establishing response initiatives.

Table 1.0 below summarizes future action items proposed by GVW along with assigned responsibilities, timelines and the estimated commitment required by GVW.

Table 1 - Summary of DCWA Recommendations and GVW Responses

Section #	Recommendation	Action Items	Responsibility	Timeline*	Estimated GVW Cost and Staff Commitment
				(Immediate <3mth; short 3mth-1yr; Med 1-3 yr; long >3yr)	GVW Cost \$ (Man-days per Year)
1.1	<i>GVW Staff meet with MFLNRO and DWO to develop strategies to address (1) Source of Turbidity caused by cattle activity and (2) Source of Bacteria/protozoa/virus related to cattle activity.</i>	<p>1. Research and Studies: UBCO is currently studying E.coli and cryptosporidium in Community Watersheds. Funds provided by Electoral Area D – discretionary funds RDNO, MFLNRO and the District of Lake country are working with UBCO on a joint Bacterial Source Tracking (BST) project. Funding is approved and site selection work in the Duteau Watershed is complete. GVW will continue support efforts in this regard.</p> <p>2. Mapping and Plans: GVW will request access to range tenure area polygons for GIS. This will be helpful when assessing range use plans and proposed cattle movements within and adjacent to sensitive areas. It will make it simple to identify areas where cattle grazing areas are and the schedule for range polygon rotation. The initiative will assist GVW and other stakeholders to better understand range use and movement in the watershed.</p>	<p>1. UBCO, MFLNRO, RDNO</p> <p>2. GVW, MFLNRO; Ranch Tenures</p>	<p>1. Medium-term</p> <p>2. Short-term</p>	<p>1. (no cost or staff time to GVW)</p> <p>2. (1.5 days)</p>
1.2	<i>Access to sensitive areas along watercourses, lakes and wetlands be restricted as the forest cover changes (from forest development, salvage logging, pine beetle or other forest health issues) to protect the water quality.</i>	<p>1. GVW and MFLNRO continue to communicate on any identified problems.</p> <p>2. GVW will initiate a meeting with Rob Dinwoodie, Range Officer, and MFLNRO, to discuss further strategies.</p> <p>3. GVW will request obtaining GIS polygons from MFLNRO that identify range management and license areas. This digital mapping information can be overlaid onto existing digital mapping and used to assess existing and proposed cattle movements and range plans.</p> <p>4. GVW will investigate vulnerability mapping of high and medium sensitivity zones within the watersheds. GVW will work with MFLNRO to identify vulnerability zones for management areas to be reserved for protection of water resources. MFLNRO and GVW will establish buffer zones and riparian setback areas where range activities pose a risk to water quality and quantity.</p> <p>5. Investigate further opportunities and funding for range control infrastructure.</p>	<p>1. GVW and MFLNRO</p> <p>2. GVW and MFLNRO</p> <p>3. GVW and MFLNRO</p> <p>4. GVW and MFLNRO</p> <p>5. MFLNRO, GVW, Ranch Tenures</p>	<p>1. Long-term</p> <p>2. Short-term</p> <p>3. Short-term</p> <p>4. Medium-term</p> <p>5. Long-term</p>	<p>1. (6 days/year)</p> <p>2. (1 day)</p> <p>3. (1 day)</p> <p>4. (5 days)</p> <p>5. (3 days)</p>
1.3	<i>The Cattle Bridge in lower reach D, and adjacent trail to the channel be inspected to confirm they are no longer a risk to water quality.</i>	<p>1. No longer applicable</p>	N/A	N/A	N/A
1.4	<i>Results of field inspections to be reviewed and improvements implemented that will reduce impacts from cattle and channel disturbance and the deposition of manure in and about the streams.</i>	<p>1. See Item 1.2.2, restricting access to sensitive areas, and section 2.1.1, stream crossing assessments.</p>	N/A	N/A	N/A
1.5	<i>MFLNRO to provide copies of Range use Plans/Range Stewardship Plans to GVW annually.</i>	<p>1. GVW to inquire if any amendments have or will be made to the Range Stewardship Plans in the Duteau Creek watershed.</p> <p>2. GVW source protection staff to review all proposed Range Use and Range Stewardship plans and provide comment. Plans and GVW response to be recorded.</p>	<p>1. GVW, MFLNRO, Range Tenures</p> <p>2. GVW</p>	<p>1. Long term</p> <p>2. Long-term</p>	<p>1. (1 day/year)</p> <p>2. (2 days/year)</p>
1.6	<i>GVW, MFLNRO and grazing licensees make a formal application to the Environmental Farm Plan.</i>	<p>1. Program application considered by TAC committee, may not be suitable for a utility to apply. Program not applicable to Water Purveyor. Applications are currently closed.</p>	N/A	N/A	N/A
2.1	<i>Results of Stream Crossing assessments be reviewed and improvements implemented at moderate and high hazard sites. The priority area is the unbuffered section between Haddo and Headgates, Ditch lines include cross drains with ditch blocks, Ditch lines and culverts be kept clear of debris and vegetated with grasses</i>	<p>1. Tolko and MFLNRO provide a report on the number of stream crossings and their water quality hazard ratings annually. Sites that are rated as moderate or high should be provided in an Excel format. GVW will review changes.</p> <p>2. Tolko and MFLNRO provide inspection reports for permanent and temporary roads in the Duteau Community Watershed annually.</p> <p>3. See section 1.2.2.4 regarding proposed vulnerability mapping.</p>	<p>1. Tolko and MFLNRO</p> <p>2. Tolko and MFLNRO</p> <p>3. See 1.2.3.4 above</p>	<p>1. Long-term</p> <p>2. Long-term</p> <p>3. See 1.2.3.4 above</p>	<p>1. (1 day)</p> <p>2. (1 day)</p> <p>3. See 1.2.3.4 above</p>
2.2	<i>Roads not required for active use should have deactivation measures implemented.</i>	<p>1. GVW will request meeting with MFLNRO to discuss specific responsibility</p> <p>2. MFLNRO to provide update on the Natural Road Act Project.</p>	<p>1. MFLRO and GVW</p> <p>2. MFLRO</p>	<p>1. Short-term</p> <p>2. Medium-term</p>	<p>1. (1 day)</p> <p>2. no GVW staff time</p>
2.3	<i>Ministry of Forest and Range develop and implement a review process to confirm existing stream crossing structures on the Duteau Creek main stem, and major tributaries downstream of the areas affected by pine beetle are adequately sized to safely convey projected future peak flows.</i>	<p>1. MFLNRO to provide an annual report on new, reconstructed and replaced culverts and bridges within the Duteau Creek Watershed.</p>	<p>1. MFLNRO</p>	<p>1. Long-Term</p>	<p>1. (0.5 day per year)</p>
2.4	<i>Tolko Industries Ltd. consider including recognition of the Duteau Creek Watershed Assessment in its forest stewardship plan</i>	<p>1. The DCWA will not be formally recognised in the Forest Development Plan</p>	<p>1. Tolko</p>	<p>1. N/A</p>	<p>1. N/A</p>

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				(Immediate <3mth; short 3mth-1yr; Med 1-3 yr; long >3yr)	GVW Cost \$ (Man-days per Year)
2.5	<i>GVW and IHA should review the expansion of the pine beetle with Tolko. Review proposed salvage harvesting plans and options.</i>	<ol style="list-style-type: none"> 1. GVW will arrange meetings as required with IH, Tolko and MFRNRO to gain insight into the status of the pine beetle, salvage-harvesting, and Tolko's retention plan.. 2. Request further information from Tolko to understand how the MPB will affect water quality, current and projected ECA levels and other factors affecting watershed health. Include sub-basin ECA's including the sub-basins below reservoirs. 	<ol style="list-style-type: none"> 1. IH, Tolko, GVW, MFLNRO 2. Tolko 	<ol style="list-style-type: none"> 1. Short-term 2. Medium-term 	<ol style="list-style-type: none"> 1. (2 days) 2. (1 day)
3.1	<i>Stakeholders should follow approved practices for the disposal of human waste products in the watershed. Regulating agencies, to provide educational materials with guidance of disposing human waste.</i>	<ol style="list-style-type: none"> 1. MFLNRO is developing a pamphlet for distribution to public, staff and contractors working in the watershed. GVW will follow up on status. 2. GVW will assist with coordination of reservoir clean-up activities and support with a budget for landfill charges to those who are providing the effort. 	<ol style="list-style-type: none"> 1. MFLNRO and GVW 2. GVW and RDNO 	<ol style="list-style-type: none"> 1. Short- term 2. Medium-term 	<ol style="list-style-type: none"> 1. (1 day) 2. \$500/year (3 days/year)
3.2	<p>1) <i>Explore opportunities to reduce the recreation pressures on the reservoirs. If camping is permitted near reservoirs, should be restricted to designated locations that will limit the risk of contamination to reservoirs.</i></p> <p>2) <i>Provide other high quality recreation sites on other lakes in the watershed.</i></p> <p><i>MFRNRO and MOE Conservation Officers apply section 58 of the Forest and Range Practices Act.</i></p> <p>3) <i>Recreation use in the watershed and near the reservoirs should be consistent with the objectives in the LRMP</i></p> <p>4) <i>Post the reservoir perimeter areas as prohibited</i></p>	<ol style="list-style-type: none"> 1. GVW will work with MFLNRO regarding recreation use, identify high risk areas, and implement measures to redirect recreational users away from sensitive areas. 2. GVW will investigate "vulnerability mapping" of high and medium sensitivity zones within the watersheds. GVW and MFLNRO will propose buffer zones and riparian setback areas where recreation activities currently pose a risk to water quality and quantity. 3. GVW will investigate available options to manage and regulate high risk recreational activities occurring along the foreshore and other riparian buffer areas. GVW will contact MFLNRO or Front Counter BC to enquire about options to allow greater protection around foreshore and other sensitive areas (ssuch as a License of Occupation, Head Lease, Resource Management Zone, Sponsored Crown Grant, Park or other available options). 4. Where ad-hoc hazardous recreation is occurring near reservoirs and other sensitive areas, GVW will engage MFLNRO and request that these lands be protected by order under Section 58, subsection (1), safeguarded with a physical barrier and posted with a notice of the order under subsection (3). 5. Investigate the establishment of controlled recreational sites around reservoirs where high use recreational activity commonly occurs (such as the Grizzly Lake foreshore). This would allow recreational officers of the MFLNRO greater control to regulate camping and other activities within the recreation site area. GVW will seek administrative assurance that increased recreation facilities along the foreshore would not be proposed in future plans. 6. GVW will contact Fish and Wildlife at MFLNRO representatives and inquire about getting an electric motor only designation on Haddo Lake. 7. GVW will request that MFLNRO report recreation usage so GVW can gain insight into activities that pose risks and hazards to water quality. 8. GVW will seek to identify and contact user groups to develop communication linkages to the off-road vehicle community. Strategies to address backcountry activities will be explored. If provincial permits are required for proposed off-road events, GVW will request a referral 	<ol style="list-style-type: none"> 1. GVW and MFLNRO 2. See Section 1.2.3.4 3. GVW, MFLNRO 4. GVW, MFLNRO 5. GVW, MFLNRO 6. GVW, MFLNRO 7. GVW, MFLNRO 8. GVW 	<ol style="list-style-type: none"> 1. Long-term 2. See Section 1.2.3.4 3. Long-term 4. Medium-term 5. Medium Term 6. Short-term 7. Short Term 8. Long-term 	<ol style="list-style-type: none"> 1. (2 days per year) 2. See Section 1.2.3.4 3. (5 days) 4. (2 days) 5. (3 days) 6. (1.5 days) 7. (1.0 day) 8. (1 day/year)
3.3	<i>MFLNRO Conservation Officers apply Section 46 of the Forest and Range Practices Act.</i>	<ol style="list-style-type: none"> 1. GVW will request an annual report be provided by MFLNRO on enforcement activity in the Duteau Creek Watershed at next TAC meeting. 	<ol style="list-style-type: none"> 1. GVW 	<ol style="list-style-type: none"> 1. long-term 	<ol style="list-style-type: none"> 1. (0.5 day)
3.4	<i>GVW work with other water suppliers to lobby for Off Highway Vehicle Legislation.</i>	<ol style="list-style-type: none"> 1. GVW will support the legislation, and will keep informed of the progress of enactment and implementation of the proposed act and associated legislation and policy 	<ol style="list-style-type: none"> 1. GVW 	<ol style="list-style-type: none"> 1. Short-term 	<ol style="list-style-type: none"> 1. (0.5 days)
4.1	<i>MoE applications for use of pesticides in watersheds upstream of Headgates should be referred to GVW for review.</i>	<ol style="list-style-type: none"> 1. GVW will review pesticide use in the watershed with the TAC 2. GVW will request from provincial ministries and Front Counter BC that all referrals and plans for pesticide applications are referred to GVW for review and comment. 	<ol style="list-style-type: none"> 1. GVW 2. GVW, MFLNRO 	<ol style="list-style-type: none"> 1. Short-term 2. Long Term 	<ol style="list-style-type: none"> 1. (0.5 days) 2. (3 days/year)
5.1	<p>1) <i>Enhance water quality monitoring program by including trend analysis for source tracking of contaminates. Should be a cooperative plan to implement source tracking to identify contaminates. Enhance current WQ monitoring program by including trend analysis for source tracking analysis. Similar to the program carried out by Cynthia Meays in 2005. Support should come from Ministries that signed the MOU. Sampling results should be reported to the DWO, SIDWT members and stakeholders annually.</i></p> <p>2) <i>Specialists from MoE and IHA should review the GVW raw water monitoring program. Confirm existing program is adequate and or how it might be expanded or enhanced.</i></p>	<ol style="list-style-type: none"> 1. GVW staff will request progress of current BST project. Water quality staff will plan for a comprehensive review of results with Duteau TAC and DWO. 2. GVW will discuss the recommendation to review of the monitoring program with Mike Sokal and the DWO. 	<ol style="list-style-type: none"> 1. GVW 2. GVW, MFLNRO 	<ol style="list-style-type: none"> 1. Medium Term 2. Medium Term 	<ol style="list-style-type: none"> 1. (1.5 days) 2. (2.5 days/year)

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				(Immediate <3mth; short 3mth-1yr; Med 1-3 yr; long >3yr)	GVW Cost \$ (Man-days per Year)
6.1	<i>Confirm the current capacity of the spillway at the intake pond. Determine appropriate design capacity to accommodate potential increases in peak flows after the loss of mature pine. Re-consider re-design the intake pond and works to situate off-stream rather than on-stream.</i>	1. GVW staff will submit for RDNO budget approval to complete required construction upgrades in 2014. Works are expected to begin in early 2014, and depending on design and staging strategy, is expected to be completed in 2015.	1. GVW	1. Medium Term	1. \$750,000 (30 days)
6.2	<i>Develop a historic water use and hydraulic record, monitor future stream flows to understand the effects of pine beetle attack and climate change on the watershed hydrology. Reinstate stream flow monitoring station WSC Stn. # 08LC006 Down stream of Headgates to monitor spill and release below Headgates intake. Re-create the historic (say 10 to 20 year) record of watershed stream flows and withdrawals using available hardcopy operations and WSC records.</i>	1. GVW will continue to support the GVW hydraulic monitoring program by collecting lake level, stream flow, ground water and snowpack data. 2. GVW will review and evaluate the lake level, stream flow, ground water and snowpack monitoring programs annually to ensure current and future objectives for hydraulic data collection are complete. 3. GVW will seek to identify opportunities for improved data capture, including the collection of data in real-time (using SCADA and remote monitoring), and will ensure data can be readily accessed. 4. GVW will create a digital library for Duteau Creek studies, reports, and other raw data to assist in future data analysis.	1. GVW 2. GVW 3. GVW, MoE; MFLNRO 4. GVW	1. Long-term 2. Long-term 3. Long-term 4. Short-term	1. \$16,000/year (13 days/year) 2. (1.0 day/year) 3. (10 days/year) 4. (3 days)
6.3	<i>Install real-time flow measurement weirs at critical control locations in the watershed. As a minimum, these should include immediately downstream of Grizzly, Aberdeen and Haddo dams. Using data from these sources, provide an annual watershed hydrology report, indicating annual operations and routing, water diverted to users, diverted to lower Duteau Creek, diverted from Harris to Duteau watersheds, etc.</i>	1. GVW is considering a capital project to install remote flow control infrastructure on the controlled outlets of Aberdeen and Haddo reservoirs. Real-time flow data collection would be a component of the project. 2. GVW will assemble a digital archive of available hydrologic data that can be used for tracking and referencing watershed flows and/or the continuing the development of a water balance model to be used for water supply forecasting. 3. GVW will speak with Rita Winkler (Penticton Creek Project) to explore hydrological changes and data collection gaps. 4. GVW will investigate data sharing and funding opportunities through grant applications and arrangements with other stakeholders for the purchase, installation and monitoring;	1. GVW 2. GVW, MFLNRO 3. GVW 4. GVW	1. Medium-term 2. Long-term 3. Short-term 4. Long-term	1. \$50,000 (3 days per year) 2. (3 days/year) 3. (0.5 day) 4. (2 days/year)
6.4	<i>It is recommended that the following water quality issues be assessed as part of the decision-making process in raising the Aberdeen Dam. - impacts on nutrient loading in Aberdeen and Haddo reservoirs; - impacts on algal production in reservoirs; - impacts from flooding lands; - preparation of a detailed construction management plan; and - preparation of comprehensive reservoir operation plan for all three reservoirs.</i>	1. GVW will respond by reviewing potential water quality and hydrological impacts and determine mitigative measures needed to avoid the identified risks. 2. GVW will commission a water quality and lake limnology impact study prior to project implementation. GVW will review existing water quality data and consider increased data capture and monitoring programs as necessary to monitor lake ecological responses to the project so changes to water quality can be understood.	1. GVW 2. GVW, MFLNRO	1. Medium-term 2. Medium-term	1. (2 days) 2. \$15,000 (5 days)
7.1	<i>MFLNRO provide an annual report to the DWO the compliance of activities undertaken in the Duteau Creek watershed under its jurisdiction. Based on the MOU, annual reporting on source protection should be provided by participating agencies to the DWO.</i>	1. GVW will request meeting with IH and review reporting and auditing requirements. GVW will seek to define the expectations and the responsibilities for auditing the activities of stakeholders. GVW will inquire about an audit process for result-based activities (forest, range, recreation) occurring within community watersheds. 2. Through the Duteau Technical Advisory Committee, GVW will ask MFLNRO if recommended reports are being completed. 3. GVW will develop a letter to SIDWT (or replacement group) requesting the provision of an annual compliance report by the participating stakeholders.	1. GVW; IH 2. GVW, MFLNRO 3. GVW	1. Short Term 2. Short-term 3. Short-term	1. (1.5 days) 2. (0.5 days) 3. (2 days)
7.2	<i>An annual compliance report should be considered by RDNO</i>	1. See section 7.1 above	1. See section 7.1 above	1. See section 7.1 above	1. See section 7.1 above
7.3	<i>GVW may consider a request to provincial Ministries to grant ownership of additional Crown land around the margins of the upland reservoirs.</i>	1. GVW will research opportunities that are available for lands that are not privately owned or leased (ie. License of Occupation). 2. GVW staff will research appropriate contacts, and communicate with appropriate ministry staff and provincial representatives responsible for tenure or land purchase. 3. GVW will consider bringing matter to RDNO board for resolution to lobby the provincial government to allow for the acquisition of land.	1. GVW, IH 2. GVW, Provincial representatives 3. GVW	1. Short Term 2. Medium-term 3. Short-term	1. (1.5 days) 2. (3 days) 3. (2 days)

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8.1	<i>All access roads should have "Community Watershed" signage installed and maintained.</i>	<p>1. GVW will maintain an inventory of educational signs that have been posted by GVW. The signs and locations will be photographed using GPS and locations moved onto a GIS database. Annual review to consider where new signs or replacements are needed.</p> <p>2. A budget has been set aside for annual replacement of damaged and new signs because many signs are found to be routinely damaged by vandalism.</p>	<p>1. GVW</p> <p>2. GVW, MFLNRO</p>	<p>1. Long-term</p> <p>2. Long-term</p>	<p>1. (2 days/year)</p> <p>2. \$5000/year (1.5 days/year)</p>
8.2	<i>Consider developing a 'Watershed Fact Sheet' Provide to public, government agencies and stakeholders. Include information re: watershed, importance of protecting water and what the reader can do to help (ie. avoid contamination of human waste). Also recommend use of RAPP line</i>	<p>1. GVW will work with other stakeholders to create a Watershed Factsheet focused on sustainable activities within the watershed. The main target audience will be recreational users.</p>	<p>1. GVW</p>	<p>1. Medium-term;</p>	<p>1. (4 days)</p>
8.3	<i>Consider establishing annual 'Watershed Awareness Day'.</i>	<p>1. GVW will investigate a "Watershed Awareness Day" initiative in conjunction with other initiatives such as Drinking Water Week or Rivers Day.</p>	<p>1. GVW</p>	<p>1. Medium Term</p>	<p>1. (3 days/ year)</p>
8.4	<i>A recreation brochure, focused on source protection should be prepared and distributed.</i>	<p>1. GVW staff will request progress update on the proposed pamphlet at the next Duteau TAC Meeting.</p> <p>2. GVW staff will contact and discuss with Okanagan Basin Water Board re: Okanagan wide educational initiatives.</p>	<p>1. GVW</p> <p>2. GVW</p>	<p>1. Short term</p> <p>2. Long-term</p>	<p>1. (0.5 day)</p> <p>2. (1 day/year)</p>
9.1	<i>Consider developing a wildfire preparedness plan that would address drinking water related concerns, include long term fuel reduction plan and firebreak plan (consider with future cut block harvesting plans).</i>	<p>1. GVW will seek to define areas within the watershed that have a high and medium sensitivity to impacts such as wildfire. Areas where wildfire would have the most impact on water quality should be identified and included in a GVW Vulnerability Map. The map information should be shared with the Vernon Fire Zone and identified within the Area D forest fire interface plan.</p> <p>2. GVW or RDNO should seek opportunities for funding for a fuel reduction plan.</p> <p>3. GVW will investigate with MFLNRO and Tolko if there is anyone tasked to look at fuel reduction planning within sensitive areas of the watershed.</p>	<p>1. GVW</p> <p>2. GVW</p> <p>3. GVW, MLFNRO, Tolko</p>	<p>1. Medium-term</p> <p>2. Medium-term</p> <p>3. Short-term</p>	<p>1. (3 days)</p> <p>2. (2 day/year)</p> <p>3. (0.5 day)</p>
10.1	<i>GVW to contact MEMPR office and arrange a meeting to present the Mines Inspector with a copy of the DCWA and review issues and concerns specific to the MEMPR. All development proposed by MEMPR in the watershed should be referred to GVW for review. Review operations of known mining activities in the watershed. GVW to confirm if there are impacts to source water supplies at the quarry at the south end of the Edwin Lakes, south of the Goat Road.</i>	<p>1. GVW will inquire and attempt to ensure that RDNO is referred applications for proposed mining activity, quarries, gravel extraction and mineral claims within the Duteau watershed via Front Counter BC. Due to concerns with transportation routes and groundwater movements between watersheds, large scale proposals within adjacent watersheds should also be referred.</p> <p>2. GVW will request to arrange a meeting with the Mines Inspector in Kamloops to discuss current activities in the watershed and to request referrals. GVW Staff will inquire about current auditing and enforcement.</p>	<p>1. GVW</p> <p>2. GVW</p>	<p>1. Short-term</p> <p>2. Short-term</p>	<p>1. (1 day)</p> <p>2. (2 days)</p>
11.1	<i>GVW and IHA should review the source protection response plan annually and update on a 5 year basis (or as a result of significant increase to risks to source water).</i>	<p>1. GVW will hold regular meetings with IH to review work plans and progress. A work-plan reference and checklist will be developed to track the progress of activities, targets and communications with stakeholders.</p> <p>2. GVW will review emergency response procedures annually for items such as wildfire, landslides and peak flow events and sudden reservoir drawdown. Contact numbers within the GVW Emergency Response Plan will be updated annually or as required.</p> <p>3. TAC members will be asked to report on their indicators (measurable) annually before April 31st.</p> <p>4. GVW will compile this information for an annual Watershed report that will be prepared and provided to the TAC and IH.</p> <p>5. GVW will plan to perform a complete watershed assessment every 10 years.</p>	<p>1. GVW</p> <p>2. GVW</p> <p>3. GVW, MFLNRO, Tolko, range operators</p> <p>4. GVW</p> <p>5. GVW</p>	<p>1. Long-term</p> <p>2. Long-term</p> <p>3. Long Term</p> <p>4. Long-term</p> <p>5. Long-term</p>	<p>1. (1.5 days/year)</p> <p>2. (0.5 days/year)</p> <p>3. (0.5/year day)</p> <p>4. (4 days/year)</p> <p>5. (2 days/year)</p>

* Immediate: within 3 months, Short-term: within a year, Medium-term: 1 to 3 years, Long-term: greater than 3 years



REGIONAL DISTRICT OF NORTH OKANAGAN

Duteau Creek Watershed Assessment Response Plan

Introduction

With changing climate and the uncertain future of water supplies, water has become one of the most precious assets in the North Okanagan. The North Okanagan Regional Growth Strategy found that the greatest concern expressed among residents, elected officials, and other working groups is the availability and quality of water. In a continued effort to reduce identified water source hazards, Greater Vernon Water (GVW), a service of the Regional District of North Okanagan (RDNO) provides the following Duteau Creek Watershed Assessment Response Plan.

By volume, the Duteau Watershed is the largest water sources serving GVW customers. Duteau Watershed provides irrigation water to over 500 bona-fide farms, and treated domestic water to over 15,000 customers. Treated Duteau water also acts as a secondary source of water for an additional 38,000 domestic customers. (Kalamalka Lake is the other major water source for GVW). The protection of the water is of the utmost importance to the long term economic and social sustainability of the region.

In December of 2008, GVW received the Duteau Creek Watershed Assessment and Recommendations for Source Protection (DCWA) final report. The report, funded by GVW and co-authored by Kerr Wood Leidal and Associates Ltd. and Dobson Engineering Ltd., was completed as a condition on the GVW Permit to Operate issued by Interior Health (IH) under Section 8 of the Drinking Water protection Act. In accordance with the regulations and directions of the Drinking Water Officer (DWO), an Assessment Response Plan must also be prepared.

The Assessment Response Plan has been prepared to outline the specific actions that will be undertaken to address the hazards and risks to drinking water quality and quantity identified and recommendations provided in the DCWA report. The key elements considered within the DCWA report are Modules 1, 2, 7 and 8 of the Comprehensive Drinking Water Source to Tap Assessment Guideline (S2T), and an update of the Interior Watershed Assessment Procedure (IWAP).

Duteau Creek Watershed

The Duteau Creek Watershed is a community watershed located approximately 20 km southeast of the City of Vernon. The drainage area is 182km² and includes a diversion of the Paradise sub-basin of the Harris Creek watershed.

The Community Watershed area is primarily within Crown Land. The Province of British Columbia operates within a framework of legislative policies that govern the management of Crown land.

Watershed Governance Framework

The multi-barrier approach is the best means to address the challenges of supplying safe drinking water (Norland & Adams, 2009). Protecting source water quality and quantity is a core element of a multi-barrier approach. Responsibility for protecting water quantity and quality is shared among federal, provincial, and local governments, First Nations, licensees and tenure holders. The provincial agencies that govern most activities on Crown land include the Ministry of Forest, Lands and Natural Resource Operations (MFLNRO), the Ministry of Energy and Mines (MEM), the Ministry of Environment and the Ministry of Health through Interior Health (IH).

GVW does not have authority over land use practices on Crown land, and therefore cannot directly protect the water resources from impacts by other watershed stakeholder groups. It is a challenge for GVW to minimize risks and reduce hazardous activities within a regulatory framework of conflicting economic and social interests. There is legislation that protects watershed hydrology and water quality; however, there is legislation that allows commercial, industrial and recreational activity to occur. The level of control in the watershed over these activities greatly influences the level of risks associated with those activities (Urban Systems, 2012). Water utilities in British Columbia have been tasked with assessing and developing source protection and response plans for all sources that they use for domestic purposes. It is clear there is a sustained need for an integrated and collaborative approach toward watershed planning and governance.

To promote communication between user groups, and ensure water quality and quantity is protected, GVW established a stakeholder Technical Advisory Committee (TAC) in 2009.

Duteau Creek Watershed Technical Advisory Committee (TAC) and Goals

The TAC is composed of representatives from provincial and federal ministries, First Nations, timber licensees, range tenures and GVW staff.

At the first TAC meeting, held on February 19, 2009 a facilitator was brought in to provide guidance and identify goals. It was agreed that the goal is to protect the quality and quantity of Duteau Creek with the understanding that Duteau Creek is a Multi-use Community Watershed, that the stakeholder meetings are to be collaborative planning rather than conflict resolution, to increase knowledge of all stakeholders and to find creative yet sound ways to move forward with the recommendations in the DCWA. A Terms of Reference (Appendix A) was agreed upon and has been used to gain input from participating stakeholders who can implement land use regulations and policies.

The Duteau TAC Committee has benefited GVW by providing access to knowledgeable personnel who are able to evaluate and resolve source water protection issues that warrant inter-agency coordination. The result provides GVW with increased capabilities to apply informed and valid decisions when implementing source protection strategies

Maintaining a functional TAC committee also provides GVW with current contacts and associations with management groups that work within the watershed. The resource provides a valuable advantage when responding to source water emergencies such as fires and landslides.

Duteau Creek Watershed Assessment Response Plan

This Response Plan identifies required actions (management practices, statutory or regulatory changes, agreements etc.) needed to mitigate existing and future threats to source water quality and quantity as identified in the in the DCWA report. This plan establishes priorities and a timeline for action items to be implemented.

The following watershed activities, responses and further actions for source protection are presented in general order of priority as defined in the DCWA.

1. Range

There is a long history of cattle grazing in BC that dates back to the late 1800's. Under authorization of the *Range Act*, ranchers are permitted to allow their cattle to graze on Crown land as regulated under tenure by *The Forest and Range Practices Act* (Fraser, 2009). The DCWA identifies that cattle grazing within Community watersheds are of concern because they pose a very high risk to water quality.

When cattle travel about the watershed they will utilize the road network and use the streams that cross the road as a source of water. These stream crossings are then commonly subject to fecal contamination and physical damage that can lead to sedimentation and increased downstream turbidity.

Following the field inspections completed for the DCWA in 2007, it was reported that there was "extensive and chronic sediment disturbance on roads at streams". Manure deposits were also commonly found in and about streams.

Since the DCWA has been written, GVW has made significant progress working with stakeholders to address the stream crossings rated as high and moderate risk to water quality.

Identified Risks:

- Sedimentation from cattle activity in and around streams and road crossings
- Bacterial contamination from cattle presence in and around streams

1.1 Address sources of Turbidity and Bacteria

Recommendation: GVW Staff meet with MFLNRO and DWO to develop strategies to address the two major drinking water hazards related to cattle range use. (1) Source of Turbidity caused by cattle activity and (2) Source of Bacteria/protozoa/virus related to cattle activity.

1.1.1. Response:

1. Representation at the Duteau Technical Advisory Committee (TAC). Range use items are discussed as required. A functional integrated working relationship exists between range operations staff at MFLNRO, range operators (Coldstream Ranch and Gary Andrews), forest development (Tolko and BCTS) and IHA.
2. A specific annual range meeting organized each year by MFLNRO and attended by DWO and GVW Staff.
3. Best management practices for range operations on Crown Land have been developed by MFLNRO (Appendix B).
4. Funding for improvements: In 2008, a grant was received from OBWB to provide an inventory of Range infrastructure (cattle guards, fences, off stream watering etc) and provide the condition of the range infrastructure. This led to a number of projects including a corral, off stream watering and fencing. The inventory was shared with the ranchers and MFLNRO as a GIS shape file. The work also led to funding for a JOP project in the Duteau, Oyama and Vernon Creek Watersheds. In 2012, a new cattle guard, corral, and a nose pump were installed in areas identified through correspondence with GVW. The installations were funded by MFLNRO through the Range program.

1.1.2. Further Action:

1. Research and Studies: UBCO is currently studying *Escherichia coli* and *Cryptosporidium* in Community Watersheds. Electoral Area D (RDNO), MFLNRO and the District of Lake Country are working with UBCO to fund a joint Bacterial Source Tracking (BST) project. Site selection work is complete and includes the Duteau Watershed. GVW will continue to support efforts in this regard.
2. Mapping and GIS: GVW will request access to range tenure area polygons for GIS. This will be helpful when assessing range use plans and proposed cattle movements within and adjacent to sensitive areas. It will make it easier to identify areas where cattle grazing areas are and the schedule for range polygon rotation. The initiative will assist GVW and other stakeholders to better understand range use and movement in the watershed.

1.1.3. Responsibility; Time line; GVW Cost Estimate

1. UBCO, MFLNRO, RDNO; Medium Term; no cost to GVW
2. GVW, MFLNRO; Ranch Tenures; Short Term; (1.5 days)

1.2 Restrict Access to Sensitive Areas

Recommendation: Access to sensitive areas along watercourses, lakes and wetlands be restricted as the forest cover changes (from forest development, salvage logging, pine beetle or other forest health issues) to protect the water quality.

1.2.1. Response:

1. MFLNRO (Range) has increased efforts to work with the forest industry and ranchers to find solutions that can be implemented. MFLNRO is developing BMP's to prevent loss of natural barriers during salvage and forest development activities.
2. A pilot project is being undertaken within community watersheds to place large woody debris barriers to restrict cattle movement through newly logged areas.

1.2.2. Further Action:

1. GVW and MFLNRO continue to communicate on any identified problems.
2. GVW will initiate a meeting with Rob Dinwoodie, Range Officer, and MFLNRO, to discuss further strategies.
3. GVW will request obtaining GIS polygons from MFLNRO that identify range management and license areas. This digital mapping information can be overlaid onto existing digital mapping and used to assess existing and proposed cattle movements and range plans.
4. GVW will investigate vulnerability mapping of high and medium sensitivity zones within the watersheds. GVW will work with MFLNRO to identify vulnerability zones for management areas to be reserved for protection of water resources. MFLNRO and GVW will establish buffer zones and riparian setback areas where range activities pose a risk to water quality and quantity.
5. GVW will investigate further opportunities and funding for range control infrastructure.

1.2.3. Responsibility; Time line; Cost

1. GVW and MFLNRO; Long-term; (6 days per yr)

2. GVW and MFLNRO; Short-term; (1 day)
3. GVW and MFLNRO; Short-term; (1 day)
4. GVW and MFLNRO; Medium- term; (5 days)
5. MFLNRO, GVW, Ranch Tenures; Long-term; (3 days)

1.3 Cattle Bridge in Lower Reach D

Recommendation: The Cattle Bridge in lower reach D, and the trail adjacent to the channel be inspected to confirm that they are no longer a risk to water quality.

1.3.1. Response:

1. The cattle bridge has been removed and GVW staff inspected the trail section in the summer of 2013 and found no evidence of cattle activity.

1.3.2. Further Action:

No longer applicable

1.3.3. Responsibility, Timeline and Cost

N/A

1.4 Reduce Impact from cattle in channel

Recommendation: Results of field inspections to be reviewed and improvements implemented that will reduce the impacts from cattle on channel disturbance and the deposition of manure in and about the streams.

1.4.1. Response:

1. High and medium hazard rated road crossings that were identified in the DCWA have been reviewed by responsible stakeholders and concerns have been addressed by implementation of BMP's.
2. Off stream watering sites have been installed at two locations. Fences and cattle guards have been strategically placed to reduce cattle movement into sensitive areas.
3. Field inspection data has been obtained from Dobson Engineering and GVW is reviewing the data.

1.4.2. Further Action:

See Item 1.2.2, restricting access to sensitive areas, and section 2.1.1, stream crossing assessments.

1.5 Annual update on Range Plans

Recommendation: MFLNRO to provide copies of Range use Plans/Range Stewardship Plans to GVW annually.

1.5.1. Response:

1. GVW normally receives plans directly from range operators. GVW will seek assurances from MFLNRO that all necessary documentation is received, and when practical, a referral should be sought from provincial authorities.

1.5.2. Further Action:

1. GVW to inquire if any amendments have or will be made to the Range Stewardship Plans in the Duteau Creek watershed.
2. GVW source protection staff to review all proposed Range Use and Range Stewardship plans and provide comment. Plans and GVW response to be recorded.

1.5.3. Responsibility, Timeline and Cost

1. GVW, MFLNRO, Range Tenures; Long term; (1 day/year)
2. GVW; Long-term; (2 days/year)

1.6 Environmental Farm Plan

Recommendation: GVW, MFLNRO and grazing licensees make a formal application to the Environmental Farm Plan.

1.6.1. Response

1. Program application considered by TAC committee, may not be suitable for a utility to apply.

1.6.2. Further Action

1. http://www.bcac.bc.ca/ardcorp/program/environmental-farm-plan-program_2013_-14 applications closed. Review if this program applies to crown land.

1.6.3. Responsibility, Timeline and Cost

N/A

2. Forestry Activity

Timber Harvesting has occurred in the Duteau Community Watershed since the 1930's. Forest tenure operational regulations have changed over time. In the early 1990's the *Forest Practices Code of British Columbia Act* was introduced in British Columbia to regulate forest harvesting operations. The Act also had introduced greater control mechanisms to protect water quality in community watersheds. In 2004, the generally "prescriptive" regulatory regime of the forest practice code was replaced with a more "results based" approach introduced under the current *Forest and Range Practices Act*. Essentially, legislative components regulating operational procedures, some of which helped to sustain water quality and other environmental values, are now regulated by comparing the affects to the resulting environmental outcome. The DCWA report and other environmental and hydrological monitoring projects are now important mechanisms necessary to monitor results under the new regulatory system.

The DCWA report maintains that the Mountain Pine Beetle epidemic and associated forest harvesting will result in increased total water yields available to GVW; however this benefit will be coupled with increased peak flow hazards within the watershed. Higher peak flows will give rise to increased sediment delivery by streams. Identified as a very high risk to drinking water, the primary source of sediment delivery is from roads at stream crossings, and to a lesser degree, channel erosion resulting from peak flows (Dobson & Nolan, 2008).

In response to the Pine Beetle infestation, Tolko Industries Ltd. (Tolko), the primary forest licensee within the watershed, has implemented a retention plan. A retention plan is enabled during large scale harvesting operations to identify and retain the forest portions that are needed for protection of

non-timber values such as water quality. The remainder forest stand is considered for harvesting (Dobson & Nolan, 2008).

Since the DCWA report was written in 2008, preliminary findings suggest that MPB affects within the Thompson-Okanagan region has peaked (Maclauchlan & Buxton, 2013). MFLNRO and Tolko are monitoring the progression of MPB within the Duteau Watershed; however the resulting affect to the watershed hydrology is not well understood at this time.

Tolko maintains active forestry roads and associated crossings within the watershed that are classified as Forest Service Roads (FSR's). Many other roads are considered non-status roads. There are a significant number of non-status roads within the watershed. Non-status roads pose a heightened risk to water quality because there is no responsible agency to address identified hazards.

Identified Risks:

- Sedimentation from industrial roads and road crossings.
- Natural sediment load from channel erosion and mass wasting.
- Increase of organic material in streams as the mature pine stands die.

2.1 Stream Crossing Assessments and Improvements

Recommendation: Results of the Stream Crossing assessments be reviewed and improvements implemented at moderate and high hazard sites. The priority area is the unbuffered section between Haddo and Headgates, Ditch lines include cross drains with ditch blocks, Ditch lines and culverts be kept clear of debris and vegetated with grasses

2.1.1. Response

1. Most high and moderate hazard sites were visited during the Duteau TAC annual field tours that took place from form 2010 to 2013.
2. Follow-up action was taken by Tolko or MFLNRO for the identified high and moderate crossings located on FSR's. Some crossings and road sections on non-status roads are still under consideration for improvements. GVW has, and will continue to seek assistance and direction from MFLNRO, and seek funding opportunities for non-status road improvements where there is a risk to water quality.
1. There are 94 stream crossings (for natural overland watercourse across roads) and 96 road cross drains (for road drainage) identified during the field work completed for the DCWA (190 total). There have also been other hazardous road crossings and road sections identified since the DCWA was released. Crossing information data from the 2007 field inspections has been collected and maintained by GVW in a GIS format.
2. See 2.3.1.2 below.

2.1.2. Further Action

1. Tolko and MFLNRO provide a report on the number of stream crossings and their water quality hazard ratings annually. Sites that are rated as moderate or high should be provided in an Excel format. GVW will review changes.
2. Tolko and MFLNRO provide inspection reports for permanent and temporary roads in the Duteau Community Watershed annually.

3. See section 1.2.2.4 regarding proposed vulnerability mapping.

2.1.3. Responsibility, Timeline and Cost

1. Tolko and MFLNRO; Long-term; (1 day)
2. Tolko and MFLNRO; Long –term; (1 day)
3. See 1.2.3.4 above

2.2 Road Deactivation

Recommendation: Roads not required for active use should have deactivation measures implemented.

2.2.1. Response:

3. Roads permitted to Forest Licensees are maintained until they are either deactivated or rehabilitated unless they are transferred to another tenure holder for their use and maintenance.
4. Non-permitted or Non Status Roads (NSR) are identified as wilderness roads with no responsibility assigned. Tenure holders, such as Tolko, may need certain NSR's to facilitate forest practices. In these instances the tenure holder will take out a Road Permit for any required NSR and will conduct any necessary upgrades or maintenance.
5. GVW is aware of the proposed provincial Natural Road Act Project, and anticipate that it may provide future opportunities for increased NSR options.

2.2.2. Further Action:

1. GVW will request meeting with MFLNRO to discuss specific responsibility
2. MFLNRO to provide update on the Natural Road Act Project.

2.2.3. Responsibility, Timeline and Cost

1. MFLRO and GVW; Short-term; staff time (1 day)
2. MFLRO; Medium –term; staff time

2.3 Existing Stream Crossings and Peak Flow

Recommendation: Ministry of Forest and Range develop and implement a review process to confirm existing stream crossing structures on the Duteau Creek main stem, and major tributaries downstream of the areas affected by pine beetle are adequately sized to safely convey projected future peak flows.

2.3.1. Response:

1. MFLNRO's current practices are to use the 100 year flood event flow for the design criteria for new and replacement culverts and bridges. New information may determine the culvert size related to watershed changes (drainage, forest development and disease)

2. There are two main crossings identified by MFLNRO staff within the priority section between Haddo and Headgates (MFLNRO crossing ID K571A and K380).

K571A was installed in 2010 and was designed to meet the maximum spillway discharge of 73.6m³/s plus 0.5m of clearance. This is well in excess of the estimated q100 for the watershed.

K380 was installed in 1986. The general arrangement drawings from that time show no flow information and the bridge elevation appears to be grade controlled. MFLNRO has no record of any issues regarding clearance issues over the past 28 years. The photo record shows the structure to have substantial clearance with clearance estimates between 4.6m and 5.9m from past inspections. MFLNRO staff anticipate no issues with this structure handling the q100 flow.

2.3.2. Further Action:

1. MFLNRO to provide an annual report on new, reconstructed and replaced culverts and bridges within the Duteau Creek Watershed.

2.3.3. Responsibility, Timeline and Cost

1. MFLNRO; Long-Term; staff time

2.4 Recognition of Plan

Recommendation: *Tolko Industries Ltd. consider including recognition of the Duteau source protection plan in its forest stewardship plan.*

2.4.1. Response:

1. The Forest Stewardship Plan, prepared by Tolko, must be consistent with applicable and currently approved legislation, regulations, and other government objectives. Tolko has indicated that it is not within the scope of Forest Stewardship Plan to consider non-regulatory practices and recommendations from other sources such as the Duteau assessment report; however, it is acknowledged that Tolko is an active participant in the Duteau Creek Watershed Technical Advisory Committee.

2.4.2. Further Action

1. The DCWA will not be formally recognised in the Forest Development Plan.

2.4.3. Responsibility, Timeline and Cost

N/A

2.5 Pine Beetle Harvest and Salvage

Recommendation: *GVW and IHA should review the expansion of the pine beetle with Tolko. Review proposed salvage harvesting plans and options.*

2.5.1. Response:

1. GVW currently receives all proposed forest stewardship plans from Tolko.
2. GVW currently reviews small salvage proposals.

2.5.2. Further Action:

1. GVW will arrange meetings as required with IH, Tolko and MFRNRO to gain insight into the status of the pine beetle, salvage-harvesting, and Tolko's retention plan.
2. Request further information from Tolko to understand how the MPB will affect water quality, current and projected ECA levels and other factors affecting watershed health. Include sub-basin ECA's including the sub-basins below reservoirs.

2.5.3. Responsibility, Timeline and Cost

1. IH, Tolko, GVW; short-term; (2 days)
2. Tolko; medium-term; (1 day)

3. Recreation and Human Activity within the Watershed

The DCWA suggests that recreational use in the watershed will continue to increase. Some recreational activities of concern include camping, fishing, boating, and off-road vehicle operation. The findings of the DCWA identify that the likelihood for increased risk of contamination will be very high with increasing recreational use.

Field assessments completed for the DCWA recorded recreational use impacts relating to forest recreation sites and, of greater concern to GVW, were the impacts of impromptu camping sites around almost all lakes and reservoirs within the watershed. The need for multiple source protection barriers to address the associated hazards is prevalent.

Identified Risks:

- o Bacteriological contamination from human presence.
- o Increased turbidity from human activities
- o Hydrocarbon contamination from petroleum products.
- o Increase of organic material in streams as the mature pine stands die.
- o Increased risk of wildfire.

3.1 Disposal of Human Waste

Recommendation: Stakeholders should follow approved practices for the disposal of human waste products in the watershed. Regulating agencies, to provide educational materials with guidance of disposing human waste.

3.1.1. Response:

1. MFLNRO is developing a pamphlet for distribution to public, staff and contractors working in the watershed.
2. In a September 2013 meeting with John Glaspie, MFLNRO Recreation Officer, it was noted that all designated outhouses are on a program to be pumped out as required.
3. Field constructed toilet facilities are routinely found within sensitive areas around reservoirs. GVW routinely sends contractors to dismantle facilities, clean areas, and properly dispose of human waste products.
4. Annual illegal dumping and garbage is collected and cleaned up around reservoirs by GVW summer staff and a contractor funded by GVW.

3.1.2. Further Action:

1. MFLNRO is developing a pamphlet for distribution to public, staff and contractors working in the watershed. GVW will follow up on status.
2. GVW will assist with coordination of reservoir clean-up activities and support with a budget for landfill charges to those who are providing the effort.

3.1.3. Responsibility, Timeline and Cost

1. MFLNRO and GVW; Short- term: (1 day)
2. GVW and RDNO; Medium –term; \$500/year (3 days/year)

3.2 Recreational Pressure on Watershed and Reservoirs

Recommendations:

- 1) *Explore opportunities to reduce the recreation pressures on the reservoirs. If camping is permitted near reservoirs, should be restricted to designated locations that will limit the risk of contamination to reservoirs.*
- 2) *Provide other high quality recreation sites on other lakes in the watershed. MFRNRO and MOE Conservation Officers apply section 58 of the Forest and Range Practices Act.*
- 3) *Recreation use in the watershed and near the reservoirs should be consistent with the objectives in the LRMP*
- 4) *Post the reservoir perimeter areas as prohibited*

3.2.1. Response

1. The Duteau Creek Watershed TAC regularly reviews recreational activities with MFLNRO Recreation staff to identify and assess drinking water hazards. Where achievable, source protection barriers are implemented.
2. GVW has designed and placed signs at reservoir locations throughout the watershed. Two new large signs have been placed on the main roads entering the watershed (Aberdeen main and Dee Lake main).
3. Dam safety signs have been posted on dams. Metal gates and large rocks are used to restrict vehicle access.
4. GVW has supported MFLNRO capital works improvements to campsite development within the watershed, but away from sensitive areas and reservoirs and water utility infrastructure (dams and gate controls).
5. During the TAC tour in 2011, compliance and enforcement officers with MFRNRO indicated that having Section 58 under FRPA enables clearer enforcement that can be utilized when needed.
6. GVW has met with Recreation Officers to discuss water quality and recreation management alternatives. An electric motor only designation has been identified as an option for Haddo Lake. Electric motor only designation is considered a safety concern on larger lakes.

7. GVW does not have authority to restrict access to lakes and reservoirs, but GVW can contact Crown land representatives to investigate possible strategies to reduce access.
8. The goals and objectives stated within the LRMP are consistent with the goals and objectives of GVW and are considered in this plan.

3.2.2. Further Action:

1. GVW will work with MFLNRO regarding recreation use, identify high risk areas, and implement measures to redirect recreational users away from sensitive areas.
2. GVW will investigate “vulnerability mapping” of high and medium sensitivity zones within the watersheds. GVW and MFLNRO will propose buffer zones and riparian setback areas where recreation activities currently pose a risk to water quality and quantity.
3. GVW will investigate available options to manage and regulate high risk recreational activities occurring along the foreshore, dams, spillways, and riparian buffer areas. GVW will contact MFLNRO (Front Counter BC) to enquire about options to allow greater protection around foreshore and other sensitive areas (such as a License of Occupation, Head Lease, Resource Management Zone, Sponsored Crown Grant, Park or other available options).
4. Where ad-hoc hazardous recreation is occurring near dams, spillways, reservoirs and other sensitive areas, GVW will engage MFLNRO and request that these lands be protected by order under Section 58, subsection (1), safeguarded with a physical barrier and posted with a notice of the order under subsection (3).
5. Investigate the establishment of controlled recreational sites around reservoirs where high use recreational activity commonly occurs (such as the Grizzly Lake foreshore, dams spillways). This would allow Natural Resource Officers the ability to regulate camping and other activities within the recreation site area. GVW will seek administrative assurance that increased recreation facilities along the foreshore would not be proposed in future plans.
6. GVW will contact Fish and Wildlife at MFLNRO representatives and inquire about getting an electric motor only designation on Haddo Lake.
7. GVW will request that MFLNRO report recreation usage so GVW can gain insight into activities that pose risks and hazards to water quality.
8. GVW will seek to identify and contact user groups to develop communication linkages to the off-road vehicle community. Strategies to address backcountry activities will be explored. If provincial permits are required for proposed off-road events, GVW will request a referral from Front Counter BC.

3.2.3. Responsibility, Timeline and Cost

1. GVW and MFLNRO; Long-term; (2 days per year)
2. See Section 1.2.3.4
3. GVW; Long-term; (5 days)

4. GVW, MFLNRO; Medium-term; (2 days)
5. GVW, MFLNRO; Medium Term (3 days)
6. GVW, MFLNRO; Short-term; (1.5 days)
7. GVW, MFLNRO; Short Term; (1.0 day)
8. GVW; Long-term; (1 day/year)

3.3 Compliance and Enforcement

Recommendation: *MFLNRO Conservation Officers apply Section 46 of the Forest and Range Practices Act.*

3.3.1. Response

1. Section 46 of the Forest and Range Practices Act restricts persons from carrying out activities in the watershed that are damaging to the environment.
2. MFLNRO Natural Resource Officers have placed a very high priority on water issues and have recently enhanced their capacity to work during weekends.
3. GVW will request that MFLNRO report enforcement information applicable to the Duteau watershed. This would allow GVW to understand activities and the level of enforcement occurring within the watershed.

3.3.2. Further Action

1. GVW will request an annual report be provided by MFLNRO on enforcement activity in the Duteau Creek Watershed at next TAC meeting.

3.3.3. Responsibility, Timeline and Cost

1. GVW; long-term: (0.5 day)

3.4 Off-Road Legislation

Recommendation: *GVW work with other water suppliers to lobby for Off Highway Vehicle Legislation.*

3.4.1. Response

1. On February 24, 2014, the Provincial Government proposed Off-Road Vehicle (ORV) Act. The act, if passed and brought into force, will provide Natural Resource Officers with more effective enforcement tools to target irresponsible ORV owners that damage sensitive habitat. This includes the ability to stop and inspect ORVs for violations and seize an ORV. The maximum fine for offences has increased from \$500 to \$5,000.

3.4.2. Further Action

1. GVW will support the legislation, and will keep informed of the progress of enactment and implementation of the proposed act and associated legislation and policy.

3.4.3. Responsibility, Timeline and Cost

1. GVW; Medium-term; (0.5 days)

4. Pesticide and Herbicide

In British Columbia, forest and range tenure holders are required to incorporate measures into their forest and range plans to prevent the introduction of 42 listed invasive species.

MFRNRO has developed a pest management plan in compliance with the *Integrated Pest Management Act* and Regulations.

The plan sets out guidance for invasive plant management on Crown land by specifying conditions such as minimum qualifications and responsibilities for applicators. The plan also establishes procedures for environmental protection and pesticide use within community watersheds.

In a recent Duteau TAC meeting, a Tolko representative indicated that the company has made a voluntary decision to not use pesticides within community watersheds.

To ensure safe operation of GVW facilities and to preserve the structural integrity of reservoir dams, deep rooted plant control is required. The RDNO conducts Industrial Vegetation control on dam structures by mechanically removing vegetation or spot treating vegetation with herbicides. All herbicide applications within community watersheds comply with the Ministry of Environment Integrated Pest Management Act & Regulations. All applicators are certified to use pesticides in the Industrial Vegetation & Noxious Weed category.

Identified Risks:

- o Chemical drinking water hazard

4.1 Pesticide use

Recommendation: *MoE applications for use of pesticides in watersheds upstream of Headgates should be referred to GVW for review.*

4.1.1. Response:

1. RDNO to seek guidance from MoE. MFRNRO has regional pest management plan in effect (Appendix C).
2. For applications within the Duteau Watershed, RDNO follows the MoE approved RDNO Pest Management Plan for Noxious Weeds – Invasive Plants (Appendix D). GVW Staff are notified prior to use, and proposals are reviewed by GVW staff prior to application.
3. Dam safety treatments are completed by RDNO Invasive weed crew. Insure permits and prescriptions are up to date.

4.1.2. Further Action:

1. GVW will review pesticide use in the watershed with the TAC

2. GVW will request from provincial ministries and Front Counter BC that all referrals and plans for pesticide applications are referred to GVW for review and comment.

4.1.3. Responsibility, Timeline and Cost

1. GVW; Short-term; (0.5 days)
2. GVW, MFLNRO; Long Term; (2 days/year)

5. Water Quality Monitoring

Section 18 of the Drinking Water Protection Act specifies a key purpose of a source assessment is to identify, inventory and assess monitoring requirements for the drinking water source and water supply.

Source water quality monitoring is an important component of the multi-barrier approach to drinking water protection. It is important for monitoring programs to be as comprehensive as possible. The source water quality program compares source water with guidelines, criteria and regulations that have been set for both health and aesthetic reasons. The program also observes seasonal trends that may affect treatment and chlorine demand and monitors for potential threats from watershed land use practices.

The DCWA confirms that the GVW monitoring program has been completed and recorded consistently since 1998. From the data, the assessors were able to review past trends and relate them to potential risks within the watershed.

5.1 Water Quality Monitoring Program

Recommendation: *Enhance current water quality monitoring program by including trend analysis for source tracking of contaminates. There should be a cooperative plan to implement source tracking to identify contaminates similar to the program carried out by Cynthia Meays in 2005. Support should come from Ministries that signed the MOU. Sampling results should be reported to the DWO, SIDWT members and stakeholders annually.*

Specialists from MoE and IHA should review the GVW raw water monitoring program to confirm it is adequate as a baseline program or how it might be expanded and enhanced.

5.1.1. Response:

1. The RDNO Electoral Areas, District of Lake Country, MFLNRO, have supported a joint Bacterial Source Tracking (BST) project with UBC Okanagan for Duteau and other local watersheds. DNA testing will be completed on water samples to identify the source of contamination. The project commenced in 2013 with hopes to gain further insight into community watersheds and identify opportunities for Best Management Practices for Range.

5.1.2. Further Actions

1. GVW staff will request progress of current BST project. Water quality staff will plan for a comprehensive review of results with Duteau TAC and DWO.
2. GVW will discuss the recommendation to review of the monitoring program with Mike Sokal and the DWO.

5.1.3. Responsibility, Timeline and Cost

1. GVW; Medium Term; (1.5 days)
2. GVW, MFLNRO; Medium Term; (2.5 days/year)

6. Watershed Hydrology and Flow Monitoring

As the population of the region increases, the volume of water available to customers is a continuing concern for GVW. GVW relies on the spring freshet to fill the upper lakes each year. The three reservoir lakes can store up to 18,910 ML (15,330 ac ft) of water. The reservoirs usually fill and provide adequate quantities of water to meet current demands; however, for years when the reservoirs do not fill restrictions are placed on customers. Water reserves can be expected to be at risk when two or more years of draught in a row are experienced (Ellis & Matsubara, 2012).

A comparison of GVW demands and storage levels has estimated that in the year 2041 GVW may not have enough water supply to meet projected demands (Ellis, Matsubara, 2012). Coupled with the projected affects of climate change, the long term risks to Duteau Creek water supply are high. Also, as reservoir water levels are drawn down, increased risks to water quality becomes a concern (Dobson & Nolan, 2008).

Peak flows from high rain events in the Duteau watershed are also a concern to GVW. The loss of forest cover, particularly in the upper watershed, could potentially to give rise to a 20-30% increase in peak flow (Dobson & Nolan, 2008). In June of 2013, heavy rain caused high flows and turbidity that forced GVW operations to temporarily shut down the Duteau Water Treatment Facility. This event also placed the Headgates intake infrastructure at risk of catastrophic damage as the flood water crested above the maximum design capacity of the spillway. Had a similar rain event occurred two weeks prior, during the peak freshet, the result could have been much worse.

Identified Risks:

- o Risk to supply. Loss of water source.

6.1 Headgates Spillway

Recommendation: *Confirm the current capacity of the spillway at the intake pond. Determine appropriate design capacity to accommodate potential increases in peak flows after the loss of mature pine.*

Re-consider re-design the intake pond and works to situate off-stream rather than on-stream.

6.1.1. Response

1. GVW has budgeted \$150,000 (2013) for engineering services, permits and pre-construction for upgrade works at Headgates. GVW has issued a Request for Proposals (RFP) for engineering services for the work. The work will include a hydraulic assessment of the capacity of the spillway.

The project will include a peak design flow assessment that will include potential impacts from climate change and recent watershed changes (i.e. increased ECA due to mountain pine beetle). The project will include a pre-design, final design and construction of the recommended spillway based on the flood design assessment.

6.1.2. Further Action

1. GVW staff will submit for RDNO budget approval to complete required construction upgrades in 2014. Works are expected to begin in 2014, and depending on design and staging strategy, is expected to be completed in 2015.

6.1.3. Responsibility, Timeline and Cost

1. GVW; Medium Term; \$750,000 (30 days)

6.2 Hydraulic Records and Stream flows

Recommendation: *Develop a historic water use and hydraulic record, monitor future stream flows to understand the effects of pine beetle attack and climate change on the watershed hydrology. Reinstate stream flow monitoring station WSC Stn. #08LC006 downstream of Headgates to monitor spill and release below Headgates intake. Re-create the historic (say 10 to 20 year) record of watershed streamflows and withdrawals using available hardcopy operations and WSC records.*

6.2.1. Response:

1. GVW is currently working with Phil Epp, M.Sc., P.Ag., Senior Hydrologist, and private consultant on contract with MFLNRO. Mr. Epp has been provided GVW operational data, and has Water Survey of Canada (WSC) data to complete a water balance and flow assessments for Duteau Creek and Bessette Creek Watersheds. The data will aid in monitoring the Duteau Watersheds response to factors such as the Pine Beetle epidemic and climate change.
2. All hard copy data collected through historical operations at Headgates has been digitally recorded by GVW. The original hard copies have been scanned for back-up.

6.2.2. Further Action:

1. GVW will continue to support the GVW hydraulic monitoring program by collecting lake level, stream flow, ground water and snowpack data.
2. GVW will review and evaluate the lake level, stream flow, ground water and snowpack monitoring programs annually to ensure current and future objectives for hydraulic data collection are complete.
3. GVW will seek to identify opportunities for improved data capture, including the collection of data in real-time (using SCADA and remote monitoring), and will ensure data can be readily accessed.
4. GVW will create a digital library for Duteau Creek studies, reports, and other raw data to assist in future data analysis.

6.2.3. Responsibility, Timeline and Cost

1. GVW; Long Term; \$16,000/year (13 days/year)
2. GVW; Long-Term; (1.0 day/year)
3. GVW, MoE; MFLNRO; Long Term; (10 days/year)
4. GVW; Short Term; (3 days)

6.3 Flow measurements

Recommendation: *Install real-time flow measurement weirs at critical control locations in the watershed. As a minimum, these should include immediately downstream of Grizzly, Aberdeen and Haddo dams. Using data from these sources, provide an annual watershed hydrology report, indicating annual operations and routing, water diverted to users, diverted to lower Duteau Creek, diverted from Harris to Duteau watersheds, etc.*

6.3.1. Response

1. GVW installed three hydrometric stations in 2009 located at Curtis Creek, Heart Creek, and Upper Duteau Creek. The purpose is to inventory the annual run-off volumes to the receiving reservoirs within the upper Duteau Watershed. Another hydrometric station was installed in lower Duteau Creek in 2011 to determine water transit time and quantity from the Haddo reservoir to the lower Duteau Creek Station.
2. Two new snow survey courses were set up in the watershed in the fall of 2007. These sites were initiated to observe the difference in snowpack between forest and clear cut sites.
3. In 2012 GVW retained Golder and Associates Ltd. to drill and install ground water monitoring piezometers at the snow course locations. The project included soil moisture and temperature readings at various depths. GVW is monitoring the site and collecting data.
4. GVW is currently upgrading remote monitoring software systems to Siemens technology. Siemens reporting tool, included with the software, will be helpful in this regard.

6.3.2. Further Action:

1. GVW is considering a capital project to install remote flow control infrastructure on the controlled outlets of Aberdeen and Haddo reservoirs. Real-time flow data collection would be a component of the project.
2. GVW will assemble a digital archive of available hydrologic data that can be used to track watershed flows and support the development of a water balance model for water supply forecasting.
3. GVW will speak with Rita Winkler (Penticton Creek Project) to explore hydrological changes and data collection gaps.
4. GVW will investigate data sharing and funding opportunities through grant applications and arrangements with other stakeholders for the purchase, installation and monitoring;

6.3.3. Responsibility, Timeline and Cost

1. GVW; Medium-term; \$50,000 (3 days per year)
2. GVW, MFLNRO; Long-term; (3 days/year)
3. GVW; Short-term; (0.5 day)
4. GVW; Long-term; (2 days/year)

6.4 Water Storage Increase

Recommendation: *It is recommended that the following water quality issues be assessed as part of the decision-making process in raising the Aberdeen Dam.*

- *impacts on nutrient loading in Aberdeen and Haddo reservoirs;*
- *impacts on algal production in reservoirs;*
- *impacts from flooding lands;*
- *preparation of a detailed construction management plan; and*
- *preparation of comprehensive reservoir operation plan for all three reservoirs.*

6.4.1. Response:

1. Raising the dam will have short and long term effects on water quality. GVW has recently started to monitor the outflow of Aberdeen Lake for nutrients and organics. The water quality data assessed at the new sampling site can be used to establish a pre-construction baseline reference for the Aberdeen Dam project.
2. While considering the Aberdeen Dam project, MoE representatives expressed concerns with the downstream hydrologic impacts during the years it would take to fill the expanded reservoir. The temporary loss of a natural high volume flush during the spring freshet was a concern.

6.4.2. Further Action:

1. GVW will respond by reviewing potential water quality and hydrological impacts and determine mitigative measures needed to avoid the identified risks.
2. GVW will commission a water quality and lake limnology impact study prior to project implementation. GVW will review existing water quality data and consider increased data capture and monitoring programs as necessary to monitor lake ecological responses to the project.

6.4.3. Responsibility, Timeline and Cost

1. GVW; Medium-term; (2 days)
2. GVW, MFLNRO; Medium-term; \$15,000 (10 days)

7. Governance: Provincial, Local and Interior Health

Ensuring that land use practices do not impact natural watershed function is part of the multi-barrier approach to source water protection. The Duteau Watershed is open to corporations and individuals for industrial, commercial, and recreational activities that will affect water quality and quantity. To reduce the associated risks to water sources, integrated watershed management and collaboration between stakeholders is a key element to source protection.

GVW is dependent on higher levels of governance to manage land use activities within the watershed. Interior Health has a mandate to protect water sources; however, most activities occurring in the watershed occur under the jurisdiction of other ministries. Also, there is a concern that associations between local and provincial government on matters of water quality are weak (Steeves, 2011).

To facilitate inter-agency accountability and coordination on drinking water protection, provincial ministries jointly developed the Southern Interior Drinking Water Team (SIDWT) through a Memorandum of Understanding agreement signed in 2006. The SIDWT was able to address key issues and respond to inquiries specific to source water protection; however, due to challenges with

committee engagement and uncertainty over mandate, the team recently discontinued regular meetings in the fall of 2011 (IH, 2012). The ability to maintain an integrated watershed planning and management approach for source water protection remains a key challenge to participating ministries (IH, 2012).

GVW works in partnership with the provincial regulatory agencies that are responsible for source water protection. Governance collaboration between ministries and political authorities is fundamental when facing the challenges and pressures associated with watershed health.

GVW recognises First Nations interests in the Duteau Creek watershed planning and will continue to encourage participation from Okanagan Indian Band and Splotsin First Nations.

7.1 Annual Reporting

Recommendation: *MFLNRO provide an annual report to the DWO (for review of) the compliance of activities undertaken in the Duteau Creek watershed under its jurisdiction. Based on the MOU there should be annual reports provided by the agencies to the DWO that report on source protection.*

7.1.1. Response:

1. SIDWT - 2011-2012 Annual Report is available.
2. GVW has provided questions to the SIDWT regarding reporting activities/enforcement under provincial jurisdiction.
3. GVW is a member on the Public Advisory Committee for Tolko's Sustainable Forest Management (SFM) certification initiative. As part of the SFM process, forest companies complete annual audits and provide annual reports to compare against established criteria.
4. RDNO (GVW, RDNO Planning) is a member on the Okanagan Basin Water Stewardship Council.

7.1.2. Future Action

1. GVW will request a meeting with DWO to review stakeholder reporting and auditing requirements. GVW will seek to define the expectations and the responsibilities for the stakeholders.
2. Through the Duteau TAC, GVW will ask MFLNRO if recommended reports are being completed.
3. GVW will develop a letter to SIDWT (or replacement group) requesting the provision of annual compliance reports by the participating stakeholders.

The scope of the reports should include:

- Planning and land use applications, land purchases, licensing, recreational activities, new and proposed management zones, new leases and tenures,
- compliance and outcomes,
- deviations from plans,
- plan amendments and results,
- complaints received and follow-up,
- Infractions and enforcement activities,
- follow-up actions and implementation of mitigation measures, and
- other available information applicable to water quality.

7.1.3. Responsibility, Timeline and Cost

1. GVW; IH; Short Term; (1.5 days)
2. GVW, MFLNRO; Short-term; (0.5 days)
3. GVW; Short-term; (2 days)

7.2 GVW Report

Recommendation: *An annual compliance report should be considered by RDNO.*

7.2.1. Response:

1. Should only proceed with coordination of DWO and MFLNRO (not within current scope of RDNO).

7.2.2. Further Action:

1. See section 7.1.2 above

7.2.3. Responsibility, Timeline and Cost

1. See section 7.1.3 above

7.3 Land around Reservoirs

Recommendation: *GVW may consider a request to provincial Ministries to grant ownership of additional Crown land around the margins of the upland reservoirs.*

7.3.1. Response:

1. Land ownership by the RDNO would allow GVW the authority to control and manage lands around the reservoirs for water quality and public health protection. RDNO at this time owns two small parcels of land at Haddo and Aberdeen.

7.3.2. Further Action:

1. GVW will research opportunities that are available for lands that are not privately owned or leased (see section 3.2.2.3).
2. GVW staff will research appropriate contacts, and communicate with appropriate ministry staff and provincial representatives responsible for tenure or land purchase.
3. GVW will consider bringing matter to RDNO board for resolution to lobby the provincial government to allow for the acquisition of land.

7.3.3. Responsibility, Timeline and Cost

1. GVW, IH; Short Term; (1.5 days)
2. GVW, Provincial representatives; Medium-term; (3 days)
3. GVW; Short-term; (2 days)

8. Educational Initiatives

Raising public awareness of the hazards associated with public drinking water supplies within the Duteau Creek Watershed is an important source protection barrier. GVW and provincial partners

have a responsibility to ensure that people within the watershed understand how their activities and choices can influence water quality.

Educational initiatives can help people within the watershed understand their connections to drinking water protection, and how individuals can modify their activities to protect water quality.

8.1 Community Watershed Signs

Recommendation: *All access roads should have "Community Watershed" signage installed and maintained.*

8.1.1. Response

1. RDNO has funded the placement of signage on each reservoir, and has also posted two new large (4'x8') reflective signs on the roadway entrance leading into the Watershed.
2. Signs have been posted on dams. Gates and rock bollards are used to restrict vehicle access onto dams.

8.1.2. Further Action

1. GVW will maintain an inventory of educational signs that have been posted by GVW. The signs and locations will be photographed using GPS and locations moved onto a GIS database. Annual review to consider where new signs or replacements are needed.
2. A budget has been set aside for annual replacement of damaged and new signs because many signs are found to be routinely damaged by vandalism.

8.1.3. Responsibility, Timeline and Cost

1. GVW; Long-term; (2 days/year)
2. GVW, MFLNRO; Long-term; \$5000/year

8.2 Watershed Fact Sheet

Recommendation: *Consider developing a 'Watershed Fact Sheet' that could be supplied to the public, government agencies and stakeholders. Include information re: watershed, importance of protecting water and what the reader can do to help (ie. avoid contamination of human waste). Also recommend use of RAPP (Report All Poachers and Polluters) 24-hour hotline.*

8.2.1. Response

1. GVW is considering development of a simple communication strategy. GVW would need to identify who is audience, what information to include, and distribution medium (website, pamphlet, signage, ads, etc).

8.2.2. Further Action

1. GVW will work with other stakeholders to create a Watershed Factsheet focused on sustainable activities within the watershed. The main target audience will be recreational users.

8.2.3. Responsibility, Timeline and Cost

1. GVW; Medium-term; (4 days)

8.3 Watershed Awareness Day

Recommendation: *Consider establishing an annual 'Watershed Awareness Day'.*

8.3.1. Response:

1. In 2008 GVW hosted a watershed tour with local elected officials
2. A "Watershed Awareness Day" Initiative would help with public education and would promote buy-in for long term planning. GVW should ensure elected representatives are kept informed about proposed plans and activities.

8.3.2. Future Action:

1. GVW will investigate a "Watershed Awareness Day" initiative in conjunction with other initiatives such as Drinking Water Week or Rivers Day.

8.3.3. Responsibility, Timeline and Cost

1. GVW; Medium Term; (3 days/ year)

8.4 Public Education

Recommendation: *A recreation brochure, focused on source protection should be prepared and distributed.*

8.4.1. Response

1. MFLNRO is developing pamphlet for distribution to the public, staff and contractors that work within the watershed.

8.4.2. Further Action:

1. GVW staff will request progress update on the proposed pamphlet at the next Duteau TAC Meeting.
2. GVW staff will contact and discuss with Okanagan Basin Water Board re: Okanagan wide educational initiatives.

8.4.3. Responsibility, Timeline and Cost

1. GVW; Short term; (0.5 day)
2. GVW; Long-term; (1 day/year)

9. Wildfire

The patterns of climate change suggest periods of prolonged precipitation deficits in the Okanagan (Cohen, et al., 2006). These longer drier periods, coupled with increased recreational activity and the effects of pine beetle, will elevate the risk of wildfire within the Duteau Creek watershed (Dobson & Nolan, 2008).

Identified Risks:

- An intense wildfire could result in the loss of the watershed for water supply for an extended period of time.
- A wildfire could cause serious degradation of water quality related to increased sediment load, phosphates, nitrates and fire retardants.

9.1 Wildfire Preparedness Plan

Recommendation: Consider developing a wildfire preparedness plan that would address drinking water related concerns, include long term fuel reduction plan and firebreak plan (consider with future cut block harvesting plans).

9.1.1. Response:

1. The Vernon Fire Zone coordinators are aware that Duteau Creek is a Community Watershed.
2. Contact numbers for the Vernon Fire Zone are located in the GVW Emergency Response Plan
3. RDNO has an Area D interface Wildfire protection plan

9.1.2. Further Action:

1. GVW will seek to define areas within the watershed that have a high and medium sensitivity to impacts such as wildfire. Areas where wildfire would have the most impact on water quality should be identified and included in a GVW Vulnerability Map. The map information should be shared with the Vernon Fire Zone and identified within the Area D forest fire interface plan.
2. GVW or RDNO should seek opportunities for funding for a fuel reduction plan.
3. GVW will investigate with MFLNRO and Tolko if there is anyone tasked to look at fuel reduction planning within sensitive areas of the watershed.

9.1.3. Responsibility, Timeline and Cost

1. GVW; Medium-term; (3 days)
2. GVW; Medium-term; (2 day/year)
3. GVW, MLFNRO, Tolko; Short-term (0.5 day)

10. Mining, Quarries, and Mineral Claims

Mining and mineral claims are a concern for GVW because of the associated hazards and risks imposed on water quality. There is mining activity occurring within the Duteau Creek watershed, but the level of the activity is, to some extent, undefined.

The DCWP identifies a number of mineral claims. The report also provides an assessment of a rock quarry development at the south end of the Edwin Lakes, south of the Goat Road.

Some BC communities have recently been impacted by mineral claims. In January of 2013, local prospectors upset many residents on Pender Island when they staked over 20 mineral claims over a vast area (Lavoie, 2013). The area included the location of a Capital Regional District water improvement project (Clogg, 2013). GVW water supplies and infrastructure are not isolated from similar risks within the Duteau Creek watershed.

Identified Risks:

- Potential for a variety of water quality impacts.
- Increased industrial traffic on roads that increases risks to the water sources.

10.1 Mining Referrals

Recommendation: *GVW to contact MEMPR office and arrange a meeting to present the Mines Inspector with a copy of the DCWA and review issues and concerns specific to the MEMPR. All development proposed by MEMPR in the watershed should be referred to GVW for review. Review operations of known mining activities in the watershed. GVW to confirm if there are impacts to source water supplies at the quarry at the south end of the Edwin Lakes, south of the Goat Road.*

10.1.1. Response:

1. In January of 2010 GVW received a referral and provided comments towards a proposed mineral mine in the Duteau Creek Watershed. The proponent had applied to extract 10,000 tonnes of rock every five years.
2. A representative from the Ministry of Energy and Mines has been invited as a stakeholder to attend the TAC meetings. The representative has attended some preliminary meetings by teleconference call.

10.1.2. Future Action

1. GVW will inquire and attempt to ensure that RDNO is referred applications for proposed mining activity, quarries, gravel extraction and mineral claims within the Duteau watershed via Front Counter BC. Due to concerns with transportation routes and groundwater movements between watersheds, large scale proposals within adjacent watersheds should also be referred.
2. GVW will request to arrange a meeting with the Mines Inspector in Kamloops to discuss current activities in the watershed and to request referrals. GVW Staff will inquire about current auditing and enforcement.

10.1.3. Responsibility, Timeline and Cost

1. GVW; Short-term; (1 day)
2. GVW; Short-term; (2 days)

11. Source Protection Response Plan Implementation

11.1 Annual Update of Response Plan

Recommendation: *GVW and IHA should review the source protection response plan annually and update on a 5 year basis (or as a result of significant increase to risks to source water).*

11.1.1. Response

1. The prioritization of recommendations and implementation of the current assessment has been on-going since 2009.
2. A Technical Advisory Committee meets twice a year to follow up on previous year action items and to develop an annual work plan.

11.1.2. Further Action

1. GVW will hold regular meetings with IH to review work plans and progress. A work-plan reference and checklist will be developed to track the progress of activities, targets and communications with stakeholders.

2. GVW will review emergency response procedures annually for items such as wildfire, landslides and peak flow events and sudden reservoir drawdown. Contact numbers within the GVW Emergency Response Plan will be updated annually or as required.
3. TAC members will be asked to report on their indicators (measurable) annually before April 31st.
4. GVW will compile this information for an annual Watershed report that will be prepared and provided to the TAC and IH.
5. GVW will plan to perform a complete watershed assessment every 10 years.

11.1.3. Responsibility, Timeline and Cost

1. GVW; Long-term; (1.5 days/year)
2. GVW; Long-term; (0.5 days/year)
3. GVW, MFLNRO, Tolko, range operators; Long Term; (0.5/year day)
4. GVW; Long-term; (4 days/year)
5. GVW; Long-term; (2 days/year)

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Citation

This report may be cited as...

Regional District of North Okanagan – Greater Vernon Water (2014, April). *Duteau Creek Watershed Assessment Response Plan*. Prepared by John Bartell, Water Source Protection Coordinator; Reviewed and edited by Renee Clark, Water Quality Manager.

List of Acronyms

BCTS – British Columbia Timber Sales

BMP(s) – Best Management Practice(s)

DCWA – Duteau Creek Watershed Assessment and Recommendations for Source Protection

DTAC – Duteau Technical Advisory Committee

DWO – Drinking Water Officer

ECA – Equivalent Clearcut Area

GIS – Geographic Information System

GVW – Greater Vernon Water

IH – Interior Health

JOP – Job Opportunity Project

MEM – Ministry of Energy and Mines

MFLNRO – Ministry of Forest, Lands and Natural Resource Operations

MPB – Mountain Pine Beetle

OBWB – Okanagan Basin Water Board

ORV – Off-Road Vehicle

RDNO – Regional District of the North Okanagan

RAPP – Report All Poachers and Polluters

SIDWT – Southern Interior Drinking Water Team

SFM – Sustainable Forest Management

TAC – Technical Advisory Committee

Appendix A

REGIONAL DISTRICT OF NORTH OKANAGAN Duteau Creek Watershed Technical Advisory Committee Terms of Reference



REGIONAL DISTRICT OF NORTH OKANAGAN

Terms of Reference Duteau Creek Watershed Technical Advisory Committee

The Regional District of North Okanagan / Greater Vernon Water received the final report for the Duteau Creek Watershed and Recommendations for Source Protection in December 2008 (Kerr Wood Leidal Consulting Engineers and Dobson Engineering Ltd.) The implementation stage is the key to a successful source water protection program. The first stakeholder meeting was held on February 19, 2009. It was agreed that the goal was to protect the quality and quantity of Duteau Creek with the understanding that Duteau Creek is a Multi-use Community Watershed, that the stakeholder meetings are to be collaborative planning rather than conflict resolution, to increase knowledge of all stakeholders and to find creative yet sound ways to move forward with the recommendations in the Assessment.

1. Role of the Technical Advisory Committee (TAC)

1.1 The role of the TAC is to provide the Regional District of North Okanagan/ Greater Vernon Water staff with comments and recommendations on objectives, strategies, policies, and land use legislation that may be considered to protect water quantity and quality and the implementation of the protection plan. The TAC will also work collaboratively with the GVW manager and staff on:

- 1.1.1 Provide advice (i.e. bulletins, posters, signage, website links and presentations) aimed at raising awareness of source water protection and the effects of land use on water quality and quantity.
- 1.1.2 Acting as a resource for RDNO/GVW management and staff for integrated resource management as well as a liaison to the ministry or licensee they represent.
- 1.1.3 Identifying opportunities that may be available through other agencies or programs to implement strategies to protect source water.
- 1.1.4 Identifying threats that may delay or impair the implementation of the protection plan.
- 1.1.5 Developing collaborative solutions that follow SMART (Specific, Measurable, Achievable, Realistic, Time- Bound) principles.

2. Composition of Committee

2.1 The TAC for this protection plan should include representation from most stakeholder agencies that will be responsible for implementation of the plan. It shall be composed of representatives from Provincial and Federal Ministries, road engineering and maintenance, (MOF, Tolko) range and range tenures

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(MOF, Coldstream Ranch, Gary Andrews) MTCA, DFO, IHA, MOE, mining, Forestry licences, Conservation and Enforcement, Splatsin, Okanagan Indian Band #1 and Regional District management and staff. Information is to be provided even if the member is not able to attend. The committee may be expanded as needed to suit the implementation matter at hand.

3. Chairperson of Committee

3.1 The Chairperson shall be Regional District of North Okanagan staff or management.

4. Meetings of the Committee

4.1 The Committee will meet two (2) times per year. The first meeting held in February is review previous years reports, to develop actions for the coming year and to capture some of the grant applications, etc (Members to provide information/report to chairperson in December). Second meeting in later September, early October – field day

5. Order of Business

5.1 The order of business will be indicated in the meeting agendas.

5.2 Agendas will be prepared by the Chairperson and provided to the group fourteen (14) days in advance of the next meeting date.

6. Record of Meetings

6.1 Regional District staff will be responsible for preparation of the records of all Committee meetings.

6.2 Records and all related documents shall be available thirty (30) days following the meeting.

7. Conduct of Members at Meetings

7.1 Committee members are expected to be respectful of one another and to offer input and suggestions that are relevant, constructive and productive.

7.1.1 Members should be committed to providing advice focused on developing recommendations.

7.1.2 Members will respect the ideas, concerns and opinions of others.

7.1.3 Everyone will have an opportunity to speak, but only one person shall speak at a time. There will be a timekeeper to ensure all persons concerns are heard within allotted time.

8. Reporting

8.1 Annual reports should be available to the Technical Advisory Committee thirty (30) days prior to the first meeting of the year as per criteria as outlined by RDNO.

Appendix B

Best Management Practices on Crown Range in Community Watersheds

Regional District of North Okanagan

9848 Aberdeen Road
Coldstream, BC V1B 2K9

**Best Management Practices
on Crown Range in Community Watersheds**



**Range Branch
Ministry of Forests, Lands and Natural Resource Operations
British Columbia
June 2011**

Best Range Management Practices on Crown Range in Community Watersheds in British Columbia

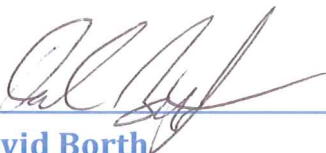
Foreword

British Columbia has a long history of multiple uses in its watersheds and there is legislation that protects watershed hydrology and water quality. The province is 94% Crown land and without access to it, the beef cattle, forest, mining, guide-outfitting, and recreation (both commercial and private) sectors would not be viable. The economy of BC and of local communities is dependent on resource industries having ongoing access to Crown land. Livestock grazing has occurred on Crown range for about 140 years and has been regulated since the formation of the BC Forest Service in 1912.

The North American science of range management dates back over 100 years and there is a large body of published research, some of which is specific to BC. Over the past 35 years there has been significant research into livestock impacts on riparian systems and water quality, and Range Branch has been monitoring the health of riparian systems since 1994. The *Forest and Range Practices Act (FRPA)* regulates livestock grazing on Crown range and provides protection of water values.

The government of British Columbia recognizes the importance of water and has embarked on a Water Act modernization process which will deliver a new *Water Act* by 2012. It is important for the Ministry of Forests, Lands and Natural Resource Operations to be engaged in the process because we manage such a large portion of the land in BC and administer thousands of Range, Land, and Forest Act tenures.

In addition to the practice requirements under FRPA, the Range Program has developed and is implementing these best management practices (BMPs) for livestock grazing in community watersheds in co-operation with local health authorities, water purveyors and range tenure holders.



David Borth
Director, Range Branch
Ministry of Forests, Lands and Natural Resource Operations

June 3, 2011

Date

Background

Most communities in British Columbia get their drinking water from surface sources that are susceptible to contamination from overland flow, seepage and direct inputs. Much of the infrastructure (including dams and water intakes) in community watersheds was developed to supply irrigation water many decades ago. Water intakes are commonly found in creeks and open canals that are unprotected from surface runoff and human and animal access. Today the public is expecting this same infrastructure to provide clean drinking water without the necessity of treatment. Although a better long-term solution might be to place intakes deep in lakes and pipe the water to the water filtration plant, this is costly.

Several water borne disease outbreaks during the past decade have raised the level of concern about management and treatment of community water supplies. In response, the Auditor General released a performance audit on *Protecting Drinking Water Sources* (1999) that raised significant concerns, and in 2001 the British Columbia Legislature passed the *Drinking Water Protection Act*.

Several boil water advisories were issued in British Columbia during the summer of 2009 resulting in challenges to how range staff and range agreement holders managed livestock in community watersheds. While livestock grazing is an authorized and legal use of these watersheds in British Columbia, it does not necessarily mean that status quo management is acceptable. If livestock use causes long-term changes to background water quality, quantity and timing of flow, there will be pressure to have range use phased-out. This document is intended to provide information on how we manage livestock use within community watersheds.

The four basic principles of range management apply wherever livestock are grazed:

- Distribute livestock over the range.
- Graze to the right use level.
- Allow enough rest during the growing season.
- Graze at the right time.

Distribute livestock use over the range

Livestock are creatures of habitat and will not typically distribute themselves uniformly over the range, even if topography is not an issue. Bulls-eye grazing patterns are typical on most range areas, with water sources, flat terrain and shaded areas receiving disproportional use. These are referred to as primary range. Unless effort is taken to distribute use through water development, strategic fencing, herding and the use of attractants, these areas of primary range tend to be overgrazed and over-used.

Use level

In the past, 50% of annual forage production was seen as the safe level of use. Recent analysis has shown that this is a poor rule of thumb. On average, late-seral range should be used at no more than 40% of production, mid-seral at 30% and early-seral at 17-25%. Some domestic forages can be used at a higher level because they are adapted to grazing and usually have growing points that are low to the ground and not easily removed by the grazing animal. We have also learned the importance of leaving plant residue to protect the soil from erosion and the evaporative effects of sun and wind. Plant residue is the first step to recovery on early-seral and damaged range.

In addition to grazing at the right levels, it's important to have enough stock numbers to get even use of grass plants. Studies have shown that plant communities respond best with higher stock densities¹ (but lower overall stocking rates²), because cattle will not graze as selectively. This translates to more even access to soil moisture and nutrients and an equal opportunity to grow roots, leaves and store food reserves.

Rest

Overgrazing and over-use are not the same thing. Over-use happens when more of the annual growth is removed than is recommended, for example if 40% use is considered safe, and 60% is actually removed. Overgrazing happens when a plant (and a range) is grazed so severely and so frequently that it does not have an opportunity to recover. A plant might be over-used, but if it has a long recovery period during active growth, it's not necessarily a harmful thing.

Specialized grazing systems typically allow growing plants a period or periods of time when they are free from grazing.

On bunchgrass range we find that rest-rotation grazing, where portions of the range are rested for one entire year in and 3 or 4 year cycle work best. Research has also shown that native bunchgrasses cannot be grazed in a twice-over rotation or in a spring and fall pattern during the same growing season. Most native grasses need from 110 to 200 days of actual growth to recover from a single grazing. In some cases, range should be grazed only once in two years. This is especially true at high latitude and at high elevations where the growing seasons are short but intense.

Time

Graze the range at a time when plants and soil won't be harmed and there is enough forage to sustain the grazing animal. There needs to be at least 15 cm of new growth for cattle to graze efficiently. Also it's best not to graze the same fields at the same time each year and to control the length of time cattle have access to the pasture unit.

¹ Stock density is the number of animals on an area of land at a moment in time. For example, 100 animal units (cows) on 20 ha.

² Stocking rate is the number of animals or animal units on an area of land over a time period typically a 30 day month. For example 0.25 AUMs/ha or 4 ha/AUM

Dormant season (winter) use might be a better choice on some lower elevation bunchgrass range. Research shows that dormant season use is less damaging to grass plants and soil. Biological soil crusts (nitrogen fixing lichens) are not damaged by winter use and provide the benefit of evenly distributing and releasing cost free nitrogen at the time when range grasses are ready to grow.

We have expanded and refined the above principles in this document for community watersheds.

What we know

- Coliform bacteria occur naturally in the soil and in decomposing vegetation. Background non-fecal coliforms will be present in most natural riparian systems especially where there is decomposing vegetation from roots, leaf fall and woody debris. Total coliforms are a good indicator of water quality and are relatively easy to sample and test. It is very costly to test for parasites such as *Cryptosporidium* and *Giardia*; both parasites are commonly carried by native birds and mammals.
- Pathogens attach to fine sediments. When sediment is disturbed by a storm event, or by people animals or vehicles travelling in or crossing a stream, pathogens can be re-suspended and travel downstream. This is why boil water advisories often occur during times of high turbidity;
- Nature has its own predator-prey relationships. Dung beetles destroy *Cryptosporidium* cysts; many forms of protozoans feed on coliforms such as *E. coli*;
- *E. coli* is killed by direct sunlight and by drying. Cow dung that is deposited in open sunlight in open meadows and grasslands poses less risk than cow dung deposited in a shaded forest understory.;
- *E. coli* survives best in water at pH 7 or higher;
- A study of four streams in the Vernon area showed that human, wildlife, pets and livestock are all *E. coli* contributors;
- A 450 kg (1,000 lb) cow will defecate 12 times per day at 2.3 kg (5 lbs) /defecation. 95% of the feces directly deposited into a stream will settle within the first 50 m. Bacteria in the sediment may remain active for several weeks or months. Daily input of feces will accumulate as long as livestock have unrestricted stream access, and any disturbance can re-suspend sediment;
- Cattle, themselves, can become infected by pathogens introduced by other warm-blooded animals, and then because of their high feces production, become secondary vectors of the disease;
- Nitrogen, phosphate and potassium can be introduced to riparian systems through livestock feces and urine. These nutrients can promote the growth of algae and pathogens in water. Saturated (anaerobic) riparian soils, especially those dominated by

sedges, have the capacity to capture and neutralize these nutrients and prevent eutrophication of the system;

- During high flows, sediment spills out and settles on the flatter floodplains of lower gradient stream reaches. It is important to have good vegetation cover and stubble to capture and filter this sediment;
- Runoff occurs along trails carrying sediment and fecal contamination into streams, wetland and lakes;
- Reservoir drawdown areas pose particular challenges as livestock often congregate, feces accumulates and then is flooded when water levels rise;
- Off-stream watering alone will greatly reduce (by up to 95%) the time cattle spend in streams.

What we can do

Management efforts are focused and range infrastructure is built with emphasis around reservoirs/lakes and their outflows, along the mainstems of creeks and upstream of water intakes.

1. *Apply Prescription (Rx) grazing*

- To maintain a healthy upland and riparian plant community that can capture precipitation, stabilize soils and act as a filter for sediment and contaminants. Grazing at the right time and at an appropriate level, followed by planned rest will allow plant communities to remain healthy and productive. There is no substitute for a healthy plant community;
- We can safely graze wet meadow riparian zones that are sedge/reedgrass/willow communities; we can safely graze dry adjacent uplands; graze to a prescribed stubble height;
- Limit time and timing of use so that cattle will not spend excessive time and use too much riparian vegetation;
- Graze some areas during the cooler season so that cattle will not spend all of their time in the shaded riparian zone. When the air temperature exceeds 32° C, especially with high humidity, cattle will become heat stressed and spend most of their time under shade;
- Riparian areas are more resilient than dry uplands because their higher soil moisture allows plants to regrow after grazing. Riparian soils are however susceptible to compaction if use is seasonlong and heavy. Apply rest to allow damaged plant communities and compacted soil to recover.

2. *Range developments*

- Where necessary, prevent livestock access to streams and lakes. Provide buffers by strategic fence and barrier placement near outlets. For example, in Okanagan-Shuswap FD, a 200 m exclusion zone around outlets is the norm.
- Restrict the time and timing of livestock access to the shorelines and outlets of reservoirs having seasonal drawdown.
- Create distinct riparian pastures that allow controlled timing and access to riparian features;
- Limit livestock watering to hardened access points (nose holes) that prevent direct access to a stream wetland or lake;
- Provide off-stream water using gravity feed systems, nose pumps or sling pumps;
- Use a float valve, or pipe overflow water back to the water source to prevent fecal contamination in runoff;
- Exclude livestock from the vicinity of water intakes. The exclusion distance will depend on the stream gradient and the presence or absence of an herbaceous riparian buffer zone. For example, in Okanagan-Shuswap FD, a 1 km exclusion zone upstream of the intake is the norm;
- Strategic domestic forage seeding of cutblocks can be used to draw livestock use away from sensitive areas.

3. *Management practices*

- Fecal deposits will increase next to water troughs and attractants. Make sure to place these where run-off won't carry feces into water;
- Use attractants, such as salt, well away from the riparian zone, and place them in covered leach proof containers;
- Actively herd to distribute livestock over the range and prevent lounging in the riparian zone;
- Place rectangular, weed free bails as filters on livestock trails. These work best on sandy, coarse textured soil.

4. *Animal health*

- Treat sick animals, and remove any animals that are scouring;
- Do not turn calves under 4 months of age on Crown range within community watersheds (young calves are often *Cryptosporidium* carriers);

- Remove or dispose of the carcasses of dead animals from riparian zones.

5. *Make changes where coliform counts become high*

- Pick up and dispose of feces if accumulation is a problem;
- Move livestock to another pasture in the rotation.

What we can't do

1. Fence out all riparian areas. Logistics, costs, and hazards to people and wildlife make this an unrealistic option.
2. Prevent all potential water contamination by livestock. It may be impossible to manage cattle and prevent water contamination where a stream is within a narrow canyon and cattle travel is restricted to a narrow riparian zone. In these cases, fecal deposits adjacent to the stream, soil trampling and sedimentation may be unpreventable. Streams that are steep gradient, without floodplain access and lacking filtering vegetation are especially susceptible to livestock impacts on water quality; livestock exclusion fencing may be the only reasonable remedy.
3. We can't eliminate natural coliforms from any stream or wetland system.
4. We can't prevent wildlife and human use of community watersheds.

Appendix 1 Link to Rangeland Health Brochures

<http://www.for.gov.bc.ca/hra/Publications/index.htm>

Appendix C

Invasive Plant Management Plan for the Southern Interior of British Columbia

Regional District of North Okanagan

9848 Aberdeen Road
Coldstream, BC V1B 2K9



**Invasive Plant
Pest Management Plan
for the
Southern Interior of
British Columbia**

**Range Branch
BC Ministry of Forests and Range**

MFR PMP 402-0656-10/15

Spring 2010

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Appendix 1. Map of the Plan Area

Appendix 2. Invasive Plant Treatment Calibration Record

Appendix 3. Example of Pesticide Use Notice

Executive Summary

An invasive plant is any introduced, alien plant species that has the potential to cause undesirable or detrimental impacts to human or animal health, the economy, and/or ecosystems. Invasive plants may displace native plant species, decrease biodiversity, reduce available forage and browse for wildlife and domestic animals, reduce habitat for rare and endangered species, contribute to loss of aesthetic values, and cause changes to ecological community structure and function. Some of these plants are toxic to humans and/or animals. Efforts to reduce their cumulative impacts are best achieved through an integrated approach of prevention and control.

The *Ministry of Forests and Range Act*, Section 4, outlines the Ministry's purpose and function to encourage maximum productivity of, and to manage, protect, and conserve its forest and range resources; managing invasive plants is an important component of this function. The goals of the Ministry of Forests and Range Invasive Plant Program are to: 1) prevent the establishment of new invasive plant species, 2) to contain the spread of existing invasive plant populations, and, 3) to minimise their impacts on ecosystems and resources on Crown land. In order to meet these goals, the principles of Integrated Pest Management are applied to deliver a balanced approach that uses a combination of knowledge, best practices, and actions to achieve invasive plant management objectives.

In British Columbia the *Forest and Range Practices Act* and accompanying Regulations require forest and range tenure holders to incorporate measures in their forest and range plans to prevent the introduction or spread of 42 listed invasive species. The *Weed Control Act* and Regulations require land occupiers, as defined in the Act, to control 21 provincially listed noxious weeds on both private and public land. The *Integrated Pest Management Act* and Regulations provide the statutory authority to allow pesticide use on public lands as described in a Pest Management Plan.

This Pest Management Plan was developed by the Ministry of Forests and Range, Range Branch, Invasive Plant Program in compliance with the *Integrated Pest Management Act* and Regulations. It outlines an Integrated Pest Management approach for the control of invasive plants on provincial Crown land, and it includes prevention strategies, manual/mechanical treatment methods, biological and cultural controls, and the use of herbicides.

The Plan covers the treatment of invasive plants in the southern interior of British Columbia. The area encompassed by the Pest Management Plan includes threatened grasslands, extensive geographic and community watersheds, vast timber, agricultural, recreational and ecological values, as well as endangered native species and plant communities, critical wildlife habitat values and unparalleled biodiversity.

1 Introduction

Section 24(2)(g) of the *Integrated Pest Management Regulation (IPMR)* requires the preparation of a Pest Management Plan (PMP) for herbicide use for the management of invasive plants on more than 50 hectares a year of public land (i.e. provincial Crown land).

A PMP is a plan that describes:

- the program delivered to manage invasive plant populations and reduce damage caused by these plants based on integrated pest management (IPM); and,
- methods for handling and applying herbicides to meet program objectives.

1.1 Purpose and Objectives of this PMP

This PMP describes how the Ministry of Forests and Range (MFR) will achieve effective management of invasive plants on provincial Crown land within the southern interior of BC using the principles of IPM, while protecting environmental and human health values.

The objectives of the PMP are to ensure the following:

- legal accountability with the provisions of the *Integrated Pest Management Act (IPMA)* and *IPMR*, as well as applicable federal, provincial and local government laws and regulations;
- the responsible use of herbicides;
- the effective use of IPM principles; and,
- public and First Nations awareness of, and input into, invasive plant management at the landscape level.

All existing populations of invasive plants may not necessarily be treated under this PMP; in some cases existing populations may be prevented from expanding beyond a defined containment boundary, whereas other populations may be too extensive to effectively treat except on extremely high value sites. Generally, the focus of treatments will be on invasive plants that are expanding into new geographic areas, and those on the leading edges or gaps between treatment areas where there is a risk of further spread into previously uninhabited, susceptible areas.

1.2 Plan Holder and Description of the PMP Area

The PMP holder will be the BC MFR.

The plan area will be specific to provincial Crown land within the geographic area defined as the Southern Interior Forest Region, with the northern boundary modified to align with boundaries delineating the Cariboo, Central Coast, and Thompson Nicola Regional Districts. The eastern, western and southern extents of the Southern Interior Forest Region constitute the remaining boundaries of the plan.

Appendix 1 contains a map showing the geographic boundaries of the area covered by this PMP.

1.3 Use of Plan on Provincial Crown Land

This PMP will provide the guidance for invasive plant management on Crown land. It is recognized that many areas serve as vectors of spread for invasive plants, such as Forest Service road systems, recreation sites and trails. Control of invasive plants in these areas is a critical component of a regional approach to successful invasive plant management. The MFR works collaboratively with regional weed committees to implement effective invasive plant management regimes across jurisdictions, where appropriate.

Partnering agencies may be authorized to use this PMP for invasive plant management activities on Crown lands, provided that the following are adhered to in a signed letter of agreement:

- Compliance with the contents of, and commitments made in this PMP; and
- Compliance with the requirements of the *IPMA*, *IPMR*, and other applicable federal and provincial legislation (e.g. the Parks Act and the Ecological Reserve Act).

1.4 Term of Plan

This plan shall be in effect for a five-year period from April 1, 2010 to March 31, 2015.

1.5 Persons Responsible for Managing Invasive Plants

The persons responsible for coordinating the management of invasive plants under this PMP, and the principal contacts for information related to this plan are:

Catherine MacRae, P.Ag.
Invasive Plant Specialist
Ministry of Forests and Range
Range Branch
1907 Ridgewood Road
Nelson, BC V1L 6K1
Tel: (250) 825-1159 Fax: (250) 825-9657
E-mail: Catherine.MacRae@gov.bc.ca

Percy Folkard, P.Ag.
Invasive Plant Agrologist
Ministry of Forests and Range
Range Branch
441 Columbia Street
Kamloops, BC V2C 2T3
Tel: (250) 371-3841 Fax: (250) 828-4987
E-mail: Percy.Folkard@gov.bc.ca

1.6 Public Use Within the Plan Area

The principal land uses within the PMP area are forestry, agriculture, tenured grazing, mining, recreation, hunting, fishing, medicinal and food plant gathering, and guide-outfitting. The area is well known for its land- and water-based recreational values; there are many high use Provincial Parks and Protected Areas including conservation areas, conservancies, recreation areas, resort tenures, and wilderness recreation sites that are popular tourist destinations. Non-consumptive activities such as hiking, photography, boating and research activities are also popular.

2 Invasive Alien Plants and Noxious Weeds

Invasive plants are plants that are non-native or alien to the ecosystem under consideration. Their introduction causes, or is likely to cause, economic or environmental damage, or harm to human health. In B.C. the term invasive plant is synonymous with invasive alien plant.

These plants threaten the natural environment and are recognized globally as the second greatest threat to biodiversity. Free from the plant pests that keep them in check in their native ranges, invasive plants reproduce rapidly and spread aggressively, dominating natural areas and altering biological communities. The result of these invasions can include reduced recreation and crop values, displaced native vegetation that is important forage for wildlife and livestock, reduced biodiversity including species at risk, and damaged native ecosystems.

For the purposes of this PMP, the following definitions apply:

Invasive plant - any invasive alien plant species that has the potential to cause undesirable or detrimental impacts to our economy, human health, animals or ecosystems. Invasive plant species may be listed under the *Forest & Range Practices Act (FRPA)*, Invasive Plant Regulation, administered by MFR.

Noxious weed – any weed designated by regulation to be noxious under the *BC Weed Control Act (WCA)* and Regulations, administered by the BC Ministry of Agriculture and Lands.

In the context of this PMP, the term “invasive plant” will be used to include both invasive alien plants and noxious weeds.

2.1 How Invasive Plants are Spread

Problems caused by invasive species have increased dramatically in recent decades, due in part to growth and spread of human populations. Population growth leads to greater disturbance of the land, increased demand for food and fiber, overuse of public land for recreation and commercial production, increased international travel, and globalization of world trade. All of these encourage the introduction, establishment, and spread of invasive plant species.

Although wind, water, domestic and wild animals can disperse invasive plant seeds, human activity is often the dominant cause of invasive plant introductions and/or spread. Invasive plants are introduced and/or spread by the following activities:

- Construction and maintenance: movement and transportation of soil and fill on highways, secondary roads, utility corridors, rail lines, pipe lines and power lines;
- Forestry operations: road/landing/skid trail building and maintenance, machinery movement during harvesting, post harvest site preparation, and log hauling;
- Range management activities: over-grazing, herding livestock, construction of stock trails, water developments, fences and corrals;
- Mining operations: road building and maintenance, movement of machinery, creation of permanent openings in the forest canopy;
- Horticultural practices: importing and planting species which over time become invasive, careless disposal of garden refuse, and unintentional seed introduction in soil; and
- Recreation activities: disturbance of soil by all-terrain and other vehicles, spread of invasive plants by vehicles, boats, camping equipment and clothing, and the spread of aquatic plants in watercourses.

2.2 The Need to Control Invasive Plants

Hundreds of species of plants have been intentionally or unintentionally introduced to North America since European exploration and settlement began. Many of these alien plants become nothing more than nuisance weeds to gardens and human-influenced landscapes, however, a small proportion end up as serious threats to natural areas and native ecosystems. These serious threats are those invasive plant species that will be addressed by this PMP.

There are also legislative requirements to control invasive plants. The *WCA* and Regulations require land occupiers, as defined in the Act to control 21 species of provincially listed noxious weeds on both private and public lands, as well as an additional 25 species that are identified as noxious within specified Regional Districts.

There are a number of traits that can be used to describe the nature of invasive plants in comparison to native species; some of which include but are not limited to the following:

- Fast growth rates;
- Prolific seed production and/or vegetative reproduction;
- Irregular germination ability allowing establishment during non-ideal conditions;
- Ability to alter soil conditions to benefit only the invasive species in question;
- Production of toxins to ward off grazers and/or predators; and
- Unhindered growth and reproduction resulting from introduction without the predators that impact the plant in its native habitat.

Because of these traits, their ability to outcompete native plants can result in large, dense infestations that have the ability to:

- Cause a decline in plant and animal biodiversity;
- Alter soil nutrient and hydrological cycles;
- Reduce soil productivity by affecting mycorrhizal fungi or changing chemistry (allelopathic chemicals);

- Negatively affect the habitat of rare and endangered species;
- Reduce the quality and quantity of forage for grazing and browsing wildlife and livestock;
- Decrease the quality of water and fish habitat;
- Change ecological community structure and function; and
- Alter fire regimes.

3 The Integrated Invasive Plant Management Program

This PMP aims to achieve effective, long-term invasive plant control and management that is compatible with legislation, societal values, and environmental resources. IPM is a decision making process for determining what actions will be taken when pest problems occur. In IPM programs, all available information is considered in order to manage pest populations effectively in an environmentally sound manner. Generally the first step in an IPM program is to prevent organisms from becoming pests, by stopping establishment of new pests and keeping established pests at an acceptable level that causes minimal damage. When applied appropriately, this process results in improved management, lower costs, ease of maintenance, and reduced environmental and economic impacts.

Successful implementation of an IPM program requires the following:

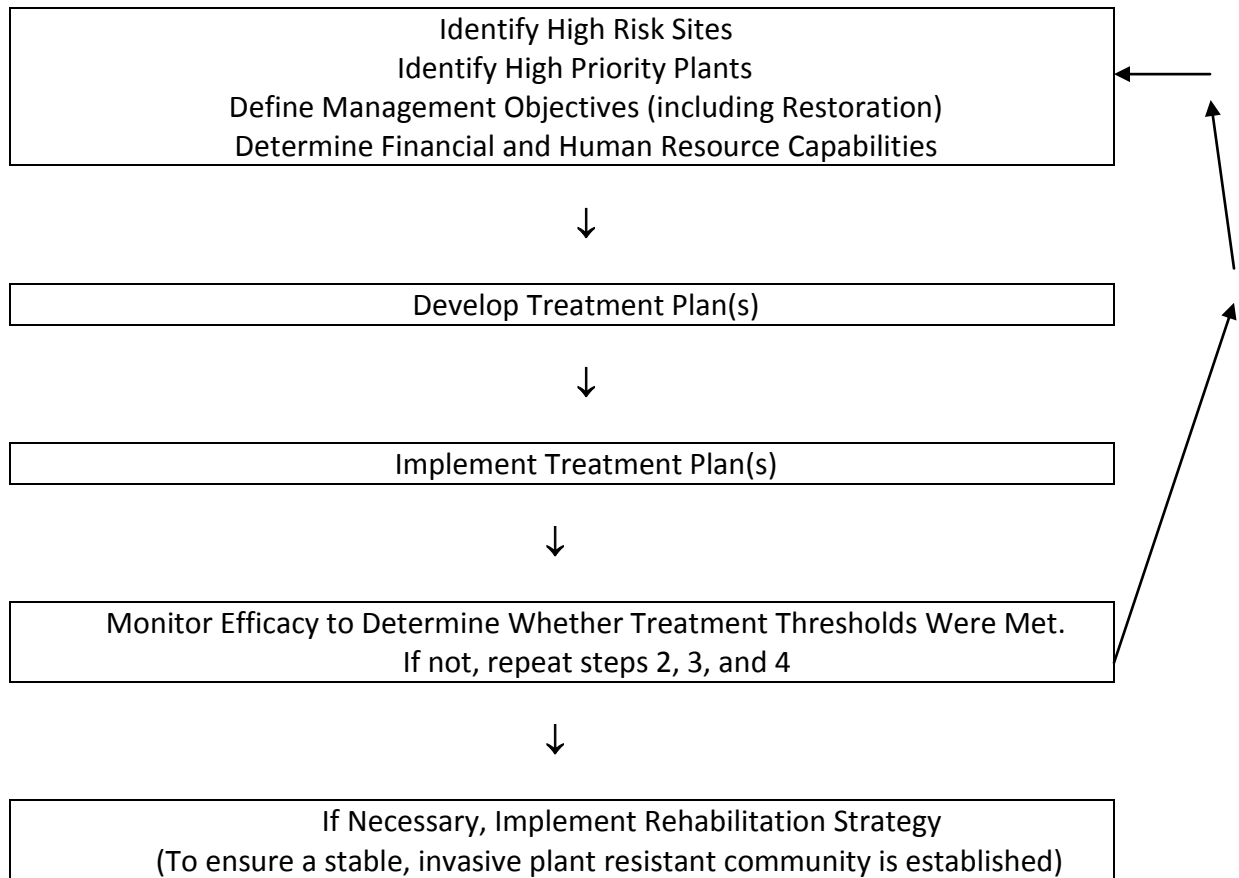
- Strategic, monitoring-based, prevention-oriented management;
- Extensive communication and cooperation among federal and provincial agencies, non-government organizations, First Nations, local governments, private industry, and landowners;
- Public education and awareness programs implemented in cooperation with local weed committees; and
- Continued resourcefulness and innovation by invasive plant managers.

The elements of an IPM program for this PMP are as follows:

- Prevention;
- Identification;
- Surveys, Inventory and Data Management;
- Management Strategies;
- Establishing Priorities;
- Invasive Plant Treatment Options;
- Treatment Method Selection; and
- Monitoring and Evaluation.

MFR and agencies authorized to conduct activities under this PMP are committed to the principles and practice of IPM, and to the implementation of IPM steps as outlined in Figure 1.

Figure 1: IPM Steps for an Effective Invasive Plant Management Program



3.1 Prevention

Preventing the initial establishment and spread of invasive plants is the single most effective method of invasive plant control. Invasive plants will invade those areas that provide suitable habitat for their survival and proliferation. Often this includes areas of soil disturbance such as road and recreation trail developments, right of way clearing for fence construction, and timber harvesting. Preventing invasive plant seeds or propagules from being deposited on these sites, revegetating disturbed areas to ensure vigorous competing vegetation, and maintaining healthy, native plant communities through appropriate grazing management practices are important preventative measures.

Consideration of invasive plants is a required component of Forest Stewardship Plans, Range Use Plans, and Range Stewardship Plans. Anyone carrying out a forest or range practice must perform measures to prevent the introduction or spread of invasive plants listed in the *Invasive Plants Regulation of the Forest and Range Practices Act (FRPA)*, as prescribed in operational plans or as authorized by the minister.

The MFR Invasive Plant Program provides information for licensees to consider when developing invasive plant measures in their operational plans. The guidance is focused on preventing and minimizing the establishment and spread of invasive plants through managing dispersal vectors and

establishing or maintaining healthy competitive vegetation. Some examples of measures license holders may consider incorporating include:

- Maintain soil, subgrade or surfacing material that is being moved during road construction as free as practicable of invasive plants or seeds;
- Educate staff and contractors to identify priority invasive plant sites that exist or threaten to establish within the plan area;
- Keep equipment yards and storage areas as free of invasive plants as practicable using mechanical, cultural or chemical treatments;
- Inspect clothing and vehicle/equipment undercarriages for plant parts or propagules if working in an area known to contain invasive plants;
- Remove (clean and wash) plant seeds or propagules from clothing and/or equipment by dislodging and containing associated water, mud and dirt on-site or at designated cleaning stations;
- Keep roadside infestations sufficiently away from road surfaces so that plant parts or seeds are not inadvertently transported by vehicles and equipment;
- Keep equipment and/or livestock out of infested areas where practicable;
- Manage grazing to maintain healthy plant communities that are resistant to invasive plant establishment and invasion; and
- Re-vegetate disturbed areas adjacent to, or known to be at risk from priority invasive plant establishment using an appropriate combination of scarification, seeding with grass seed that is predominately free of invasive plant seed such as Common #1 Forage Mixture or better, fertilizer mulch or other. This activity could occur as: a) part of road, landing and skid trail construction or maintenance or site preparation; b) after woody debris piles are burned, following timber harvesting of fence or fence line clearing; c) around range developments and areas of cattle congregation.

3.2 Identification

Accurate identification of invasive plant species and recognition of the threat posed by new invaders is a fundamental requirement for successful invasive plant management programs. Several resources are available for accurate identification of invasive plants. Dichotomous keys are useful for ensuring accurate species identification and E-Flora BC provides an electronic atlas accessible to anyone with internet access. The Ecology section of Research Branch within MFR maintains a herbarium of native and introduced plant samples collected from BC, and the Royal BC Museum may also occasionally provide species identification services to the Invasive Plant Program. All staff and contractors engaged in managing invasive plants are provided plant identification training and reference materials.

3.3 Surveys, Inventory and Data Management

Invasive plant surveys are observations made at a single point in time to determine the occurrence of one or many species within a defined landscape. The difference between a survey and an inventory is that an inventory is a cataloguing of all invasive plants of concern within a management area, whereas a survey is an individual observation or a sampling of a representative portion of a larger

landscape. In other words, an inventory is the overall picture within the geographic area, which is made up of one to many invasive plants surveys.

Inventories of invasive plant species within the PMP area are required to effectively develop and implement provincial, regional, and local management strategies, and to measure program success. Surveys and inventories can be conducted at different intensity levels, or categories, depending upon the individual situation.

Invasive plant surveys focus primarily on those species listed either under *FRPA's Invasive Plant Regulation*, or in the *WCA Regulation*, or on priority species identified by local weed committees which are not regulated by provincial legislation. Surveys are also an important first step in discovering a new incursion of a species, and finding isolated patches of expanding species. The survey(s) confirms invasive plant infestation extent, size, distribution, and density.

Surveys may be conducted by truck, ATV, motorbike, bicycle, boat, or on foot depending on access to the area, the level of detail required, and budget. Efforts are made to choose the method that will have the least impact on the land base.

Areas that are likely to be susceptible to invasion will be examined in detail once the survey boundaries have been determined. Many dry land invasive species tend to invade grasslands and forest openings while riparian or emergent invasive species prefer lakeshores, ponds, sloughs, creeks, river edges, marshes and seepage areas. Experience with biogeoclimatic zones and sub-zones may assist in focusing survey efforts. Areas that have been recently disturbed or that receive disturbance on a regular basis are surveyed because they are generally the preferred habitat for establishment of invasive species. Such areas may include, but are not limited to:

- Roadsides, ditches, pullouts and landings;
- Recreation sites;
- Openings in the forest canopy;
- Burned areas;
- Air strips;
- Gravel pits;
- Areas where vehicle traffic and loading/unloading is common;
- Areas that are/have been over-grazed, and areas of heavy livestock and/or wildlife use;
- Areas where there has been recent development, or construction sites where machinery has been present; and
- Any other areas where human activity or natural disturbance may increase the likelihood of invasive plant introduction, establishment and spread.

When a target species is detected, the information is recorded on a *Site and Invasive Plant Inventory Record*. If it is a new site, information specific to the site and the invasive plant is recorded. If the site is an existing site, only the Site ID and data specific to the survey of any invasive plant infestation(s) will be recorded.

Information recorded at an invasive plant site includes the UTM coordinate (northing, easting and zone), location, date, species, estimated size of the infestation in hectares, distribution, density, and any pertinent site characteristics or additional information. Site photos may also be taken. If the surveyor is unable to correctly identify a particular plant species a sample is taken for proper identification. Invasive plant surveys and inventories are conducted in accordance with the methodology outlined in MFR's Invasive Plant Program Reference Guide (<http://www.for.gov.bc.ca/hra/Plants/application.htm>).

Invasive plant survey and inventory data is housed within the IAPP application. This comprehensive database and mapping application allows extraction of relational data, statistics and spatial mapping information, and is housed at the following web site: <http://www.for.gov.bc.ca/hra/Plants/application.htm>.

The inventory information in IAPP provides the basis for monitoring species activity, evaluating the effectiveness of treatment prescriptions at the local and landscape scale, and for decision making within the program. Extensive effort is made to maintain the inventory at a high standard, including documenting over time invasive plant locations as they move and change in size, distribution and density. Although the task is large due to the extent of area managed and number of species and infestations, collecting treatment and treatment monitoring data and updating survey data significantly helps to maintain the inventory.

3.4 Management Strategies

Managing invasive plant populations under an "injury threshold" approach is complex and confusing. The *IPMR* defines the injury threshold 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." The principle of injury threshold was developed for agricultural systems to manage the economic impacts that pests have on crops. There is an ecological and/or economic threshold associated with a pest density at which action is taken to prevent injury. With invasive plants, ecological, economic and social impacts are considered when determining the best management strategy for targeted species. Invasive plants that are determined to be a high threat and do not occur in a region or occur only at very low population levels, are controlled before their populations expand to cause significant injury. It is only when invasive plant species have expanded to a large area and rehabilitation of critical habitats and other values are contemplated that injury thresholds as defined under the *IPMR* are considered. MFR's approach is based on selection of the optimum management strategy for each invasive plant species as presented below.

The selection of which invasive plant management strategy to employ on a landscape is determined by the review and consideration of key factors. These factors include: 1) species distribution across a defined landscape, 2) invasiveness (threat) of the invasive plant species, 3) susceptibility of habitats that are invaded or threatened by the species, and 4) density of plants at a site, or potential for the species to become very dense.

Upon review of the current inventory data for each species, the distribution of known sites will either be considered localized within a defined area of susceptible habitat, or endemic across the majority of susceptible habitat. If an invasive plant species is detected and confirmed to be a new

incursion to the province, a provincial response plan is engaged with the objective of eradicating the new invader. This is referred to as **Early Detection Rapid Response**. If a species is determined to be localized to a small area, or a new incursion to the management area or region, the resulting management objective may be to extirpate the species from the infested sites through a regional early detection and rapid response treatment plan. If the localized infestation covers a much larger area and there is no chance of eradicating the population, the resulting management objective is to contain the infestation in order to stop the spread and establishment into uninfested areas. This is referred to as **Containment**. Finally, if a species is determined to be endemic across the majority of a defined area(s) of susceptible habitat behind a containment line, the resulting management action is referred to as **Rehabilitation**. Rehabilitation actions include biological control measures, intensive treatments, and revegetation. The potential for a species to cause impacts in the future due to high density indicates that rehabilitation may be required. These three strategies are discussed further below.

3.4.1 Early Detection Rapid Response

The management objective of this strategy is to extirpate all sites with the goal of removing the invasive plant threat. The discovery of a new invader to the province invokes the provincial Early Detection and Rapid Response Plan developed by the Inter-Ministry Invasive Species Working Group which may also involve the federal government if the species is new to Canada. A new incursion of an invasive plant species into a region from another part of the province is also managed to achieve extirpation, provided there is susceptible habitat at risk.

3.4.2 Containment

The management objective of this strategy is to control all targeted invasive plant species sites outside a defined infested area. This is accomplished by delineating a geographic polygon, referred to as a containment line, around the infested area, and targeting all sites outside of the line for extirpation in order to stop the spread of the species. Action taken inside the containment line is then referred to as rehabilitation which is explained in section 3.4.3. The containment area may be small or large depending on the distribution of the species; small containment polygons typically cover one or several drainages or a portion of a valley. These polygons are often small enough that they are easily delineated within the boundaries of a regional weed committee, and are uploaded and displayed in the IAPP application for land manager and public viewing and for determining which sites require treatment. Large containment areas may cover significant portions of a region or of the province. Regardless of their size, the susceptible habitat outside a containment line becomes the targeted treatment area for each invasive plant species.

3.4.3 Rehabilitation

The management strategy for rehabilitation is to reduce the current impact(s) of an invasive plant species, or multiple species, to an acceptable level (i.e. below an injury threshold). Once the density of plants is significant enough to impact the ecosystem, the services it provides, or the economic values derived from it, the injury threshold of the site has been reached.

Rehabilitation treatments may be undertaken within a containment area to accelerate the recovery of an ecosystem to a previously existing natural or desired state. Biological control (for species with agents available) is often used behind containment lines, either by itself or in combination with other management strategies, to weaken the invasive plant population by decreasing its density and ability to reproduce. In summary, the management strategy of rehabilitation is to reduce the potential impacts at a site caused by high invasive plant densities, recognizing that eradication is no longer feasible, and that future management of the site must take the continued existence of these plants into account.

3.5 Establishing Priorities

Once a plant species has been designated a threat either through legislation, a formal risk assessment process, or through monitoring and/or regional weed committee determination, it will be given a designated priority for control. Prioritizing invasive plants for containment activities involves consideration of both the species and the site and may be accomplished by using a priority matrix. Species are first prioritized according to their relative threat to undisturbed habitat as illustrated in Table 1.

Table 1: An example of invasive plant prioritization.

CATEGORY 1	CATEGORY 2	CATEGORY 3	CATEGORY 4
Anchusa	Baby's breath	Bachelor's buttons	Bull thistle
Leafy spurge	Bluweeed	Black knapweed	Dalmatian toadflax
Marsh thistle	Canada thistle	Brown knapweed	Diffuse knapweed
Perennial pepperweed	Common tansy	Burdock spp.	Hound's-tongue
Puncturevine	Field scabious	Common toadflax	Nodding thistle
Rush skeletonweed	Hoary alyssum	Giant knotweed	St. John's wort
Spotted knapweed	Ox-eye daisy	Gorse	
Sulphur cinquefoil	Plumeless thistle	Hoary Cress	
Yellow hawkweed spp.	Purple loosestrife	Japanese knotweed	
Yellow starthistle	Scotch thistle	Meadow knapweed	
	Tansy ragwort	Russian knapweed	
	Teasel	Scentless chamomile	
	Scotch broom		
	Yellow iris		

The definitions of each category are as follows:

Category 1: Invasive plants that pose extreme risk for invasion and spread into undisturbed sites. These species have the ability to become the most abundant plant across a site or area, often becoming the dominant species. The invasion may occur slowly or rapidly. This category also includes new species not currently present in an area.

Category 2: Invasive plants that pose a high risk of invasion and spread into undisturbed sites. These species may become very prevalent and abundant across some or all of a site or area but may require some disturbance to become the dominant species.

Category 3: Invasive plants that pose a moderate risk to invasion and spread into new areas and often require disturbance to become significantly abundant in an area.

Category 4: Invasive plants that pose a low to moderate risk of invasion and spread into undisturbed sites. Disturbance is required to allow these species to become abundant. Species that have been reduced to an acceptable level as a result of successful biological programs are included here.

Categories are reviewed often and species may be added or moved between categories at any time if new introductions occur, if a region is identified as threatened by a species, or if the performance of a species has been altered due to the impacts of biological control agents or improved land management practices.

Site prioritization, the second component of the priority matrix, is summarized in Table 2.

Table 2: Site priority definitions.

Priority	Purpose or Intent of Treatment
1 Extremely High Risk	<ul style="list-style-type: none"> • Intent is to stop the spread of invasive plants in areas that are generally less than or equal to 0.25 ha • Widely separated by distance or physical barrier from the main infestation • Threatening non-infested, highly susceptible areas • High probability of control
2. High Risk	<ul style="list-style-type: none"> • Generally less than or equal to 0.5ha • Intent is to stop the enlargement of sites in highly susceptible areas • Good probability of control
3. Moderate Risk	<ul style="list-style-type: none"> • Intent is to stop the enlargement of sites of greater than or equal to 0.5 ha in highly susceptible areas or less than or equal to 0.5 ha in moderately susceptible areas. • Good probability of control
4 Low Risk	<ul style="list-style-type: none"> • To stop the enlargement/contain sites in moderately susceptible areas of greater than or equal to 0.5ha. • Good probability of control.

The final component of the Priority Matrix is the combination of species and site categories that will define what level of program may be delivered with currently available funding. This is summarized in Table 3 below.

Table 3: Priority matrix and program definitions.

Species Category	Site Category	Program Definition and Objectives
1	1	<u>Critical Program:</u> Objectives are to stop the spread and establishment of species by eradicating only the new and geographically isolated, high priority plant sites. Containment lines will expand under this program level.
1	2	
1	3	
2	1	
2	2	<u>Containment Program:</u> Objectives are to stop the spread of a plant species by eradicating all sites outside containment lines to stop spread and establishment. Containment lines are expected to hold or be reduced in size.
2	3	
3	1	
1	4	
2	4	<u>Full Program:</u> Objectives are to meet containment program objectives and the needs of local rehabilitation objectives in order to maintain ecological values.
3	2	
3	3	
3	4	

3.6 Invasive Plant Treatment Options

All treatment options are considered after it has been established that a species at a site is designated as a high priority for control. The IPM approach is always considered to ensure that an invasive plant species is receiving the most effective treatment. The following treatment options are considered for use either individually or in combination:

- Mechanical and cultural control;
- Biological control agents; and
- Selective and spot application of herbicides.

3.6.1 Mechanical Control

Mechanical control methods that may be used in an integrated invasive plant management program include the following:

- Covering/Smothering;
- Cutting;
- Digging/Excavating;
- Girdling;
- Hand pulling;
- Mowing;
- Pruning;
- Stabbing;
- Tilling; and
- Spot burning.

Mechanical methods of invasive plant control are often used on small sites or portions of sites, because they:

- Involve using simple and readily available tools and equipment;
- Are effective and environmentally safe methods if timed correctly and precautions are taken to minimize soil disturbance and native vegetation loss in the treatment area;
- Are sometimes the only available techniques for invasive plant control in areas where herbicides cannot be used (e.g. first option to be considered when in close proximity to environmentally sensitive features);
- May be effective at reducing invasive plant density or movement off site; and/or
- Result in minimal or no impacts to fish habitat.

The limitations of mechanical control are as follows:

- Mowing is less effective on low-growing plants, or those that have the ability to resprout quickly after disturbance. Mowing may not be the best choice on a site if seed feeding bio-control agents are present;
- Cutting effectiveness is largely dependent on plant species, stem diameter, time of cut, and age of the plant;
- Spot burning can pose safety issues for both workers and the environment;
- Burning and/or mowing exacerbates the growth of some invasive plant species;
- Covering/smothering may be costly and labour intensive because treatment sites require regular monitoring to detect and repair torn materials;
- Excavating may be costly and labour intensive as complete removal of all root fragments must be obtained to prevent re-growth in rhizomatous species;
- Digging; excavating and hand-pulling are not suitable treatments for species with adventitious root buds and rhizomes;
- Soil disturbance may facilitate the re-establishment of invasive plants; and
- Repeated follow-up treatments must be conducted to remove all new germinates for three to five years or longer, dependant on the length of time the targeted species' seed remains viable.

When targeting a site for eradication, as in early detection and containment objectives, removal of any viable seed remaining after herbicide application is extremely important to avoid increasing the soil seed bank. Proper disposal of invasive plants or invasive plant parts following mechanical control is important; invasive plants, plant parts and seeds should be bagged and disposed of in a landfill or other designated disposal site.

3.6.2 Cultural Control

Targeted grazing, re-vegetation and/or fertilization are examples of cultural control methods. Managing public use of land to reduce or prevent weed infestation is another example of a cultural control.

Targeted grazing involves using cattle, goats, or sheep for invasive plant control and has the following advantages:

- May be economical;
- May retard plant development and seed formation and will gradually deplete root reserves because the tops of young plants are continuously grazed; and
- May be a viable option for control of certain species of invasive plants in areas where manual or mechanical methods or herbicides cannot be used.

Some of the limitations of targeted grazing include:

- the “non-selective ” nature of grazing may result in removal of desirable vegetation in conjunction with targeted invasive plants; and
- animal husbandry and transportation costs can be prohibitive.

3.6.3 Biological Control Agents

Biological control agents are predominantly insects and are introduced when and where appropriate to reduce invasive plant populations. They attack and weaken target invasive plant species and over time reduce the plant density. This treatment option is most often used behind containment lines to assist in rehabilitation of infested areas.

A complete list of agents commonly used and of agents under development is available on-line at:

<http://www.for.gov.bc.ca/hfp/biocontrol/index.htm>

The benefits of using biological control agents include the following:

- Affords long-term control on sites with well-established invasive plant populations;
- Used in areas where other treatment methods may not be feasible, such as pesticide free zones (PFZ); and
- They reduce invasive plant populations below a level where significant environmental or economic damage occurs.

Some of the limitations of using biological control include the following:

- Some agents may be slow to effect target species because they can take up to 5 or 10 years to become established and disperse; and
- Biological control agents are not available for all invasive plant species.

3.6.4 Herbicide Application

All herbicides are applied on a spot treatment basis to suppress invasive plants with the goal of reducing herbicide use on each site over time. Herbicides are used when no other method of control is practical or effective.

The benefits of spot applications of herbicides include:

- Effective, safe and easy to use IPM tool;
- Treatment costs may be significantly lower than those associated with manual or mechanical methods; and
- No soil disturbance.

Herbicides are not used within ten meters of water (with the exception of wipe-on application of glyphosate or new approvals of aminopyralid (see section 4.7)) and their usefulness is limited in areas with seasonal water courses and on sites with coarse soils.

3.7 Treatment Method Selection

Generally, no method will achieve control in a single treatment; the success of different treatment methods will depend on characteristics of the target invasive plant and on site conditions. The integration of a number of control strategies into an IPM program is often more effective than using a single treatment alone.

General conditions associated with selection and use of treatment options are shown in Table 4.

Table 4: General conditions associated with treatment options.

Treatment	Conditions for Use
Manual and Mechanical (e.g. covering/smothering, cutting, digging/excavating, girdling, hand pulling, mowing, pruning, stabbing, tilling, spot burning)	<ul style="list-style-type: none"> • new, small incursions used to limit rhizomatous root spread to prevent seed production • applicable to most species but aggravate some situations, e.g., larger hawkweed sites • sometimes requires restoration (to some extent) with native grasses and plant species
Cultural (i.e. targeted grazing by sheep, cattle, goats, etc.)	<ul style="list-style-type: none"> • incursion size is variable, otherwise similar to mechanical treatments
Biological (i.e. systematic release of insects and diseases that feed or attack exclusively on targeted invasive plant species)	<ul style="list-style-type: none"> • older, more established incursions generally with widespread occurrences of target species beyond treatment site • currently only applicable to thistles, knapweeds, toadflaxes, tansy ragwort, leafy spurge, hound's-tongue, and St. John's wort within the PMP area
Chemical (i.e. judicious, strategically targeted use of herbicides)	<ul style="list-style-type: none"> • incursion size is variable • restricted use within close proximity to: species at risk, domestic water intakes, water licenses, agricultural food production systems, environmentally sensitive or riparian areas, PFZs, no treatment zones (NTZ), or public use areas.

Other considerations include seasonality, weather conditions, financial and human resources, site accessibility, site conditions, target species composition and percent cover, and the ecological, economic, and societal consequences of not treating.

3.8 Monitoring and Evaluation

Monitoring is repeated over time so changes in invasive plant populations can be followed. It is conducted regularly and is used to detect new invaders, to measure the effect of treatments on the target invasive plant and on non-target vegetation, and to record trends that may be occurring in an invasive plant population. IAPP is an important component of monitoring because it houses long-term inventory, treatment, and monitoring data. Monitoring results are used to guide program direction and provide appropriate feedback for adjustments to ensure the Invasive Plant Program is effectively managing invasive plants. Some specific components of monitoring are described below.

3.8.1 Species Monitoring

Inventory surveys repeated over time provide a record of information about invasive plant occurrence, density, and site characteristics. Surveys are completed visually and critical observations are recorded. MFR maintains the integrity of the species inventory by routinely monitoring invasive plant sites and updating surveys as resources allow. Many sites are inventoried before receiving an initial treatment through species-specific, and/or geographic-specific survey activities; an exception to this is a site that has a new, priority species that is encountered during the delivery of treatment activities. In following years, site survey information is updated from treatment information collected in the field.

3.8.2 Treatment Monitoring

Chemical and mechanical treatment sites are evaluated following treatment as soon as it is possible to observe efficacy. A minimum of 10% of treatment sites are monitored annually following treatment to ensure the following:

- Compliance with the commitments made in this PMP;
- Compliance with the *IPMA* and *IPMR* and other legislation; and
- Correct completion of IAPP treatment records.

The following information is assessed during treatment monitoring:

- Efficacy of control method used;
- Protection of environmentally sensitive areas;
- Potential or actual impacts to non-target vegetation or soils;
- Re-growth of invasive plants;
- Re-treatment requirements, if any; and
- Cost-effectiveness of the treatment program.

Biological control treatments are monitored to determine the following:

- Establishment;
- Biological control agent population growth and dispersal; efficacy of agent(s) and level of invasive plant control achieved over time; and
- Identification of gaps in bioagent effectiveness due to bioagent habitat preferences.

4 Operational Information

The operational information included in this section includes the following:

- Qualifications and responsibilities of persons applying herbicides;
- Procedures for safely transporting herbicides [*IPMR Section 58(3)(a)(i)*];
- Procedures for safely storing herbicides [*IPMR Section 58(3)(a)(ii)*];
- Procedures for safely mixing, loading and applying herbicides [*IPMR Sections 58(3)(a)(ii) and (iii)*];

- Procedures for the safe disposal of empty herbicide containers and unused herbicides [*IPMR Section 58(3)(a)(iv)*];
- Procedures for responding to herbicide spills [*IPMR Section 58(3)(a)(v)*]; and
- Identification of each pesticide that will be used under the plan, the manner of its application, and the type of equipment required for each manner of application [*IPMR Section 58(3)(c)*].

4.1 Qualifications and Responsibilities of Persons Applying Herbicides

The transportation, storage, handling, application and disposal of pesticides are governed by federal and provincial legislation. Personnel and their contractors will follow safe handling practices including workplace requirements for Workplace Hazardous Materials Information System (WHMIS) labeling and worker education. The required practices for pesticide applicators are detailed in:

- Worker's Compensation Board of British Columbia (1998) *Occupational Health and Safety Regulation – BC Regulation 296/97 as amended by BC Regulation 185/99 – Sections 6.70 to 6.109*;
- BC Ministry of Environment, Lands and Parks (2005) *Handbook for Pesticide Applicators and Dispensers*; and
- Workers' Compensation Board of British Columbia (1990) *Standard Practices for Pesticide Applicators*.

All herbicide applications under this PMP will be conducted or supervised by a person who holds a Pesticide Applicator Certificate endorsed for the class of pesticide and the pesticide use required under this PMP.

The responsibilities of the Certified Pesticide Applicator are to:

- Be in continuous attendance at the site with available proof of certification;
- Ensure that applications do not violate this PMP or applicable legislation;
- Supervise no more than 4 uncertified applicators at one time;
- Maintain continuous contact, auditory and/or visual, with the uncertified assistants;
- Be within 500 meters of persons being supervised; and
- Comply with the standards contained in Division 7 of the *IPMR*.

4.2 Procedures for Safely Transporting Herbicides

The Transport of Dangerous Goods Act regulates the handling and transportation of poisonous substances that may include herbicides. The *IPMA and IPMR* also specify certain transport requirements/procedures.

The plan holder will ensure that ministry personnel and/or contractors follow these procedures for safely transporting herbicides within the Plan area:

- Ensure that herbicides are carried in a compartment that is secured against spillage and unauthorized removal. The compartment shall be separate from food and drinking water, safety gear, spill containment equipment and people;
- Ensure that all herbicide containers are inspected for defects prior to transporting. Herbicides will either be kept in their original containers with intact labels, or they may be stored in appropriate containers that have a copy of the label affixed to the outside of the container. Herbicides that come in large (i.e.: 10 liter) containers can be transferred to smaller, safer, easy to use containers for transport to, and use at small sites;
- Ensure that the vehicle is equipped with a first aid kit, fire extinguisher, spill contingency plan and kit, and that the vehicle operator has been trained to handle spills;
- Ensure that all documents and placards are carried in, or placed on, transport vehicles as required under the *Transportation of Dangerous Goods Act*, the *IPMA* or the *IPMR*; and
- Ensure that the vehicle operator reads and understands the herbicide labels and the product Material Safety Data Sheet (MSDS) for all herbicides being transported.

4.3 Procedures for Safely Storing Herbicides

The plan holder will ensure that ministry personnel follow these procedures for safely storing herbicides within the Plan Area:

- Ensure that herbicides are stored in accordance with the *IPMA*, *IPMR* and the WorkSafeBC document *Standard Practices for Pesticide Applicators*;
- Keep herbicides in their original containers and with original packaging. If original packaging is not available, the herbicides will be placed in appropriate containers that have a copy of the label affixed to the outside of the container;
- Ensure that storage facilities are locked when left unattended, ventilated to the outside atmosphere, are entered only by persons authorized to do so, and that there is a placard affixed and maintained on the outside of each door leading into the storage area bearing, in block letters that are clearly visible, the words “WARNING – CHEMICAL STORAGE – AUTHORIZED PERSONS ONLY”;
- Keep storage facilities separate from work and living areas, and away from food, flammable materials, bodies of water and water sources;
- Ensure the storage facility is equipped with necessary spill equipment, first aid kits, and the appropriate MSDS of herbicides stored;
- Ensure that the person responsible for the storage area notifies the appropriate fire department of the presence of herbicides on the premises; and
- Ensure that herbicides that release vapors, and bear a "poison" symbol on the label are stored in a storage facility that is not attached to or within a building used for living accommodation.

The plan holder has no direct control of the herbicide storage practices of its contractors while they are not under contract to MFR. Some contractors may store herbicides for extended periods of time in vehicles when performing a number of herbicide treatments for the plan holder(s). The contractor’s

vehicle is considered a mobile storage unit. Persons responsible for herbicide storage will ensure that all herbicides are stored in a locked canopy or similar arrangement, separate from the driver and personal protective gear.

4.4 Procedures for Safely Mixing, Loading and Applying Herbicides

The plan holder shall ensure that ministry personnel and/or contractors follow these procedures for safely mixing, loading and applying herbicides within the Plan Area:

- Ensure that all mixing, loading and application of herbicides is carried out by, or directly supervised by, a Certified Pesticide Applicator with the appropriate category of certification, and that all manufacturer's recommendations, as specified on the herbicide labels, are adhered to;
- Ensure that all mixing, loading and application of herbicides is undertaken in a safe manner. All mixing and loading shall be undertaken only in areas at least 15 meters from, and selected to prevent, any spilled herbicides from entering PFZs, NTZs, bodies of water, fish or wildlife habitat, water sources, or other environmentally sensitive features (e.g., agricultural production areas);
- Ensure that containers used to mix, prepare or apply herbicides are not washed or submerged in any body of water;
- Ensure that eye wash station(s), protective clothing, safety spill kits, spill response plans, a copy of this invasive plant PMP, each herbicide products MSDS, emergency telephone numbers and first aid supplies are present and available at or near each mixing, loading or treatment site;
- Follow all directions and restrictions on herbicide product labels, including adhering to the recommended re-entry times to treated areas unless personal protective equipment is worn; and
- Ensure that the listed herbicides in this PMP will only be mixed with water as a carrier for herbicide applications. Prior to any water being collected in the field from a natural source for use in invasive plant applications, a fresh water permit will be acquired from the MOE.

4.5 Procedures for Safe Disposal of Empty Herbicide Containers and Unused Herbicides

Except where herbicides are applied by plan holder personnel, the responsibility of container disposal will lie with the contractor.

The plan holder will ensure that ministry personnel and/or contractors follow these procedures for the safe disposal of empty herbicide containers and unused herbicides within the Plan Area:

- Ensure that all herbicide waste is disposed of in a manner consistent with the requirements of the BC *Environmental Management Act, Special Waste Regulation*, and in accordance with the manufacturer's instructions as noted on the product label, as appropriate;
- Ensure that empty herbicide containers are returned to the herbicide distributor as part of their recycling program; or triple rinsed or pressure rinsed, altered so that they cannot be reused, and disposed of in a permitted sanitary landfill or other approved disposal site; and

- Ensure that all leftover herbicide mix is stored for future use in a manner consistent with the requirements specified in Section 4.3 (Procedures for Safely Storing Herbicides).

4.6 Procedures for Responding to Herbicide Spills

The plan holder will ensure that ministry personnel and/or contractors follow these procedures for responding to herbicide spills within the Plan Area. If contractors that work under this PMP have their own spill response plan, they must meet or exceed the following plan:

- Ensure that a herbicide spill kit accompanies all vehicles within the plan area, and contains, as a minimum, emergency telephone numbers, agricultural white lime (25 kg.), kitty litter (2-20 kg. bags), large plastic garbage bags (4), shovels (2), pesticide neutralizing solution (1), an ABC type fire extinguisher, polyethylene or plastic tarp (3 x 3m minimum), dustpan and shop brush, flagging and rope, a herbicide first aid kit, and personal protective clothing/equipment (rubber gloves, safety glasses); and
- Ensure that the following spill procedures are followed if a herbicide spill occurs within the plan area:
 1. All personnel shall be protected from herbicide contamination by wearing appropriate protective clothing and safety gear;
 2. Any person exposed to a herbicide shall be moved away from the place of the spill;
 3. First aid should be administered, if required;
 4. The source of the spill should be stopped;
 5. The spilled material should be stopped from spreading by creating a dam or ridge;
 6. The project supervisor shall ensure operations cease until the spill is contained and the source is repaired;
 7. Absorbent material shall be spread over the spill, if applicable, to absorb any liquid;
 8. The absorbent material shall be collected in garbage bags or containers with the contents clearly marked and removed from the spill site, and disposed of in a landfill;
 9. When more than one liter of herbicide is spilled, the person responsible for the project will immediately report it to the Invasive Plant Specialist; and
 10. An approved representative of the plan holder(s) will be notified of the details related to the spill as soon as is practical by the project/contract supervisor.

4.7 Herbicide Selection and Use

The herbicides intended for use under this PMP are described below. Herbicide selection is driven first by the conditions of the site, and secondly by the target species. Currently, only glyphosate products may be used within 1 meter of a high water mark, while the remaining herbicides can only be used where a 10 meter PFZ can be maintained by ensuring an adequate buffer zone. Milestone application within the PFZ is currently under review and if approved by the Ministry of Environment (MOE), will be included as an option under this PMP. All herbicides listed below are subject to intermittent product name changes, therefore an equivalent product may be used provided it contains the same formulation of active ingredients.

Milestone is one of the newest broadleaf specific herbicides for use in invasive plant control. Aminopyralid, a synthetic enzyme, is the active ingredient and functions by its systemic mode of action. This product is considered a reduced risk herbicide due to its fast aquatic degradation and low groundwater advisory. *Milestone* is more selective than picloram because the active ingredient does not cause significant mortality or impacts on tree and brush species as well as grasses, but does provide up to three years of residual control on primary target species such as knapweed and sulphur cinquefoil. This allows for treatment of these plants under tree canopies and through native brush species. Another formulation that may be used has the Trade Name *Restore*, which consists of aminopyralid and 2,4-D Amine.

Tordon 22K is a selective, broadleaf specific, residual herbicide that can remain in the soil for several years and continue to control susceptible vegetation. This is a systemic herbicide for use on a wide variety of broadleaf invasive plants. The active ingredient is picloram which may persist in the soil, therefore care must be taken to avoid areas where soil may be moved or where there is a shallow aquifer or domestic water intake. The mode of action and soil persistence allows for a broader application window.

Round-up is a non-selective, non-residual herbicide that kills all vegetation on contact. Since it kills valuable grasses as well as broadleaf invasive plants, its use is very limited. Application is generally by wick or stem injection and it is used close to water when other herbicides cannot. There is no soil persistence and the active ingredient glyphosate is rendered inactive once in contact with soil.

Lontrel & Transline is a selective, residual herbicide containing clopyralid. It is less persistent in soil than picloram and it does not injure trees and shrubs when applied to target herbaceous species in close proximity to their stems.

Grazon is a herbicide containing both 2,4-D and picloram. Therefore it provides immediate control with the 2,4-D and longer-term, residual control typical of picloram. *Grazon* provides a wider application window than either picloram or 2,4-D alone. 2,4-D is a selective, non-residual herbicide that targets most broadleaf invasive plants and brush.

Escort is a product containing metsulfuron methyl as an active ingredient. *Escort* is a non-selective herbicide that is effective in the suppression and control of hard to control invasive plants. *Escort* is commonly used on invasive plants that are difficult to kill such as common tansy and Canada thistle.

Dyvel DSp herbicide contains dicamba, 2,4-D and mecoprop-p as active ingredients for broadleaf invasive plant control. It is used in the Invasive Plant Program for the control of hoary alyssum.

Vanquish herbicide contains dicamba alone and allows for treatment of hoary alyssum where 2,4-D Amine use is not permitted (e.g.. near highways rights-of way).

2,4-D Amine is a broadleaf specific herbicide used for many broadleaf and woody invasive plants. 2,4-D Amine can be tank mixed with other label indicated herbicides to increase efficacy for certain plant species and environmental conditions.

Clearview is a combination of aminopyralid (as in *Milestone*) and metsulfuron-methyl (as in *Escort*) in one product that allows for better control of most broadleaf plants. At the time of PMP development, the product is currently under review with the Pesticide Management Regulatory Agency of Health Canada and registration is pending. It is expected to be available in early 2010.

Reclaim is another new herbicide expected to be available in early 2010. It is a combination of aminopyralid, metsulfuron-methyl and 2,4-D. It is currently under review with the Pesticide Management Regulatory Agency of Health Canada and registration is pending.

Surfactant is used when treating plants which have some physical characteristic that limits herbicide uptake. For example, blueweed treatment with most herbicides requires the use of a surfactant due to a pubescent leaf surface and thick cuticle which can reduce chemical uptake.

4.7.1 Description of Application Equipment Proposed for Use

The following is a description of each type of spot application equipment that will be used under this PMP:

Backpack Sprayer: A portable, manually operated, low pressure container with a nozzle and a positive shut-off system used for spot application of herbicides onto foliage, basal bark areas, or into or onto freshly cut stems and stumps.

Vehicle mounted sprayer: Any tank and pump unit mounted onto a vehicle with one or multiple handguns and potentially one or more boom and/or boomless nozzle attachments. The vehicle may be a four-wheel drive truck or all terrain vehicle.

Wick/Wipe On Applicators: Absorbent pad, wicks or rope attached to a long-handled applicator or stick used to apply herbicides onto foliage, basal bark areas, or freshly cut stems or stumps.

Squirt Bottle: Hand-held, non-pressurized container used to apply herbicides onto foliage, basal bark areas, or freshly cut stems or stumps.

Injection Tools: Used to inject herbicides into individual stems.

5 Standard Operating Procedures

Environmental protection is one of the principal reasons for the existence of the Invasive Plant Program. In order to protect ecosystems, there are circumstances where the use of a herbicide is the only method that can effectively remove invasive plant species. This is particularly true when site goals require extirpation of all target species, or restoration of a site is required because a particular injury threshold has been exceeded. MFR recognizes that the benefits of safe, localized herbicide use far outweigh the damage to ecosystem health and function that can result from invasive plant establishment and spread.

5.1 Environmental Procedures

All invasive plant management activities proposed under this PMP will incorporate standard operating procedures to ensure the protection of our environment. These procedures require that any person(s) applying or handling herbicides under the authority of this PMP be cognizant of the location of the following:

- community watersheds;
- domestic and agricultural water sources (e.g. wells for irrigation);
- riparian areas and all bodies of water whether or not they contain fish;
- wildlife habitat and species at risk; and
- food plants intended for human consumption.

In this PMP, all PFZs will comply with the standards contained in Division 7 of the *IPMR*. A PFZ is defined as an area of land that must not be treated with pesticides, and must be protected from pesticide contamination through either direct means (e.g. through herbicide drift) or indirect (e.g. soil and/or water movement). PFZs are measured by the horizontal distance from the high water mark.

PFZs will be identified and marked or flagged as required prior to any herbicide application.

In order to decrease the risk of breaching a PFZ, appropriate buffer zones will be applied outside PFZs. Products containing glyphosate are eligible for wick application within a PFZ up to one meter from the high-water point of any riparian area. Glyphosate products may also be used within an ephemeral water source providing that the zone will be free of water for at least 48 hours after application.

5.1.1 Procedures to Protect Community Watersheds

Before herbicide applications may occur within 100 meters of a community watershed boundary, the following precautionary procedures must be implemented:

- The location of community watersheds to be protected will be verified by accessing the Community Watershed Database, maintained by the BC MOE, at the following web site;

http://www.env.gov.bc.ca/wsd/data_searches/comm_watersheds/index.html

- Herbicides will not be stored within a community watershed for more than 24 hours prior to their use, and they will be removed from the community watershed within 7 days of use, unless they are stored in a permanent structure;
- A 10 meter PFZ shall be maintained from the point of herbicide application and all bodies of water within the community watershed;
- A 30 meter PFZ shall be maintained down slope from the point of herbicide application and all licensed water intakes within the community watershed;
- A 100 meter PFZ shall be maintained upslope from the point of herbicide application and all licensed water intakes within the community watershed;
- Herbicide use will be discontinued if herbicide residues or breakdown products are detected at a community watershed water intake, and further use shall not be undertaken until the BC

Ministry of Health Services, medical health officer, has been satisfied that all required measures have been implemented to preserve water quality.

5.1.2 Procedures to Protect Domestic and Agricultural Water Sources

The plan holder shall ensure that prior to herbicide applications for invasive plant management near private and/or agricultural lands, the locations of registered domestic and agricultural water sources shall be verified visually and/or by assessing applicable government web sites. Attempts to identify and locate unregistered domestic and agricultural water sources will be made by visual observations followed by attempting to contact the owner/occupier of the land prior to herbicide applications should a potentially unregistered water source be observed.

5.1.3 Procedures to Protect Water Bodies and Riparian Areas

In order to protect fish, riparian areas, and bodies of water from adverse effects during invasive plant management (chemical and non-chemical), the plan holder will implement the following procedures to minimize any adverse and lasting effects on natural ecosystems:

- PFZ procedures described in Section 5.1.1 will be followed for all bodies of water and riparian areas;
- Ensure that whenever herbicide, manual or mechanical control methods are applied, efforts are made to eliminate harmful alteration, damage or destruction to water bodies. Reducing negative impacts on streamside vegetation and bank stability will reduce erosion and water turbidity. To prevent contamination of water, broadcast treatment with glyphosate will not be applied to ditches that flow directly or indirectly into streams;
- Ensure that best management practices (as derived from documents on species habitat, lifecycle information and locations) are applied during invasive plant management;
- Hold pre-work meetings with plan holder(s) personnel and/or contractors and affected agencies to ensure all involved in the invasive plant management process can competently protect riparian areas and bodies of water during the course of the work;
- Eliminate invasive plant control impacts on water bodies and riparian areas by ensuring that contract documents and prescriptions will describe best management practices, including, but not limited to, no refueling of machinery or herbicide mixing within 15 meters of a riparian zone, no clean up (excluding the case of an emergency spill) or disposal of herbicide materials within 15 meters of riparian zones, and including a requirement to install descriptive flagging such as “Riparian Zone” and “Pesticide-Free Zone” placed at appropriate intervals; and
- Ensure that minimum protection measures are adhered to according to the requirements specified in the *IPMR* during herbicide applications for all bodies of water, dry streams, and classified wetlands.

5.1.4 Procedures to Protect Wildlife Habitat/Species at Risk

In order to protect wildlife and species at risk from adverse effects during invasive plant management, the plan holder will implement the following procedures to minimize any adverse and lasting effects on natural ecosystems:

- Ensure that where sensitive ecosystems or 'at risk' plant, vertebrate or invertebrate species have been identified in higher-level plans, wildlife management areas, and other plans, they will be managed accordingly within the PMP;
- Ensure that there is communication with agencies responsible for species at risk prior to invasive plant management being carried out, so that management plans can be adjusted accordingly;
- Ensure that best management practices (as derived from documents on species habitat, lifecycle information and locations) are applied during invasive plant management; and
- Hold pre-work meetings with plan holder(s) personnel and/or contractors and affected agencies to ensure all involved in the invasive plant management process can competently protect species at risk and wildlife habitat during the course of their work.

5.1.5 Procedures to Prevent Herbicide Contamination of Natural Food Sources

Berry picking is common throughout the plan area. Bee keeping areas, vegetable gardens, and areas containing agricultural crops or domestic animals are also found at many locations within the plan area, but generally removed from any potential treatment area(s). In addition, First Nations people within the plan area may use several species of plants for ethno-botanical purposes. Most often, invasive plant sites occur in areas where past ground vegetation disturbance has occurred, such as road, landing and utility construction, timber harvesting, heavy cattle, horse, and/or wildlife grazing, all-terrain vehicle activity, and other human induced and natural disturbances. These areas are not often traditional use plant areas because disturbance removes natural vegetation. This helps to greatly reduce the risk of human food contamination as it separates those areas most likely to receive direct herbicide application for invasive plant control from those areas where ethno-botanical collections usually occur. The risk of human contact with herbicides still exists, as does the risk to affect natural use plants, therefore ongoing communications with First Nations is important and encouraged. This allows First Nations to share information on traditional use plants of concern and/or areas where collection or propagation may occur, as well as for the Invasive Plant Program to share information on identification of priority invasive plants. Exchanging information will help protect traditional use plants from any damage or impact from both invasive plants and/or any particular treatment that could be used to manage them. Control measures being applied in specific use areas can be adapted to ensure herbicide contamination does not occur, and to ensure that the appropriate treatment effectively removes invasive plants and protects resource plants.

5.2 Procedures for Safe Herbicide Application

Ensuring that correct environmental protection procedures are in place can be further strengthened by requiring that handling and applying herbicides is conducted in a manner that reduces the risk of accidents caused by human error or equipment malfunction.

5.2.1 Pre-Treatment Inspection Procedures for Identifying Treatment Area Boundaries

The following procedures shall be implemented to ensure that treatment area boundaries are identified and, where necessary, clearly marked prior to herbicide application:

- A pre-treatment inspection will be conducted to establish treatment boundaries and to document the location of environmentally sensitive areas;
- A pre-treatment meeting shall be held between the Contractor and the plan holder to confirm treatment area boundaries and the locations of environmentally sensitive features; and
- Marking/flagging of PFZs not immediately noticeable to an applicator will be completed prior to herbicide application.

5.2.2 Procedures for Maintaining and Calibrating Herbicide Application Equipment

All herbicide application equipment used under this PMP for invasive plant management will be safe, clean, in good repair, compatible with, and appropriate for the herbicide being applied. All equipment will be inspected and calibrated prior to the commencement of herbicide applications and weekly throughout the application season. An example of an Equipment Calibration and Checklist form is shown in Appendix 2. Backpack sprayers shall also be re-calibrated when changing herbicide products or when nozzle output begins to vary.

5.3 Procedures for Monitoring Weather Conditions

An anemometer (wind speed) and thermometer will be used to ensure weather conditions are suitable for herbicide application at treatment sites before herbicide treatment occurs and periodically during herbicide application. Wind speed and direction and temperature will be recorded prior to application.

The certified pesticide applicator has the final authority to decide when herbicide applications should be stopped due to inclement weather or adverse site conditions. The manufacturer's label will dictate when herbicide operations will be stopped due to weather. Examples of conditions which herbicide applications should cease are as follows:

- When conditions prevent the herbicide product from being applied effectively according to label instructions (e.g. periods of rain or snow);
- Ground wind velocity is over 8 km/hour for foliar application;
- The maximum temperature stated on the herbicide label is exceeded; or
- Precipitation is forecast within four hours of application.

6 Reporting, Notification and Consultation

The Invasive Plant Program is committed to following the *IPMR* when managing invasive plants. We will maintain a high standard of communication, record keeping and professionalism when developing and consulting on this PMP and any future amendments that may arise. Specific activities in these areas, as well as requirements under *IPMA* are outlined in this section.

6.1 Reporting

Accurate record keeping allows both the plan holder and the Administrator, *IPMA*, to:

- Monitor the quantity of herbicides used;
- Ensure compliance with the *IPMR*;
- Ensure compliance with the commitments made in this PMP; and
- Ensure compliance with the contents of the Pesticide Use Notice.

The plan holder will ensure that each of the required records described below are maintained.

6.1.1 Confirmation Holder Use Records

The plan holder, partnering agencies and each contracting firm that applies herbicides under this PMP must maintain daily records of herbicide use.

Section 37(1) of the *IPMR* describes the requirements for these records. The following records must be kept for each treatment location and day of use:

- The date and time of the herbicide use;
- The name of the invasive plant targeted for treatment;
- The trade name of each herbicide used and its registration number under the federal Act;
- For each herbicide used, the method and rate of application and the total quantity used;
- The prevailing meteorological conditions including temperature, precipitation and velocity and direction of the wind, these conditions should be measured at the beginning of each day before starting treatment, re-measured if obvious changes in environmental conditions occur throughout the day, and re-measured at the end of any treatment day; and
- A record for each piece of the holder's herbicide application equipment that requires calibration, showing when the equipment was calibrated and the data upon which its calibration was based.

In addition to maintaining daily records of herbicide use, all users of the PMP will retain records of site assessment and invasive plant inventory as well as operational herbicide and other treatment records. These records will include:

- IAPP sSite and Invasive Plant Survey Record forms;
- Maps of invasive plant sites, treatment and biological control locations;
- IAPP Treatment records; and
- Project checklists including equipment, First Aid and spill kit.

6.1.2 Annual Report for Confirmation Holders

In accordance with Section 39 of the *IPMR*, the plan holder will provide to the Regional Administrator, *IPMA*, the following information for each calendar year by January 31 in the next calendar year for operations conducted under this PMP during the calendar year:

- The name and address of the confirmation holder, and their confirmation number;
- Trade name and active ingredient of the herbicide(s) applied, including their PCP numbers;
- Locations and total area treated (ha); and

- Quantity of each active ingredient applied (kg).

6.1.3 Annual Notice of Intent to Treat

The plan holder will forward, in writing, to MOE, at least 21 days prior to treatment in each year during which the PMP is in effect, an Annual Notice of Intent to Treat (NIT) for the following year. The NIT will be submitted to each Regional Office of MOE within whose geographic boundaries herbicide applications are being proposed. This NIT will identify:

- Name and business location of confirmation holder(s);
- Proposed treatment methods;
- Herbicides proposed for use and their method of application; and
- Estimated area proposed for treatment.

6.2 Requests to Amend the PMP

The plan holder will forward in writing to MOE any request for an amendment to the PMP. Amendment requests concerning new application techniques or similar changes will not require further public advertising or First Nations consultation, provided that the amendment request is within land owned or controlled by the plan holder. Amendments to add new active ingredients will require further public advertising and/or First Nations consultation.

6.3 Notification of Contravention

Section 72(1)(d) of the *IPMR* requires that a confirmation holder give written notice to the administrator on a contravention of the *IPMA* or *IPMR* that involves the release of a pesticide into the environment. The plan holder commits to abiding by this requirement.

The plan holder has implemented contractor guidelines to ensure compliance with this Section. Failure of the contractor to observe the following requirements may be cause for contractor dismissal:

- Violation of the requirements of the *IPMA* or the *IPMR*;
- Mixing of herbicides in inappropriate locations such as near environmentally sensitive zones;
- Failure to use adequate personal protective equipment when required by the product label;
- Application of treatment herbicides within prohibited zones;
- Improper cleanup or reporting of spills;
- Application of herbicides by uncertified personnel without appropriate supervision;
- Improper disposal of unused herbicides or containers;
- Improper equipment calibration;
- Application of herbicides under inappropriate or unsafe conditions;
- Failure to properly complete and submit daily operating logs or records; or
- Handling, storing, mixing, transporting, or applying herbicides in a manner that violates product labels.

6.4 Posting of Treatment Notices

Treatment Notices will be posted in locations that are clearly visible and legible from each approach maintained by the plan holder for public/employees/contractors to access the treatment area or at locations where due diligence would require them. The signs shall remain posted for 48 hours following herbicide application, and contain the following information:

- The trade name and active ingredient of the herbicide;
- The date and time of the herbicide treatment;
- The purpose of the treatment;
- The method of application;
- Precautions to be taken to prevent harm to people entering the treatment area;
- The PMP confirmation number;
- The plan holder(s) contact information; and
- For each treatment location, the applicator will maintain a record of where notices were posted.

The Treatment Notices shall be:

- A minimum size of 550 sq. cm;
- Water resistant; and
- Display the title “**Notice of Pesticide Use**” in bold letters that are clearly legible to a person approaching the treatment area. Substitution of “pesticide” with “herbicide” is permissible.

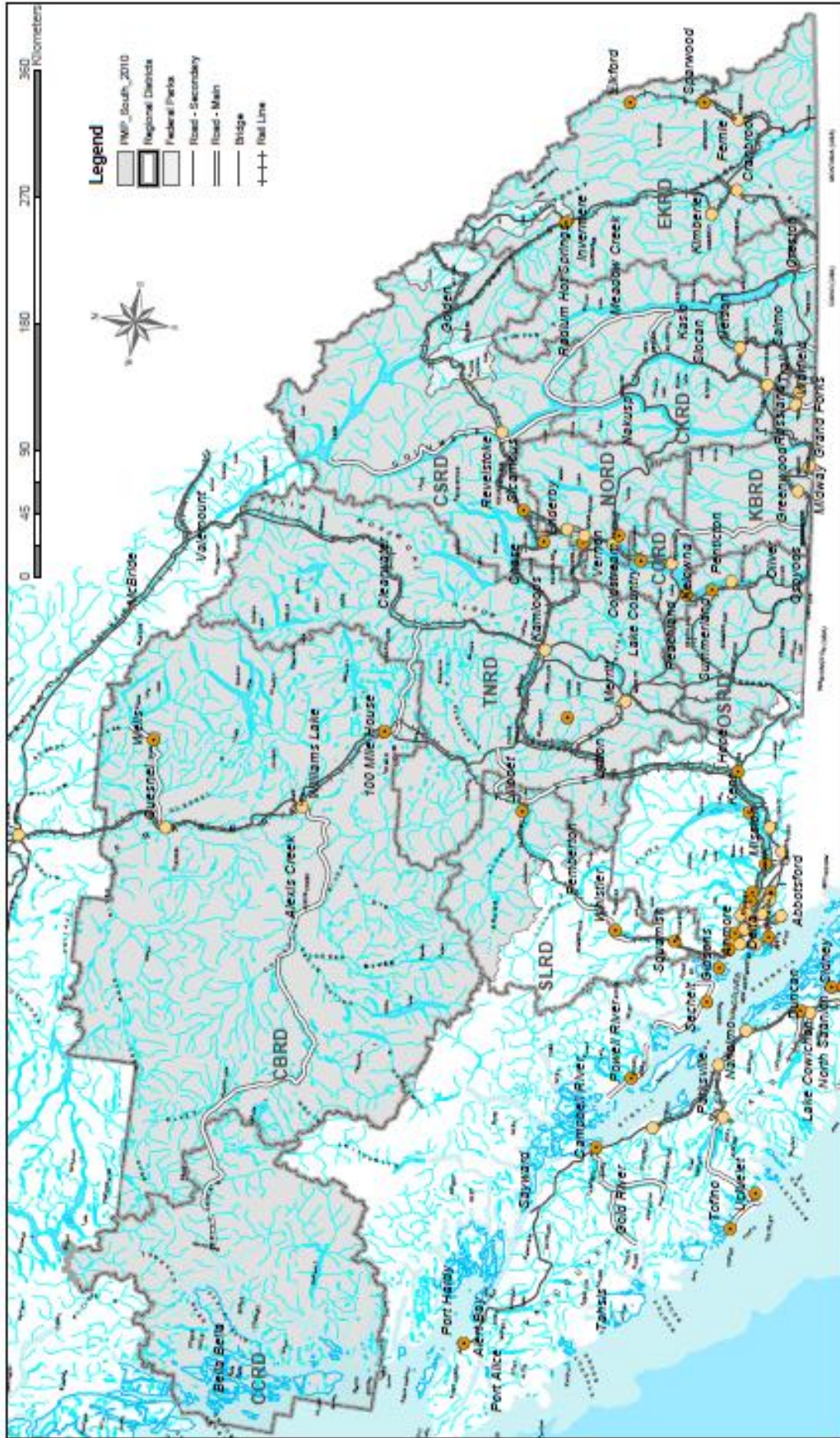
An example of a Treatment Notice is shown in Appendix 3.

6.5 Interagency Consultation and Coordination

MFR is a leader in invasive plant control in the province of British Columbia and is actively involved with coordinating and collaborating on invasive plant management programs with other ministries, agencies and stakeholders. Information on invasive plant inventories and treatments will be provided to these groups on an ongoing basis, and is readily available through the IAPP application. Since the BC *Weed Control Act* states that 'every occupier has the responsibility to control noxious weeds', MFR will conduct its integrated invasive plant program within the plan area in communication and cooperation with other 'land occupiers' including, but not limited to the following:

- BC Ministry of Agriculture and Lands;
- BC Ministry of Transportation and Infrastructure;
- BC Ministry of Environment, including Protected Areas Division;
- Integrated Land Management Bureau;
- Utilities, specifically those with rights-of-way;
- First Nations;
- Local governments including Regional Districts and Municipalities; and
- Regional weed committees and other conservation-based non-government organizations.

Area of Southern Interior of BC for proposed Pest Management Plan



Appendix 2: Example Equipment Calibration Form

INVASIVE PLANT TREATMENT CALIBRATION RECORD

Date _____
Calibration # _____
Employer _____
Calibration Location _____

Instructions for backpack or handgun sprayer (for 400L / ha delivery rate)

Measure a 5m by 5m square in a field or landing away from any riparian area or watercourse. Using only water in equipment, measure the time taken with each piece of equipment and nozzle combination to fill a measuring cup to 1.0 L. This time indicates the time taken for a piece of equipment to release 400 L of carrier to 1 hectare of area. If you using a delivery rate of 200 L / ha, measure the time taken to fill to 0.5 L. Have every applicator evenly cover the 25m test square in the time allotted for each piece of spray equipment. Record equipment and applicator times below with each applicator understanding the swath speed for correct coverage with each piece of equipment. Each applicator will undergo three calibrations with each piece of equipment.

Equipment and Applicator Summary

Applicator	Spray equipment	Correct Time (sec)	Calibration attempts (sec)
			1
			2
			3
			1
			2
			3
			1
			2
			3
			1
			2
			3
			1
			2
			3



NOTICE OF PESTICIDE USE

Treatment Area:

Pest(s) To Be Controlled:

Pesticide Name(s), Active
Ingredient(s) & Registration
Number(s) (PCP):

Start Time & Date Of Pesticide
Application:

Alternate Start Time & Date:

Pesticide User Licensee Name
& Licence Number:
Telephone Number:

Precautions to Minimize
Exposure to Pesticides:

Do not enter the treated area before

Do not remove this sign before

For emergency medical information contact:
B.C. Drug and Poison Information Centre 1-800-567-8911 or 604-682-5050

Appendix D

REGIONAL DISTRICT OF NORTH OKANAGAN Pest Management Plan For Noxious Weeds – Invasive Plants

REGIONAL DISTRICT
OF
NORTH OKANAGAN



PEST MANAGEMENT PLAN
for
NOXIOUS WEEDS - INVASIVE PLANTS

Ref. ID: RDNO PMP 2012-2017
Confirmation No. 141-0030-12/17
December 2012



Available at: www.rdno.ca

EXECUTIVE SUMMARY

In British Columbia the *Weed Control Act* and accompanying regulations require that land users and occupiers control noxious weeds on private and public land. This Pest Management Plan (PMP) outlines the Integrated Pest Management (IPM) approach for the control of noxious weeds/invasive plants, which will include prevention, cultural, manual, mechanical, biological and chemical controls on public lands owned or controlled by Regional District of North Okanagan (RDNO). This PMP is the legal authority for RDNO to use herbicides for the control of noxious weeds/invasive plants.

Noxious weeds/invasive plants impact lands by displacing or replacing native plant species. All resources occurring on infested lands are impacted by these plant species. The spread of these plants has resulted in reduced biodiversity, displaced native vegetation and degraded habitat quality. Loss of forage and browse for wildlife and livestock or loss of aesthetic values has negative socio-economic impacts. For these reasons, efforts to reduce these impacts through prevention and control are an integral part of managing lands within RDNO.

The goal of the Noxious Weed program in RDNO is to prevent the introduction of new species of noxious weeds/invasive plants, and reduce the spread of existing noxious weeds/invasive plants to minimize the impacts on lands within RDNO. To achieve this, IPM principles will be used as described in this PMP. IPM involves noxious weed/invasive plant inventory, selection of treatment method that most effectively target specific noxious weed/invasive plant species while minimizing impacts to the environment, and evaluation of effectiveness of treatment.

The *Integrated Pest Management Act and Regulation* provides the statutory authority to allow herbicide use on public lands as described in a PMP. This PMP covers the selection of treatments that most effectively target specific noxious weeds/invasive plants while minimizing impacts to the environment. The vegetation management practices described in this PMP will include both non chemical and chemical options, and will discuss the selection process that RDNO will use to decide on the most appropriate method(s) for vegetation management.

This PMP will serve as a strategic management planning tool which will allow for the effective prevention and control of noxious weeds/invasive plants within RDNO.

**Regional District of North Okanagan
Pest Management Plan
Noxious Weeds – Invasive Plants**

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1.0 INTRODUCTION

This Pest Management Plan (PMP) describes how the Regional District of North Okanagan (RDNO) will achieve effective management of noxious weeds/invasive plants within the RDNO using principles of integrated pest management (IPM), while protecting environmental and human health values.

For the purpose of this PMP, the following definitions apply:

Noxious weed – any weed designated by legislation to be noxious under the BC *Weed Control Act (WCA)* and *Regulation (WCR)*, administered by the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO).

Invasive plant – any invasive alien plant species that has the potential to cause undesirable or detrimental impacts to RDNO economy, human health, animals or ecosystems. Invasive plant species may be listed under the *Forest & Range Practices Act (FRPA)*, *Invasive Plant Regulation (IPR)*, administered by MFLNRO.

The objectives of this PMP are to ensure:

- legal accountability with the provisions of the *Integrated Pest Management Act (IPMA)* and *Regulation (IPMR)*, as well as applicable federal, provincial and local government laws and regulations;
- the responsible use of herbicides;
- the effective use of IPM principles;
- public and First Nation awareness of noxious weed/invasive plant management in RDNO; and,
- public and First Nation input into noxious weed/invasive plant management in RDNO.

This PMP states the applicable text and fulfills the requirements of Section 58 of the *IPMR*.

1.1 GEOGRAPHIC AREA OF THE PMP

58 (1) A pest management plan prepared for the purpose of section 7(1)(a) of the Act must include the following identifying information;

- (a) a description of the geographic boundaries of the area to which the plan applies and maps or diagrams showing proposed treatment areas within that area;**

This PMP will be specific to land within the geographic area defined as RDNO, which occupies approximately 787,000 hectares of land of which approximately 608,000 hectares are crown lands; 167,500 hectares are private lands and 11,500 hectares are First Nation lands. Approximately 70,000 hectares are within the Agricultural Land Reserve.

There are a variety of land uses within RDNO area. Lands that are used for recreation, forestry, and range lands are generally Crown Lands within the Okanagan Shuswap Forest District (OSFD). The remainder of RDNO area is

made up of Incorporated Municipalities and Electoral areas. A number of public utility corridors, such as highways, roads, hydro, natural gas and other utility right of ways, crisscross the region. Within the Municipalities and Electoral areas there are typical residential areas, rural areas with large lots, small holding areas with small acreage, many of which have hobby farm activities, to larger properties in hay, grain, cattle, orchard, or other agricultural activities to very large farming operations. There are many areas within RDNO that are not suitable for agricultural activities as well as vacant properties that are generally left in a natural, undisturbed condition.

The primary uses for lands within RDNO that are usually included for noxious weed/invasive plant control programs are public utility corridors and rural areas where natural resource extraction and the growing of hay, grain and other agricultural crops is predominant.

There are a number of geographic areas that have characteristic property types. They are:

- The City of Vernon, City of Armstrong, City of Enderby, Village of Lumby - primarily urban in nature with typical city type lots serviced by sewer/septic tank and municipal water systems.
- District of Coldstream – has a large urban area with typical city-type lots as well as some rural areas, small holding and larger agricultural properties.
- Township of Spallumcheen – a few smaller urban areas with city-type lots with mostly larger properties producing hay and grain and other agricultural crops.
- BX area – some urban areas with city type lots intermingled with rural and small holding properties. Agricultural activities include orchards, some hay productions and a variety of hobby farms.
- Commonage, Lumby-Mabel Lake valley, Enderby-Mabel Lake valley, Cherryville area – generally large properties producing a variety of agricultural crops, some recreational uses and some resource extraction.
- Enderby to Mara Lake area – some large properties producing a variety of agricultural crops, recreational uses, with a few intermingled small holding and urban areas.

Appendix 1 contains a map showing the geographic boundaries of the area covered by this PMP.

1.2 RESPONSIBILITY FOR MANAGING PESTS

58 (1) A pest management plan prepared for the purpose of section 7(1)(a) of the Act must include the following identifying information;

- (b) the person responsible for managing pests in relation to the land described in paragraph (a);**
- (c) the name and phone number of an individual who is the principal contact for information relating to the pest management plan.**

The person responsible for managing pests and the principal contact for RDNO is John Friesen, R.P.F., Weed Control Officer. Mr. Friesen can be contacted at:

- Office: 250 550-3749
- Cell: 250 309-9100
- Email: john.friesen@rdno.ca
- Mailing: Regional District of North Okanagan
9848 Aberdeen Road, Coldstream, B.C. V1B 2K9

2.0 INTEGRATED PEST MANAGEMENT PROGRAM

According to the *IPMA*, IPM “means a process for managing pest populations that includes the following elements:

- *Planning and managing ecosystems to prevent organisms from becoming pests;*
- *Identifying pest problems and potential pest problems;*
- *Monitoring populations of pests and beneficial organisms, damage caused by pests and environmental conditions;*
- *Using injury thresholds in making treatment decisions;*
- *Suppressing pest populations to acceptable levels using strategies based on considerations of:*
 - *Biological, physical, cultural, mechanical, behavioral, and chemical controls in appropriate combinations,*
 - *Environmental and human health protection; and*
- *Evaluating the effectiveness of pest management treatments.”*

This PMP aims to achieve effective, long-term noxious weed/invasive plant control and management that is consistent with legislation, social values and environmental resources. IPM is a decision making process for determining what actions will be taken when pest problems occur. All available information is considered to manage pest populations effectively. RDNO is committed to the principals and practice of IPM and will implement the following elements in the IPM program:

- Prevention;
- Identification
- Surveys, Inventory and Data Management;
- Management Strategies;
- Noxious Weed/Invasive Plant Treatment Options;

- Treatment Method Selection; and,
- Monitoring and Evaluation.

2.1 PREVENTION

58 (2) A pest management plan prepared for the purpose of section 7(1)(a) of the Act must include the following integrated pest management elements;

- (a) a description of the program that will be employed to prevent organisms from becoming pests;***

Preventing the initial establishment and spread of noxious weeds/invasive plants on non-infested sites is the most effective and often most economical method of noxious weed/invasive plant control. Noxious weeds/invasive plants will invade areas that provide suitable habitat for their survival and proliferation.

In most cases the seed or propagules of a noxious weed/invasive plant requires suitable habitat which includes areas of soil disturbance. Vectors of noxious weed/invasive plant spread include, but are not limited to, wind, water, wildlife, livestock and man. Natural vectors are very difficult to control, however, when man is the vector, negligence or a lack of understanding can be the key contributors to noxious weed/invasive plant spread. The following preventative measures will help reduce the spread of noxious weeds/invasive plants:

- keep disturbance on non-cultivated lands to a minimum;
- grass seed all disturbed sites upon completion of activity with approved seed mix;
- manage plant communities to ensure health and vigor and to promote desirable species;
- when driving, stay on established roadways;
- check clothing, vehicles and field equipment for presence of noxious weeds/invasive plants when leaving infested areas;
- remove noxious weeds/invasive plants from clothing and vehicles by dislodging and ensure they are contained on-site or disposed of;
- treat or pull and remove any isolated noxious weed/invasive plant infestations;
- dispose noxious weed/invasive plant seeds and propagules at regional disposal facilities;
- do not transport noxious weed/invasive plant infested soils within the PMP area;
- do not transport noxious weed/invasive plant infested hay or seed within the PMP area; and/or,
- report any new infestations to RDNO staff.

A key element in RDNO's long-term noxious weed/invasive plant control is education. RDNO will continue to promote the development and distribution of educational material aimed at increasing public awareness of noxious weeds/invasive plants.

2.2 IDENTIFICATION

58 (2) A pest management plan prepared for the purpose of section 7(1)(a) of the Act must include the following integrated pest management elements;

(b) either

- (i) a description of the program that will be employed to identify pests targeted by the plan, or**
- (ii) identification of the pests targeted by the plan;**

The accurate identification of noxious weeds/invasive plants and recognition of the threat posed by them is a fundamental requirement for successful management programs for the following reasons:

- Certain noxious weeds and invasive plants must be controlled by law;
- Depending on a plant's growth stage, growth rate, characteristics, physical location and degree of invasiveness, control may or may not be required; and.
- Control methods may differ depending on the plant species. Some may be easily controlled by non-chemical methods, but others may only be effectively managed through the use of certain herbicides or a combination of both.

It is important to have a basic understanding of plant biology, including knowledge of growth stages, life cycles and classification, so that the safest, most appropriate and effective control methods may be used. RDNO staff will rely on dichotomous keys, publications, fact sheets, guidebooks, brochures and web based information to assist in the identification, management and control of noxious weeds/invasive plants.

The weed species that will be treated are those designated as noxious weeds and/or invasive plants for the Province of British Columbia and RDNO. It is recognized that different geographic areas within RDNO may have weed priorities unique to each particular area.

2.2.1 Noxious Weeds

The *WCA* and *WCR* impose a duty on land occupiers to control designated noxious plants within British Columbia. Within the *WCA*, certain weeds are classified as noxious within all regions of the province and others are designated as noxious within the boundaries of listed regional districts. RDNO evaluates and treats all noxious weeds on these lists that it deems necessary at a given time and location. The current provincial and regional noxious weed lists are shown below:

Table 1 Noxious Weeds within all regions of British Columbia

Annual Sow Thistle	<i>Sonchus oleraceus</i>	Japanese Knotweed	<i>Fallopia japonica</i>
Bohemian Knotweed	<i>Fallopia bohemica</i>	Jointed Goatgrass	<i>Aegilops cylindrica</i>
Bur Chervil	<i>Anthriscus caucalis</i>	Leafy Spurge	<i>Euphorbia esula</i>
Canada Thistle	<i>Cirsium arvense</i>	Milk Thistle	<i>Silybum marianum</i>
Common Crupina	<i>Crupina vulgaris</i>	North Africa Grass	<i>Ventenata dubia</i>
Common Reed	<i>Phragmites australis</i>	Perennial Sowthistle	<i>Sonchus arvensis</i>
Dalmatian Toadflax	<i>Linaria dalmatica</i>	Purple Loosestrife	<i>Lythrum salicaria</i>
Dense-flowered Cordgrass	<i>Spartina densiflora</i>	Purple Nutsedge	<i>Cyperus rotundus</i>
Diffuse Knapweed	<i>Centaurea diffusa</i>	Rush Skeletonweed	<i>Chondrilla juncea</i>
Dodder	<i>Cuscuta spp.</i>	Saltmeadow Cordgrass	<i>Spartina alterniflora</i>
English Cordgrass	<i>Spartina anglica</i>	Scentless Chamomile	<i>Matricaria maritime</i>
Flowering Rush	<i>Butomus umbellatus</i>	Smooth Cordgrass	<i>Spartina alterniflora</i>
Garlic Mustard	<i>Alliaria petiolata</i>	Spotted Knapweed	<i>Centaurea biebersteinii</i>
Giant Hogweed	<i>Heracleum mantegazzianum</i>	Tansy Ragwort	<i>Senecio jacobaea</i>
Giant Knotweed	<i>Fallopia sachalinensis</i>	Velvetleaf	<i>Abutilon theophrasti</i>
Giant Mannagrass/ Reed Sweetgrass	<i>Glyceria maxima</i>	Wild Oats	<i>Avena fatua</i>
Gorse	<i>Ulex europaeus</i>	Yellow Flag Iris	<i>Iris pseudacorus</i>
Himalayan Knotweed	<i>Polygonum polystachyum</i>	Yellow Nutsedge	<i>Cyperus esculentus</i>
Hound's-tongue	<i>Cynoglossum officinale</i>	Yellow Starthistle	<i>Centaurea solstitialis</i>
		Yellow Toadflax	<i>Linaria vulgaris</i>

Table 2 Noxious Weeds within RDNO

Burdock	<i>Arctium spp.</i>	Russian Knapweed	<i>Acroptilon repens</i>
Common Tansy	<i>Tanacetum vulgare</i>	Scotch Thistle	<i>Onopordum acanthium</i>
Hoary Cress	<i>Cardaria spp.</i>	Sulphur Cinquefoil	<i>Potentilla recta</i>
Oxeye Daisy	<i>Chrysanthemum leucanthemum</i>		

2.2.2 Invasive Plants

Invasive plants are non-native plants that have found their way into British Columbia without the insect predators and/or plant pathogens that help

keep them in check in their native habitats. Invasive plants have highly adaptive, aggressive mechanisms of establishment and growth, and can cause serious economic and environmental impacts to forestry, agriculture, tourism/recreation, industries and First Nations. Invasive plants possess many of the same characteristics as noxious weeds, and therefore considered to be pests. For the purposes of *Section 47* of the *FRPA*, the prescribed species of invasive plants are as follows:

Table 3 Invasive Plants List, FRPA Invasive Plants Regulation

Anchusa	<i>Anchusa officinalis</i>	Meadow Knapweed	<i>Centaurea pratensis</i>
Baby's Breath	<i>Gypsophila paniculata</i>	Nodding Thistle	<i>Carduus nutans</i>
Black Knapweed	<i>Centaurea nigra</i>	Orange Hawkweed	<i>Hieracium aurantiacum</i>
Blueweed	<i>Echium vulgare</i>	Oxeye Daisy	<i>Chrysanthemum leucanthemum</i>
Brown Knapweed	<i>Centaurea jacea</i>	Perennial Pepperweed	<i>Lepidium latifolium</i>
Bull Thistle	<i>Cirsium vulgare</i>	Plumless Thistle	<i>Carduus acanthoides</i>
Canada Thistle	<i>Cirsium arvense</i>	Puncturevine	<i>Tribulus terrestris</i>
Common Burdock	<i>Arctium minus</i>	Purple Loosestrife	<i>Lythrum salicaria</i>
Common Tansy	<i>Tanacetum vulgare</i>	Rush Skeletonweed	<i>Chondrilla juncea</i>
Dalmatian Toadflax	<i>Linaria dalmatica</i>	Russian Knapweed	<i>Acroptilon repens</i>
Diffuse Kapweed	<i>Centaurea diffusa</i>	Scentless Chamomile	<i>Matricaria maritima</i>
Field Scabious	<i>Knautia arvensis</i>	Scotch Broom	<i>Cytisus scoparius</i>
Giant Knotweed	<i>Polygonum sachalinense</i>	Scotch Thistle	<i>Onopordum acanthium</i>
Gorse	<i>Ulex europaeus</i>	Spotted Knapweed	<i>Centaurea biebersteinii</i>
Hoary Alyssum	<i>Berteroa incana</i>	St. John's-wort	<i>Hypericum perforatum</i>
Hoary Cress	<i>Cardaria draba</i>	Sulphur Cinquefoil	<i>Potentilla recta</i>
Hound's-tongue	<i>Cynoglossum officinale</i>	Tansy Ragwort	<i>Senecio jacobaea</i>
Japanese Knotweed	<i>Polygonum cuspidatum</i>	Teasel	<i>Dipsacus fullonum</i>
Leafy Spurge	<i>Euphorbia esula</i>	Yellow Iris	<i>Iris pseudacorus</i>
Marsh Thistle	<i>Cirsium palustre</i>	Yellow Starthistle	<i>Centaurea solstitialis</i>
Meadow Hawkweed	<i>Hieracium pilosella</i>	Yellow Toadflax	<i>Linaria vulgaris</i>

2.3 MONITORING

58 (2) A pest management plan prepared for the purpose of section 7(1)(a) of the Act must include the following integrated pest management elements;

- (c) a description of the monitoring program that will be employed before or during the pesticide use for assessing pest populations, environmental conditions and damage caused by pests, which program must include a description of**
- (i) the monitoring methods,**
 - (ii) the frequency of monitoring, and**
 - (iii) the data that will be collected;**

Information on noxious weed/invasive plant species, size of infestations and distribution and density is collected by RDNO staff on a regular basis throughout the growing season. Designing an effective noxious weed/invasive plant management program requires an understanding of the regional and local characteristics of the management area. Factors such as the location of environmentally sensitive areas, noxious weed/invasive plant species and their abundance and the general site conditions are important for selecting the best methods of management. This information is used to develop annual work plans, priorities and decisions on treatment.

The following MFLNRO Invasive Alien Plant Program (IAPP) forms may be used to record inventory, treatment and monitoring information on noxious weed/invasive plant sites:

- Site and Invasive Plant Inventory Record
- Invasive Plant Chemical & Mechanical Treatment Record
- Pesticide Use Record Form
- Chemical or Mechanical Monitoring Record
- Biological Control Agent Dispersal Record
- Biological Control Agent Release & Monitoring Record

Noxious weed/invasive plant surveys and inventories are conducted in accordance with the methodology outlined in IAPP's Reference Guide. Data is collected and recorded on a site specific basis using the MFLNRO IAPP forms. The monitoring information collected includes:

- date;
- plant species;
- UTM coordinates;
- plant distribution;
- plant density;
- riparian information;
- location and adjacent property issues;
- soil characteristics; and,
- any pertinent site characteristics or additional information.

Noxious weed/invasive plant survey and inventory data are stored within the IAPP application. This database and mapping application allows extraction of

relational data, statistics and spatial mapping information, and is accessible at the following web site:

<http://www.for.gov.bc.ca/hra/Plant/application.htm>

RDNO staff also receives information from the general public on the locations of new noxious weed/invasive plant infestations. Surveys and inventories are then conducted as part of regular inspections. These locations are then monitored on a regular basis.

2.4 TREATMENT THRESHOLDS

58 (2) A pest management plan prepared for the purpose of section 7(1)(a) of the Act must include the following integrated pest management elements;
(d) the injury thresholds that will be applied in deciding whether a pesticide treatment is necessary and an explanation of
(i) how the thresholds were chosen, and
(ii) how the thresholds will be applied;

To facilitate noxious weed/invasive plant control decisions, a management strategy has been developed for consistent, efficient treatment. Noxious weeds/invasive plants are prioritized into 4 categories according to level of concern to agriculture and natural resources, refer to Table 4. The categorization reflects more closely, the historical activity in RDNO. It is recognized that these may change if weeds that are not known to be in the area are discovered. As agricultural activities change and methods of weed control changes, so can the weed priorities change. It is also noted that different geographic areas within RDNO may have different weed priorities.

Table 4

Noxious Weed/Invasive Plant Categories within RDNO

Category 1-Extremely Invasive	Category 2-Very Invasive
Anchusa Common Reed Gorse Japanese Knotweed Field Scabious Giant Hogweed Leafy Spurge Marsh Thistle Perennial Pepperweed Puncturevine Rush Skeletonweed Scotch Thistle Spotted Knapweed Sulphur Cinquefoil Yellow Starthistle	Blueweed Bohemian Knotweed Bur Chervil Common Tansy Flowering Rush Garlic Mustard Giant Knotweed Giant Mannagrass Himalayan Knotweed Hoary Alyssum Milk Thistle North Africa Grass Plumeless Thistle Purple Loosestrife Scotch Broom Tansy Ragwort Teasel Yellow Flag Iris
Category 3-Invasive	Category 4-Lessor Important Species
Baby's Breath Black Knapweed Brown Knapweed Burdock Canada Thistle Hoary Cress Hound's-tongue Meadow Knapweed Orange Hawkweed Oxeye Daisy Russian Knapweed Scentless Chamomile Yellow Toadflax	Annual Sow Thistle Bull Thistle Dalmatian Toadflax Diffuse Knapweed Nodding Thistle Perennial Sow Thistle St. John's-wort

Category 1 Species are extremely invasive and are the highest risk to native vegetation, endangered ecosystems and recreational land. These species pose an extreme risk for invasion and spread into undisturbed sites as they have the ability to become the most dominant species on a site. This category also includes new species not currently present in RDNO.

Category 2 Species pose a high risk of invasion and spread into native vegetation, endangered ecosystems and recreational land. These species are either less competitive than Category 1 species, or are more easily controlled due to their biology and ecology.

Category 3 Species pose a moderate risk of invasion and spread into native vegetation, endangered ecosystems and recreational land. These species may require disturbance to become significantly abundant in an area.

Category 4 Species pose a low to moderate risk of invasion and spread into native vegetation, endangered ecosystems and recreational land. Disturbance is required to allow these species to become abundant. Species that have been reduced to an acceptable level as a result of successful biological programs are included in this category.

Weed infested sites are ranked according to priority. The definitions of the four priorities are:

Table 5 Noxious Weed/Invasive Plant Site Priorities within RDNO

Priority	Purpose or Intent of Treatment
1 Extremely High Risk	<ul style="list-style-type: none"> • Intent is to stop the spread of noxious weeds/invasive plants in areas that are generally less than or equal to 0.25 ha • Widely separated by distance or physical barrier from the main infestation • Threatening non-infested, highly susceptible areas • High probability of control
2 High Risk	<ul style="list-style-type: none"> • Generally less than or equal to 0.5 ha • Intent is to stop the enlargement of sites in highly susceptible areas • Good probability of control
3 Moderate Risk	<ul style="list-style-type: none"> • Intent is to stop the enlargement of sites of greater than or equal to 0.5 ha in highly susceptible areas or less than or equal to 0.5 ha in moderately susceptible areas • Good probability of control
Footnote	<i>The majority of time and budget for RDNO is consumed by categories 1,2,&3. Priority is given to areas that are directly impacting an agricultural crop, secondly to areas that are near croplands and thirdly to areas where no cropland is directly affected but where weeds could be transported from. Response to weeds in these areas is on the basis of complaints or requests received as well as monitoring and scheduled treatment areas.</i>
4 Low Risk	<ul style="list-style-type: none"> • To stop the enlargement/contain sites in moderately susceptible areas of greater than or equal to 0.5 ha • Good probability of control
Footnote	<i>Category 4 weeds are generally responded to on a property specific request basis and occasionally on a complaint. The property owner usually takes control measures. Should there be a direct impact on an agricultural crop, RDNO crews will treat the weed.</i>

Using the Plant Categories and the Site Priorities, RDNO has developed the treatment priority outlined in the table below.

Table 6 Injury Thresholds

Plant Category	Site Priority	Treatment Priority
1	1	1
1	2	2
2	1	3
2	2	4
3	1	5
3	2	6
All	3	7
All	4	8

It is recognized that noxious weed/invasive plant priorities are subject to change, as new species are identified as being detrimental to the agricultural community and as land use changes. There are also different priority weed species in the different geographic areas of RDNO.

2.4.1 Noxious Weed/Invasive Plant Control Strategy:

With noxious weeds/invasive plants, ecological, economic and social impacts are considered when determining the best management strategy for targeted species. Noxious weeds/invasive plants that are determined to be a high threat and do not occur in a region or occur only at very low population levels, are controlled before their populations expand to cause significant injury. It is only when noxious weeds/invasive plants have expanded to a large area and rehabilitation of critical habitats and other values are contemplated that injury thresholds are considered.

The selection of which invasive plant management strategy to employ on a landscape is determined by the review and consideration of key factors. These factors include:

- species distribution across a defined landscape,
- invasiveness (threat) of the noxious weed/invasive plant,
- susceptibility of habitats that are invaded or threatened by the noxious weed/invasive plant, and,
- density of plants at a site, or potential for the species to become very dense.

If a noxious weed/invasive plant is detected and confirmed to be a new incursion to the province, a provincial response plan is engaged with the objective of eradicating the new invader. This is referred to as **Early Detection Rapid Response**. If a species is determined to be localized to a small area, or a new incursion to the management area or region, the resulting management objective may be to extirpate the species from the

infested sites through a regional early detection and rapid response treatment plan. If the localized infestation covers a much larger area and there is no chance of eradicating the population, the resulting management objective is to contain the infestation in order to stop the spread and establishment into areas not infested. This is referred to as **Containment**. If a noxious weed/invasive plant is determined to be endemic across the majority of a defined area of susceptible habitat behind a containment line, the resulting management action is referred to as **Rehabilitation**. Rehabilitation actions include biological control measures, intensive treatments, and revegetation. The potential for a species to cause impacts in the future due to high density indicates that rehabilitation may be required.

2.5 TREATMENT OPTIONS

58 (2) A pest management plan prepared for the purpose of section 7(1)(a) of the Act must include the following integrated pest management elements;

(e) pest treatment options including

- (i) a description of the pesticide and non-pesticide treatment methods of controlling pests that may be used,**
- (ii) the rationale for selecting the treatment methods described under subparagraph (i),**
- (iii) the benefits and limitations of each treatment method described under subparagraph (i), and**
- (iv) a description of how a decision to use treatment methods will be made;**

The selection of a treatment option to control noxious weeds/invasive plants will depend on:

- Treatment timing;
- The species or complex of noxious weed/invasive plant being targeted;
- Species composition and percent cover;
- Site characteristics including land use, proximity to water sources, bodies of water, soil type and other environmentally sensitive areas;
- Environmental sensitivities in surrounding areas;
- Safety, economic impacts and site accessibility; and,
- The consequences of not treating.

IPM techniques proposed for use under this PMP include:

- Manual and Mechanical Weed Control;
- Cultural Weed Control;
- Biological Weed Control; and,
- Chemical Weed Control.

2.5.1 Manual and Mechanical Weed Control

Manual and mechanical control methods of weed control are effective and environmentally safe methods if timed correctly and precautions are taken to minimize soil disturbance and native vegetation loss. These methods are not practical for large areas, and alternative methods may be applied.

Manual and mechanical control methods that may be used in the IPM program include hand pulling, digging, hand cutting, mowing, and the use of gas powered weed trimmers.

Rationale, Selection Criteria and Benefits of Using Manual and Mechanical Control

Gas powered weed trimmers, pruners, and hand scythes are used to cut weeds before they go to seed in Pesticide Free Zones (PFZ's) along roads and other rights of ways (except riparian areas). Small patches of weeds or single scattered weeds are often hand pulled in these areas as well. Digging weeds is generally associated with hand pulling to assist in getting roots out as well. Weeds that are removed through hand pulling or as a result of cutting and gathering later in the season, when there may be seed set, are disposed of in a RDNO landfill.

- Hand pulling is effective on tap-rooted plants when the size of the infestation is small and the soils are amenable to hand pulling;
- Hand pulling is sometimes the only available technique for plant control in areas where herbicides cannot be used;
- Manual and mechanical control will generally effectively eliminate the current year's seed production and significantly reduce the plant's root reserves that contribute to the next year's growth;
- Manual and mechanical control will generally reduce seed production; and,
- Manual and mechanical control may be effective at reducing invasive plant density or movement off site.

Limitations of Manual and Mechanical Control

- Hand pulling normally needs to be done for several years to eliminate plants from a site, as there is usually a seed bank;
- Hand pulling is not efficient once an infestation involves thousands of plants;
- Manual and mechanical control is not effective for rhizomatous plants such as Canada thistle, as it tends to break up the rhizomes and stimulates plant growth;
- Excavating may be costly and labour intensive as complete removal of all root fragments must be obtained to prevent re-growth in rhizomatous species;
- Uprooting noxious weeds/invasive plants can cause soil disturbance along a body of water and result in siltation, destabilize the slope or improve the seed bed for re-infestation;
- Mowing is less effective on low-growing plants that are growing beneath the mowing height, can encourage growth rather than weaken the plants and cannot be done when flower-feeding bio-control agents are working on a site; and,
- Repeated follow-up treatments generally need to be conducted to remove all new germinates, often three to five years.

2.5.2 Cultural Weed Control

Cultural weed control includes seeding areas of disturbed soil to reduce the spread of weeds.

Rationale, Selection Criteria and Benefits of Using Cultural Control

- Manually planting disturbed areas known to be at risk to noxious weed/invasive plant establishment using certified seed will reduce the risk of noxious weed/invasive plant establishment and erosion.

Limitations of Using Cultural Control

- May require irrigation to establish and maintain.

2.5.3 Biological Weed Control

Biological control involves the introduction of pests and parasites specific to certain noxious weeds/invasive plants. Most noxious weeds/invasive plants arrived in North America as seeds, and therefore without the biological agents that regulate them. Biological control is the use of a weed's natural enemies (insects and pathogens) to reduce its population at or below a tolerable level. These natural enemies are used to establish a long-term balance between the biological organism and the weed. The agents are thoroughly tested before release to ensure that they will not harm native and desirable introduced plants. When effective, biological control provides self-perpetuating, self-dispersing and continual control of weeds. It is therefore a cost-effective, sustainable, and environmentally compatible means of controlling widespread introduced weeds.

Biological control agents usually reduce weed populations by decreasing plant vigor, reproduction, and competitive ability, which in turn encourages the dominance of the desired species. Bio-agents are primarily utilized in areas where weed infestations are too extensive to be reduced effectively by utilizing mechanical or herbicide methods, or in areas within a PFZ.

The MFLNRO, Southern Interior Region, is the primary agency involved in the screening and propagation of bio-control agents. RDNO has been an active participant in the collection and release of bio-control agents since the mid 1990's. RDNO is committed to continuing with the collection and release of bio-control agents when and where appropriate to reduce noxious weeds/invasive plants populations.

A complete list of agents commonly used and the agents under development is available on-line at:

http://www.for.gov.bc.ca/hra/Plants/biocontrol/bioagents_available.htm

The following table lists biological control agents introduced to a number of noxious weeds/invasive plants in B.C. (the list may not necessarily be complete):

Table 7 Biological Control Agents in B.C.

BIOCONTROL AGENT	WEED SPECIES	MODE OF ACTION
<u>Agepeta zoegana</u>	<u>Centaurea biebersteinii</u> Spotted knapweed	Root feeder
<u>Aphthona cyparissae</u>	<u>Euphorbia esula</u> Leafy spurge	Root/shoot feeder
<u>Aphthona czwalinae</u>	<u>Euphorbia esula</u> Leafy spurge	Root/shoot feeder
<u>Aphthona nigriscutis</u>	<u>Euphorbia esula</u> Leafy spurge	Root/shoot feeder
<u>Chrysolina hyperici</u>	<u>Hypericum perforatum</u> St. John's-wort	Leaf/shoot feeder
<u>Cyphocleonus achates</u>	<u>Centaurea diffusa/biebersteinii</u> Diffuse/Spotted knapweed	Root feeder
<u>Eriophyes chondrillae</u>	<u>Chondrilla juncea</u> Rush skeletonweed	Reduces seed production by galling the stem
<u>Galerucella spp.</u>	<u>Lythrum salicaria</u> Purple Loosestrife	Feeds on leaves and stems
<u>Larinus minutus</u>	<u>Centaurea biebersteinii</u> Spotted knapweed	Seed reduction in seed head
<u>Larinus obtusa</u>	<u>Centaurea biebersteinii</u> Spotted knapweed	Seed reduction in seed head
<u>Longitarsus quadriguttatus</u>	<u>Cynoglossum officinale</u> Hound's-tongue	Damages roots flea beetle/root feeder
<u>Mecinus janthinus</u>	<u>Linaria dalmatica/vulgaris</u> Dalmatian/Common toadflax	Reduces seed production and root growth. weevil, stalk/root feeder
<u>Metzneria paucipunctella</u>	<u>Centaurea biebersteinii</u> Spotted knapweed	Seed head
<u>Mogulones cruciger</u>	<u>Cynoglossum officinale</u> Hound's-tongue	Reduces vigor of plant through damage to the root and stem. weevil/root feeder
<u>Pelochrista medullana</u>	<u>Centaurea biebersteinii</u> Spotted knapweed	Leaf feeder
<u>Puccinia acroptili</u>	<u>Acroptilon repens</u> Russian knapweed	Rust species affects photosynthesis and growth
<u>Puccinia chondrillina</u>	<u>Chondrilla juncea</u> Rush skeletonweed	stem rust
<u>Puccinia jaceae</u>	<u>Centaurea diffusa/biebersteinii</u> Diffuse/Spotted knapweed	Rust species affects photosynthesis and growth

Table 7 cont. Biological Control Agents in B.C.

BIOCONTROL AGENT	WEED SPECIES	MODE OF ACTION
<u>Rhinocyllus conicus</u>	<u>Cirsium arvense</u> Canada thistle <u>Carduus nutans/acanthoides</u> Nodding/Plumeless thistle	Reduces seed production of infested plants
<u>Sphenoptera jugoslavica</u>	<u>Centaurea biebersteinii</u> Spotted knapweed	Root feeder
<u>Urophora affinis</u>	<u>Centaurea diffusa/ biebersteinii</u> Diffuse/Spotted knapweed	Seed reduction in seed head
<u>Urophora quadrifasciata</u>	<u>Centaurea diffusa/ biebersteinii</u> Diffuse/spotted knapweed	Seed reduction in seed head
<u>Urophora solstitialis</u>	<u>Carduus acanthoides</u> Plumeless thistle	Seed reduction in seed head
<u>Urophora stylata</u>	<u>Cirsium vulgare</u> Bull thistle	Seed reduction in seed head

Rationale, Selection Criteria and Benefits of Using Biological Control

- Have proven effective to reduce herbicide use and also achieve long-term control on sites with well-established noxious weed/invasive plant populations;
- Are usually utilized in areas where noxious weed/invasive plant infestations and distribution are too established to be reduced effectively by other treatment methods;
- Once established, provide an inexpensive, long term and non-toxic means to control weed populations;
- Field releasing is relatively inexpensive and scheduling with other duties keeps release and monitoring costs low;
- Reduce noxious weed/invasive plant populations below a level where significant environmental or economic damage occurs; and,
- There are very few known worker and public safety issues associated with releasing biological control agents.

Limitations of Using Biological Control

- After their introduction, biological control agents can take five to ten years to become established and increase to numbers large enough to cause damage to the target plants;
- Ongoing monitoring is required to determine establishment, dispersal and impact on plant populations;
- Does not result in elimination of the plant species from sites;
- Some specialized equipment and training is required for transporting, releasing, distributing and monitoring biological control agents;
- Biological control agents are not available for all noxious weed/invasive plant species;

- Biological control agents are generally not effective when used at small sites with a low density of plants and/or where adjacent property owners or agencies are not involved in the cooperative control effort; and,
- There is some public concern as to whether native flora and fauna may be impacted by the release of biological agents.

2.5.4 Chemical Weed Control

Herbicide applications are only one component of RDNO noxious weed/invasive plant control program but their use is critical to control the spread of noxious weeds/invasive plants. Herbicides will be used as a last resort and for the control of noxious weeds/invasive plants on sites where a high level of control can be achieved. All herbicide applications under this PMP will be selective or spot applications to targeted invasive plants. Application techniques will be selected that minimize injury to non-target plants and soils through spray drift and leaching in soils. Consequently, applications by wick/wipe to foliage may also be used.

Rationale, Selection Criteria and Benefits of Using Chemical Control

- Herbicides offer a useful tool that can be integrated with other management techniques;
- With the exception of biological control agents, the economic costs of treating many sites with herbicides may be significantly lower than other treatment methods;
- It is very unlikely that manual, mechanical or cultural techniques alone will be effective at achieving the required level of control to reduce the spread of high priority noxious weeds/invasive plants and manage existing infestations at priority sites due to their specialized biology and persistence;
- The use of herbicides applied at prescribed label application rates should provide excellent control of target plants; and,
- The degradation of habitat as a result of noxious weed/invasive plant infestations may exceed degradation resulting from judiciously applied, selective and spot application of specific herbicides.

Limitations of Using Chemical Control

- With the exception of herbicides containing the active ingredient glyphosate, herbicides cannot be applied to plants growing within 10 meters of water bodies, dry streams or classified wetlands.
- At least one follow-up application is generally required to give total control of most plant species; and,
- Exposure of herbicides may present a risk to workers, the public and untargeted species of plants and animals if not completed in accordance to the *IPMA* and *IPMR*, standards listed in this PMP, and/or instruction on the herbicide label.

2.5.5 Treatment Selection Decision Tree

Treatment selection shall be based upon the following decision tree. The decision tree is designed as a general guideline for the many circumstances but recognizes that in site specific cases, judgment based on extenuating circumstances, may supersede the decision tree recommended treatment strategy.

- 1) Identification of Weed Species
 - a) Species is on noxious weed/invasive plant list or weed alert bulletin **Go To 2)**
 - b) Species **not** listed..... **no action**
- 2) Species location
 - a) Species is found on RDNO owned/controlled land **Go To 3)**
 - b) Species is **not** found on RDNO owned/controlled land .. **notify appropriate party**
- 3) Water Resources and Environmental Considerations
 - a) Species is found adjacent to or in an environmentally sensitive or riparian area, domestic water intake or well PFZ **Go To Table 8**
Treatment Methods EXCLUDING Chemical Control
 - b) Species is **not** found adjacent to or in an environmentally sensitive or riparian area, domestic water intake or well PFZ..... **Go to 4)**
- 4) Soil
 - a) Coarse texture **Go To Table 8**
Treatment Methods EXCLUDING Chemical Control
 - b) Fine texture **Go To 5)**
- 5) Other Considerations
 - a) No other values require protection..... **Go To Table 9**
Treatment Methods INCLUDING Chemical Control
 - b) Other values require protection **Go To 6)**
- 6) **Once all concerns have been evaluated and weed species, site and soil types have been assessed, a final decision can be made on the most appropriate method of noxious weed/invasive plant control for the site.**

The decision tree identifies the strategic treatment options. The infestation site is then prioritized according to Table 4 - Plant Category and Table 5 - Site Priority shown in Section 2.4.

Table 8 Treatment Methods EXCLUDING Chemical Control

	Small (Individual plant to 0.5 hectares)	Medium (0.5 to 2 hectares)	Large (more than 2 hectares)
Limited Distribution (Codes 1, 2, 3, and 4)	1 – Digging and Hand Pulling 2 – Cutting/Mowing	1 – Digging and Hand Pulling 2 – Cutting/Mowing	1 – Cutting
Patchy Distribution (Codes 5 and 6)	1 – Digging and Hand Pulling 2 – Cutting/Mowing	1 – Biological 2 – Cutting/Mowing	1 – Biological
Continuous Distribution (Codes 7, 8 and 9)	1 – Biological 2 – Cutting/Mowing	1 – Biological or Manual	1 – Biological or Manual

Table 9 Treatment Methods INCLUDING Chemical Control

	Small (Individual plant to 0.5 hectares)	Medium (0.5 to 2 hectares)	Large (more than 2 hectares)
Limited Distribution (Codes 1, 2, 3, and 4)	1 – Digging and Hand Pulling 2 – Cutting/Mowing 3 - Chemical	1 – Digging and Hand Pulling 2 – Cutting/Mowing 3 - Chemical	1 – Cutting/Mowing 2 – Chemical
Patchy Distribution (Codes 5 and 6)	1 – Digging and Hand Pulling 2 – Cutting/Mowing 3 - Chemical	1 – Biological 2 – Cutting/Mowing 3 – Chemical	1 – Biological
Continuous Distribution (Codes 7, 8 and 9)	1 – Biological 2 – Cutting/Mowing 3 – Chemical	1 – Biological	1 – Biological

- Code 1** rare individual, a single occurrence
- Code 2** a few sporadically occurring individuals
- Code 3** a single patch or clump of a species
- Code 4** several sporadically occurring individuals
- Code 5** a few patches or clumps of a species
- Code 6** several well-spaced patches or clumps
- Code 7** continuous uniform occurrence of well-spaced individuals
- Code 8** continuous occurrence of a species with a few gaps in distribution
- Code 9** continuous dense occurrence of a species

2.5.6 Treatment Area Evaluation

Prior to treatment, sites are assessed for presence of noxious weeds/invasive plants and their impact to the site. Injury threshold is assessed by site susceptibility and size of current noxious weed/invasive plant population. Site treatment is prescribed based on the decision tree,

Section 2.5.5, which takes into consideration site priority, noxious weed/invasive plant presence, size of infestation, soil type and location. If herbicides are going to be used, the following information will be provided:

- Location of the proposed herbicide use;
- Target species;
- Map of treatment area showing the location and distance to bodies of water, domestic and agricultural water sources, wells, sources of food for human consumptions and environmentally sensitive areas (eg. wildlife habitat areas, riparian areas);
- Location of residences and areas with human activities within 30 meters of proposed herbicide use. Residents to be advised of proposed treatment;
- Soil types and proposed PFZ from adjacent trees if products containing the active ingredient picloram are proposed for use;
- Location of all PFZ's, no treatment zones (NTZ's) and buffer zones that require flagging or staking prior to herbicide use; and,
- Signs posted at visible access points to the treatment areas as required by regulation.

2.5.7 Specific Treatment Options by Weed Species

Several treatment options are often available to control noxious weeds/invasive plants. The following specific recommendations give some examples of control options that RDNO may consider for the control of weeds of most concern within RDNO:

Burdock – Mowing after the plant has bolted but before it has flowered can be used to eliminate seed production. 2,4-D, picloram and glyphosate are effective when applied to first-year rosettes. There are currently no biological control agents available for common burdock control.

Canada thistle – Repeated mowing can be effective in reducing seed set. Intensive cultivation aimed at depleting food reserves in the roots, followed by competitive cropping, is effective in the long term. Spring and autumn applications of clopyralid, aminopyralid, or a dicamba/2,4-D tank mix have been effective when the roots are actively growing. Spring applications of picloram have also been effective when the Canada thistle is in the pre-bud to early bud growth stages. Six biological control agents are available for Canada thistle control.

Common bugloss – Cutting or mowing before plants flower will prevent seed production. Flowering stalks should be bagged, removed from the site, and disposed of in a landfill. Small populations can be hand pulled, especially younger plants before the deep taproot has developed. Herbicide applications have not proven effective in controlling common bugloss. Preliminary studies have shown that glyphosate and 2,4-D in combination with dicamba has provided some control. There are currently no biological control agents available for common bugloss control.

Dalmatian toadflax – Hand-pulling before seed-set each year can be an effective management method for small infestations. Cutting the plants will reduce top growth seed production but will not kill the plant. Fall applications of picloram or a mixture of picloram and 2,4-D may give effective control. Several biological control agents are currently available for dalmatian toadflax control.

Diffuse knapweed – Cutting or mowing before seed-set can be effective to reduce seed production, but will not eliminate large infestations. Mowing should be followed by a fall herbicide treatment. Hand-pulling can be effective in small infestations, but usually needs to be repeated. Aminopyralid, picloram, 2,4-D, clopyralid or a mixture of picloram and 2,4-D are effective for diffuse knapweed control. Herbicides should be applied before plants set seed, or applied to rosettes in the fall for maximum effectiveness. There are many biological control agents for the control of diffuse knapweed.

Field scabious – Cutting, mowing and cultivation are effective control methods. Small infestations of immature plants can be hand-pulled. Seed production can be reduced by cattle grazing early in the season, but the plant becomes unpalatable as it produces flowering stalks. Picloram and metsulfuron-methyl give effective control. Picloram should be applied in the spring or autumn, while metsulfuron-methyl should be applied to actively growing plants up to the early flower bud stage. There are currently no biological control agents available for Field scabious control.

Hoary alyssum – Small populations can be controlled by hand-pulling. Mowing can be effective in preventing seed production. Applications of 2,4-D, dicamba and glyphosate applied in spring or autumn to actively growing plants have proven to be effective. There are currently no biological control agents available for Hoary alyssum control.

Hoary cress – Due to the rhizomes of this perennial weed, mechanical control provides minimal control. Digging can provide control of very small infestations. Hand-pulling of above ground plant parts is ineffective. Effective chemical control requires multiple applications. Glyphosate can control hoary cress however it will injure and kill perennial grasses. Metsulfuron-methyl or dicamba can be effective if combined with an agricultural surfactant. The optimum time to apply Metsulfuron-methyl is in the spring when it is flowering or in the fall. There are currently no biological control agents available for hoary cress.

Hound's-tongue – Hand-pulling small infestations and mowing plants before seed-set will reduce seed production and may kill the plant. Picloram or a mixture of picloram and 2,4-D can be used for long term control if applied in the spring, summer or fall. Glyphosate is also effective in controlling actively growing plants. Two biological control agents are currently available for hound's-tongue control.

Leafy spurge – Mechanical and manual methods are generally ineffective because of the plant's extensive root system. Picloram alone has been used successfully on small infestations. A combination of picloram and 2,4-D are effective if applied before flowers emerge in the spring. Dicamba plus 2,4-D are also effective in managing leafy spurge. Glyphosate can be effective when

applied at one-month intervals followed by fall grass seeding. Several biological control agents are currently available for leafy spurge control.

Orange hawkweed – Hand-pulling small infestations can be effective if the roots and stolons are not scattered. Mowing can prevent seed production but will encourage vegetative reproduction. Picloram or picloram and 2,4-D provide good control when applied to actively growing plants in spring and early summer. There are currently no biological control agents available for orange hawkweed control.

Oxeye daisy – Hand-pulling and digging before seed production can be effective if most of the underground parts of the plant are removed. Picloram, a mixture of picloram and 2,4-D, metsulfuron-methyl and glyphosate give effective control. There are currently no biological control agents available for oxeye daisy control.

Rush skeletonweed – Hand pulling can be an effective treatment if repeated because of the plant's extensive root system. Mowing is ineffective at controlling rush skeletonweed. Herbicide applications should be applied after the plant has bolted but before seed set. Picloram can be effective if applied to rosettes. There are several biological control agents that may be effective in distorting the growth of rush skeletonweed.

Scotch thistle – Mechanical control can be effective because the plant does not reproduce vegetatively. Severing the taproot 1 to 2 inches below the ground can be effective but plants can regrow from severed roots and cut stems may still produce viable seed. Scotch thistle is best controlled in the rosette stage. Picloram, dicamba, 2,4-D, and clopyralid applied in spring before the plant bolts or in the autumn to rosettes has been effective in managing Scotch thistle. No biological control agents are currently available for Scotch thistle control.

Scentless chamomile – Seed production is reduced if plants are mowed before they flower. Scentless chamomile produces new flowers below the normal mower cutting height so to be effective mowing must be done early and often. Picloram and aminopyralid have been shown to be effective if applied early in the season before flowering. There are currently no biological control agents available for oxeye daisy control.

Spotted knapweed – Cutting, mowing or pulling before the plant sets seed can be effective on small infestations. The entire root system should be removed so that the plant will not resprout from the crown or remaining roots. Aminopyralid, picloram, a mixture of picloram and 2,4-D, 2,4-D alone, clopyralid and glyphosate are effective in controlling spotted knapweed. Herbicides should be applied before the mature plants set seed for maximum effectiveness. There are many biological control agents for managing knapweed.

Sulphur cinquefoil – Small infestations can be controlled by hand-digging. Picloram, a mixture of picloram and 2,4-D, clopyralid and 2,4-D are effective in controlling sulphur cinquefoil. There are currently no biological control agents for sulphur cinquefoil.

2.6 MONITORING PROGRAM

58 (2) A pest management plan prepared for the purpose of section 7(1)(a) of the Act must include the following integrated pest management elements;

- (f) a description of the monitoring program that will be employed for evaluating the effectiveness of the pesticide use on pest populations and the environment, including effects on organisms other than targeted pests, by comparison with the information collected under the program described in paragraph (c), which program must include a description of**
- (i) the monitoring methods,**
 - (ii) the frequency of monitoring, and**
 - (iii) the data that will be collected.**

Post treatment evaluation will normally occur within 14 days of application to determine the effectiveness of the treatment. Key areas are selected within known treatment sites and evaluated to ensure:

- compliance with the commitments made in this PMP;
- compliance with *IPMA* and *IPMR*;
- successful achievement of the required level of control; and,
- collection and sharing of information.

Dyes may be used with herbicide treatment to aid in both the accuracy of treatment as well as post evaluation. For mechanical treatment, sites are assessed for possible re-growth and need for a second treatment. When evaluating the results of both chemical and non-chemical controls, RDNO staff shall collect the following information to establish whether:

- the targeted noxious weeds/invasive plants were affected by the control option chosen;
- the level of control is acceptable;
- the treatment method used was effective;
- environmentally sensitive areas were adequately protected;
- herbicide application rate needs to be adjusted;
- there was any observable off-site herbicide movement or impact on surrounding areas;
- the established PFZ's, NTZ's and buffer zones were appropriate for the treatment method; and,
- whether follow-up treatments are required at the site.

The timing and procedure for evaluating specific treatment programs will depend on the treatment method. RDNO will take reasonable efforts to ensure that treatment sites are evaluated within one year of the treatment.

Biological control will be evaluated for agent establishment within 2 years after a release is made. Once establishment is verified on a site, dispersal and efficacy of the agent will also be assessed.

RDNO may also conduct inspections during treatment of both herbicide applications and/or manual/mechanical treatments conducted under this PMP. These inspections may assess public and worker safety, environmental

concerns, completion schedules and adherence to standards, specifications and the commitments made in this PMP.

3.0 HERBICIDE APPLICATION AND OPERATIONAL PRACTICES

58 (3) A pest management plan prepared for the purpose of section 7(1)(a) of the Act must include the following operational information;

(a) a description of the methods of handling, preparing, mixing, applying and otherwise using pesticides that will be employed under the plan including a description of the following procedures:

- (i) procedures for safely transporting pesticides;**
- (ii) procedures for safely storing pesticides;**
- (iii) procedures for safely mixing, loading and applying pesticides;**
- (iv) procedures for the safe disposal of empty pesticide containers and unused pesticides;**
- (v) procedures for responding to pesticide spills;**

The treatment of noxious weeds/invasive plants within the PMP area is performed by seasonal staff and/or contractors with valid service licenses to conduct noxious weed/invasive plant control treatment.

The transportation, storage, handling, application and disposal of herbicides are governed by federal and provincial legislation. All staff and contractors working with herbicides will follow safe handling practices including workplace requirements for Workplace Hazardous Materials Information System (WHMIS) labeling and worker education, and in compliance with *Division 7* of the *IPMR*. The required practices for herbicide applicators are detailed in:

- Workers' Compensation Board of British Columbia (1998) *Occupational Health and Safety Regulation – BC Regulation 96/97 as amended by BC Regulation 185/99 – Sections 6.70 to 6.109*;
- B.C. Ministry of Environment (2005) *Handbook for Pesticide Applicators and Dispensers*; and,
- Workers' Compensation Board of British Columbia (1990) *Standard Practices for Pesticide Applicators*.

3.1 QUALIFICATIONS AND RESPONSIBILITIES OF PERSONS APPLYING HERBICIDES

The Weed Control Officer, employed by RDNO to manage the noxious weed/invasive plant control program, is responsible for the development of the PMP.

All herbicide applications will be conducted or supervised by a person who holds a valid Pesticide Applicator Certificate endorsed for the class of pesticide and the pesticide use required for this PMP. The responsibilities of the Certified Pesticide Applicator are to:

- be in continuous attendance at the site;
- ensure that applications do not violate this PMP or applicable legislation;

- supervise no more than 4 uncertified assistants at one time;
- maintain continuous auditory and/or visual contact with each uncertified person being supervised;
- be within 500 meters of persons being supervised;
- comply with the standards contained in *Division 7* of the *IPMR*; and,
- have proof of certification available.

All seasonal staff applicators must attend RDNO in-house training and discussion sessions.

3.2 PROCEDURES FOR SAFELY TRANSPORTING HERBICIDES

The federal *Transport of Dangerous Goods Act (TGA)* regulates the handling and transportation of poisonous substances which include herbicides. The *IPMA* and *IPMR* also specify certain transport procedures. The following procedures will be followed with respect to the transport of herbicides as part of the noxious weed/invasive plant control program within RDNO:

- the amount of herbicide carried in any one vehicle will be no more than what is necessary for each project, except where transportation occurs between storage facilities;
- herbicides will be carried in a secure lockable compartment;
- herbicide containers will be inspected for defects prior to transporting and will only be transported in original labeled container or containers that have the label displayed with the trade name, active ingredient, concentration of amount and PCP #;
- herbicides will be carried separately from food and drinking water, safety gear and people;
- spill containment and clean up equipment will be transported separately from herbicides but in close proximity to the herbicide on each vehicle during transportation and use of herbicides;
- appropriate documents such as operational records, material safety data sheets and the PMP document will be carried in each vehicle during herbicide use and transportation,
- ensure that all documents and placards are carried in, or placed on, transport vehicles if required under the *TGA*, the *IPMA* or the *IPMR*; and,
- ensure that the vehicle is equipped with a first aid kit, fire extinguisher, spill contingency plan and kit, and the vehicle operator has been trained on how to handle spills.

3.3 PROCEDURES FOR SAFELY STORING HERBICIDES

Herbicides will be stored in accordance with the *IPMA*, *IPMR* and the Workers' Compensation Board document titled *Standard Practices for Pesticide Applicators* at a RDNO compound. RDNO will comply with the following procedures for safely storing herbicides:

- ensure that storage facilities are locked when left unattended, ventilated to the outside atmosphere, are entered only by persons authorized to do so

and have a placard affixed and maintained on the outside of each door leading into the herbicide storage area bearing, in block letters that are clearly visible, the words “**WARNING – CHEMICAL STORAGE – AUTHORIZED PERSONS ONLY**”;

- keep herbicides in their original containers and with original packaging. If the original containers are not available, the herbicides will be placed in containers that have the label displayed with the trade name, active ingredient, concentration of amount and PCP #;
- keep storage facilities separate from work and living areas, and away from food, flammable materials, bodies of water and water sources;
- the person responsible for the storage area will notify the appropriate fire department of the presence of the herbicide on the premise; and,
- when a vehicle is considered a mobile storage unit, the herbicide will be stored in a locked canopy or compartment separate from the passenger area and personal protective equipment.

3.4 PROCEDURES FOR SAFELY MIXING, LOADING AND APPLYING HERBICIDES

Mixing, loading and application of herbicides will be carried out by certified pesticide applicators in the appropriate category of certification, or by individuals directly supervised by a certified pesticide applicator in the appropriate category of certification. RDNO will comply with the following procedures while mixing, loading and applying herbicides:

- mixing of herbicides will be conducted in a safe manner;
- ensure that containers used to mix, prepare, or apply herbicides are not washed or submerged in any body of water;
- ensure that eye wash station(s), personal protective equipment, safety spill kits, spill response plans, a copy of this PMP, each herbicide product’s Material Safety Data Sheet (MSDS) and first aid supplies will be present on site;
- adhere to the recommended re-entry times to treat areas unless personal protective equipment is worn; and,
- no mixing or loading of herbicides within 15 meters of PFZ’s, NTZ’s, bodies of water, fish or wildlife habitat, water sources or other sensitive environmental features.

3.5 PROCEDURES FOR SAFE DISPOSAL OF EMPTY HERBICIDE CONTAINERS AND UNUSED HERBICIDES

The responsibility of container disposal associated with the noxious weed/invasive plant control program lies with staff or the contractor. Disposal of empty herbicide containers will be according to the manufacturer’s instructions as noted on the product label or provincial instructions and recommendations that are detailed in the Ministry of Environment (MOE) *Handbook for Pesticide Applicators and Dispensers*. RDNO will adhere to the following procedures for safely disposing of empty herbicide containers and unused herbicides:

- Empty containers will be triple rinsed, punctured so they are not re-useable, and disposed of at appropriate landfill sites or returned to the herbicide distributor as part of their recycling program; and,
- Any unused chemical will be stored at a RDNO chemical storage facility in the original container for future use.

3.6 HERBICIDE SPILL RESPONSE PLAN

A herbicide spill kit on all vehicles used in noxious weed/invasive plant control shall contain as a minimum, the following articles:

- Instructions for spills;
- Emergency Telephone Numbers;
- Agricultural white lime;
- Kitty litter;
- Large plastic garbage bags;
- Shovels;
- Nutrasol;
- ABC Type Fire Extinguisher;
- Polyethylene or plastic tarp (10'X10' minimum);
- Dustpan and shop brush;
- Flagging tape and Rope;
- First Aid kit; and,
- Personal Protective Safety gear (long-sleeved shirts, long pants, boots, gloves, safety glasses, etc.).

A copy of the spill response plan will be at or near each work site. All staff working with herbicides will be familiar with this spill response plan. All contractors that work under this PMP must have their own spill response plan and it must meet or exceed the contents of this PMP.

The following procedures will be followed if a spill occurs:

- All personnel shall be protected from herbicide contamination by wearing appropriate protective clothing and safety gear;
- Move any exposed person away from the place of the spill and keep the person warm;
- Provide first aid if necessary;
- Stop the source of the spill;
- Create a dam or ridge to stop the spilled material from spreading;
- Inform the project supervisor of the spill;
- The project supervisor will ensure all personnel working on the project are aware a spill has occurred and the cleanup procedures have commenced;
- The project supervisor will ensure operations cease until the spill is contained and the source is repaired;
- Absorbent material will be spread over the spill, if applicable, to absorb any liquid;

- The absorbent material will be collected in garbage bags or containers with contents clearly marked;
- Any contaminated soil or material from the spill site will be collected in garbage bags or containers and removed from the spill site;
- The project supervisor will contact the RDNO for shipping instructions and disposal requirements; when more than 1 liter of herbicide is spilled, the project supervisor will immediately report the spill to the Provincial Emergency Program by telephoning **1-800-663-3456** or, where that is not practical, to the local police or the nearest detachment of the RCMP; and,
- The project supervisor will notify the RDNO of the details related to the spill as soon as practical.

3.7 BOUNDARY MARKING PROCEDURES

All herbicide treatment of noxious weeds/invasive plants within the PMP area will be outlined on the annual treatment records indicating site and treatment. Each individual site is identified providing accurate location and recording of treatments. Signage will be placed at the start and end of treatment on all public areas where the public is likely to go. When treatment occurs within recreational sites, signage will be placed at all entrances to the site. Applicators will also mark PFZ's around surface water, wells, domestic water intakes, and any other areas where PFZ's must be maintained.

4.0 ENVIRONMENTAL PROTECTION STRATEGIES AND PROCEDURES

58 (3) A pest management plan prepared for the purpose of section 7(1)(a) of the Act must include the following operational information;

(b) a description of the environmental protection strategies and procedures that will be followed under the plan, including a description of the following strategies and procedures:

- (i) strategies to protect community watersheds and other domestic and agricultural water sources from adverse effects of pesticide use;**
- (ii) strategies to protect fish and wildlife, riparian areas and wildlife habitat from adverse effects of pesticide use;**
- (iii) strategies to prevent pesticide contamination of food intended for human consumption;**
- (iv) pre-treatment inspection procedures for identifying treatment area boundaries;**
- (v) procedures for maintaining and calibrating pesticide application equipment;**
- (vi) procedures for monitoring weather conditions and strategies for modifying pesticide application methods for different weather conditions;**

The *IPMA* and *IPMR* require a description of the environmental protection strategies and procedures that will be followed under this plan, including a description of the following strategies and procedures:

- Strategies to protect community watersheds and other domestic and agricultural water sources;
- Strategies to protect fish and wildlife, riparian areas and wildlife habitat;
- Strategies to prevent pesticide contamination of food intended for human consumption;
- Pre-treatment inspection procedures for identifying treatment area boundaries;
- Procedures for maintaining and calibrating pesticide application equipment; and,
- Procedures for monitoring weather conditions and strategies for modifying pesticide application methods for different weather conditions.

4.1 STRATEGIES TO PROTECT COMMUNITY WATERSHEDS

The location of community watersheds to be protected will be verified by accessing the Community Watershed Database, maintained by the MOE, at the following web site:

http://www.env.gov.bc.ca/wsd/data_searches/comm_watersheds/index.html

The RDNO PMP will abide by the following strategies to protect community watersheds:

- Prior to herbicide use, all water licensees within 100 meters of proposed herbicide use will be notified;
- Prior to the use of herbicides, community watersheds shall be identified to determine if pesticide treatments are within a community watershed or are within 100 meters upslope of any water intake;

- A 100 meter NTZ will be maintained upslope from the point of herbicide application and all licensed water intakes within the community watershed;
- Herbicides will not be stored within a community watershed for more than 24 hours prior to their use, and removed from the community watershed within 7 days of their use, unless they are stored in a permanent structure;
- A 10 meter PFZ will be maintained from point of herbicide application and all bodies of water within the community watershed;
- A 30 meter PFZ will be maintained down slope from point of herbicide application and all licensed water intakes within a community watershed;
- All PFZ's will be measured and marked/flagged prior to herbicide application; and,
- Herbicide use will be discontinued if herbicide residues or herbicide breakdown products are detected in a community watershed water intake, and further use will not be undertaken until the Ministry of Health has been satisfied that all required measures have been implemented to preserve water quality.

4.2 STRATEGIES TO PROTECT DOMESTIC AND AGRICULTURAL WATER SOURCES

RDNO shall ensure that prior to herbicide applications for noxious weed and invasive plant control, strategies are developed and implemented that identify and protect domestic and agricultural water sources. The following table describes the minimum water protection measures that will be implemented for herbicide application under this PMP. The PFZ's and NTZ's in this table are consistent with the standards specified in *Sections 71(3) and 71(4)* of the *IPMR*.

Table 10 Water Protection Measures

Section of IPMR	Permitted Application	NTZ/PFZ	Comments
All Herbicides			
71(3)	Domestic and agricultural wells and water intake, including all methods and pesticides.	30 m NTZ*	NTZ may be reduced if confirmation holder is reasonably satisfied that a smaller NTZ will ensure no pesticide enters well or intake.
73(1)	Around or along a body of water or dry stream and classified wetland using any pesticide except glyphosate, subject to label restrictions and including all application methods.	10 m PFZ	Except glyphosate.
Glyphosate Applications			
74(1)(a)(i)(B)	Along or around a body of water or classified wetland that: <ul style="list-style-type: none"> • is fish bearing; or, • drains directly into a fish bearing body of water; or, Along or around a dry stream that when wet: <ul style="list-style-type: none"> • is fish bearing or drains directly into a fish bearing body of water. 	2 m PFZ	Industrial site that must be free of vegetation.
74(1)(a)(ii)	Along or around a body of water or classified wetland that: <ul style="list-style-type: none"> • is fish bearing; or, • drains directly into a fish bearing body of water; or, Along or around a dry stream that when wet: <ul style="list-style-type: none"> • is fish bearing or drains directly into a fish bearing body of water. 	2 m PFZ	Selective treatment of noxious weeds and invasive plants.
74(1)(b)	Along or around a body of water or classified wetland that: <ul style="list-style-type: none"> • is fish bearing; or, • drains directly into a fish bearing body of water; or, Along or around a dry stream that when wet: <ul style="list-style-type: none"> • is fish bearing or drains directly into a fish bearing body of water. 	5 m PFZ	
74(1)(c)	Along or around a permanent body of water that: <ul style="list-style-type: none"> • is not fish bearing at any time of the year; and, • does not drain directly into fish bearing water. 	2 m NTZ	
74(2)(c)	Up to but not below the high water mark of temporary free standing bodies of water and over dry streams that: <ul style="list-style-type: none"> • are not fish bearing at any time of the year; and, • do not drain directly into fish bearing body of water. 	0 m NTZ	

* The 30 meter NTZ from domestic and agricultural wells and water intakes may be reduced if the confirmation holder for this PMP is reasonably satisfied

that the smaller zone will ensure that herbicide from the use will not enter the water supply, intake or well.

“Pesticide Free Zone” (PFZ) – means an area of land, measured in meters, that must not be treated with herbicide and must be protected from herbicide moving into it via drift, runoff or leaching.

“No Treatment Zone” (NTZ) – means an area of land that must not be treated with herbicide. NTZs will be identified and marked prior to any herbicide application.

RDNO shall ensure that, prior to herbicide applications for noxious weed/invasive plant management, the locations of registered domestic and agricultural water sources shall be verified visually and/or by assessing applicable government web sites. Attempts to identify and locate unregistered domestic and agricultural water sources will be made by visual observations and/or by attempting to contact the owner/occupier of the land prior to herbicide applications.

4.3 STRATEGIES TO PROTECT FISH AND WILDLIFE, RIPARIAN AREAS AND WILDLIFE HABITAT

The PFZ’s and NTZ’s specified in Section 4.2, Table 10 will provide protection for bodies of water, fish and wildlife. In addition, RDNO shall exercise caution when working with herbicides adjacent to, and within sensitive ecosystems including riparian areas and sensitive wildlife habitat.

The *Species at Risk Act* and *BC Wildlife Act* will be adhered to. Known locations of species at risk will be obtained from the Conservation Data Center.

4.3.1 Strategies to Protect Riparian Areas

Prior to noxious weed/invasive plant control methods being implemented in riparian areas, the following shall be confirmed:

- Location of all bodies of water;
- Classification of all bodies of water as fish bearing or not fish bearing, if unknown will default to fish stream;
- The boundaries of any required PFZ and NTZ;
- No herbicide mixing or cleanup or disposal of herbicide materials within 15 meters of riparian zones; and,
- The most appropriate method of vegetation management.

4.3.2 Strategies to Protect Wildlife Habitat

To protect wildlife and their habitat, the following strategies will be implemented:

- Low-growing shrubs and plants that are important winter browse species for wildlife will not be treated with herbicides or by non-chemical methods;
- PFZ's will be established and maintained around inhabited raptor and heron nests, wildlife trees and mineral licks during pest management activities;
- To minimize soil disturbance as much as possible; and,
- Mechanical, manual and biological control will be used where there is a significant risk of harming vulnerable plant or animal species.

4.4 STRATEGIES TO PREVENT CONTAMINATION OF FOOD INTENDED FOR HUMAN CONSUMPTION

RDNO staff will attempt to locate areas where there is crop food intended for human consumption and take the appropriate precautions during vegetation management operations to avoid contamination of these sites.

High value berry producing plants that have the potential to or are known to be consumed or collected by humans and other important native plant species will not be targeted for herbicide treatment. First Nations or other members of the public may identify these sites during higher level planning, consultation or referral. RDNO will not knowingly apply herbicide, or allow herbicides to drift, onto berries or edible plants. There will be no herbicide applied within 10 meters of berries from the time the flowers open until the time most berries have dropped from the plant.

Selective application of glyphosate may be applied within 1 meter of agricultural land which is actively utilized by livestock or actively producing crops. Other herbicides approved under this PMP will be applied as per label recommendations in areas actively producing crops or that are grazed by cattle.

RDNO will identify and record the location of areas where food intended for human consumption is grown. These areas will be recorded on the Herbicide Inspection Report and Checklist.

RDNO has established and maintains a Pesticide-Free Zone Registry which identifies the locations of properties where the landowners do not wish herbicides to be applied. A 10 meter PFZ will be maintained around these properties. This registry is intended to minimize the likelihood of herbicide contamination of food intended for human consumption and to protect organic farmers and beekeepers.

4.5 PRE-TREATMENT INSPECTION PROCEDURES FOR IDENTIFYING TREATMENT AREA BOUNDARIES

RDNO staff will complete the Herbicide Inspection Report and Checklist shown in Appendix 2. This form requires observing and recording the location and distance to bodies of water, domestic and agricultural water sources, wells,

sources of food for human consumption and environmentally sensitive areas. Signs will also be posted at visible access points to the treatment areas as required in the *IPMA* and *IPMR*. The proposed location of all PFZ's and buffer zones will be flagged or staked prior to herbicide application.

4.6 PROCEDURES FOR MAINTAINING AND CALIBRATION OF HERBICIDE APPLICATION EQUIPMENT

All herbicide application equipment used by RDNO staff will be safe, clean, in good repair, compatible and appropriate for the herbicide being used. All sprayers will be calibrated, using the form shown in Appendix 3, on a regular basis throughout the spray season to ensure that the equipment is being operated in accordance with the herbicide product application rate.

The following will be undertaken to ensure that the equipment is functioning as intended:

- Sprayers will be assigned to specific operators;
- Sprayers will be recalibrated if a different applicator uses the sprayer for the day;
- Sprayer fittings and hoses will be checked each day for leaks and signs of wear prior to use;
- Sprayers will be calibrated prior to each spray season and on a monthly basis;
- Calibration test forms will be completed for each herbicide product that will be applied; and
- At the beginning of each spray season, the RDNO will inspect equipment, safety gear, spray vehicles, spill kits, and related equipment, and conduct a calibration test with all applicators.

4.7 PROCEDURES FOR MONITORING WEATHER CONDITIONS AND STRATEGIES FOR MODIFYING HERBICIDE APPLICATION METHODS FOR DIFFERENT WEATHER CONDITIONS

Measurements will be made to record weather conditions prior to and periodically during all pesticide applications. Precipitation, temperature, wind speed and direction, and sky conditions will be recorded. Local weather forecasts and predictions will be monitored through Environment Canada and every effort will be made to ensure that weather conditions are suitable for herbicide application as specified on the product label.

Herbicide applications will not occur if any of the following apply:

- The maximum/minimum temperature specified on the herbicide product label is exceeded;
- It begins to rain steadily, increasing the chances of leaching and excessive runoff;
- Wind speed and direction cause the application of herbicide to drift and/or miss the target vegetation;

- Ground wind velocity exceeds 8 km/hour;
- If foliage is covered with frost or ice; or,
- If water is flowing on the foliage.

5.0 HERBICIDE SELECTION AND USE

58 (3) A pest management plan prepared for the purpose of section 7(1)(a) of the Act must include the following operational information;

(c) identification of each pesticide that will be used under the plan, the manner of its application and the type of equipment required for each manner of application.

Many herbicides have been shown to be effective for noxious weed/invasive plant control at application rates recommended on the label. If proven effective through research, lower application rates may be used to protect certain values such as impacts to the environment. At no time will herbicides be applied at application rates higher than those specified on their respective labels.

There is considerable research into chemicals for the control of weeds. Over time, there may be some chemicals that are withdrawn from use while new, reformulated or less toxic chemicals may become available. RDNO will continually update information regarding chemicals for weed control and choose chemicals that are more effective, less toxic, new or reformulated, to achieve the desired control results.

The herbicides intended for use under this PMP are described in Table 11. Herbicide selection is driven by the conditions of the site, and by the target species. All products listed below are subject to intermittent product name changes, therefore an equivalent product may be used provided it contains the same formulation of active ingredients.

Table 11 Herbicide Application Rates/Site Characteristics

Herbicide Trade Name (Active Ingredient)	Application Rate/ha *	Noxious Weed / Invasive Plant	Treatment Sites	Where cannot be used
2,4-D Amine 600 (2,4-D)	0.7 – 4.5 L	Burdock Bull Thistle Canada Thistle Hoary Cress Leafy Spurge	Broadleaf weeds	MOTI highways
Arsenal (Imazapyr)	3.0 L	Broadleaf invasive plants (non-selective)	For control of broadleaf weeds, perennial grasses and brush on non-crop lands	Near desirable plants or wet areas
Banvel II (Dicamba)	2.1 – 4.6 L	Most broadleaf invasive plants Diffuse Knapweed Russian Knapweed	For control of broadleaf weeds in cereal, corn, pastures and non-crop lands	Near desirable plants
Clearview (Aminopyralid & Metsulfuron-methyl)	135 – 230 grams	Canada Thistle Field Scabious Ox-eye Daisy Plumeless Thistle Russian Thistle Scentless Chamomile Spotted Knapweed Wild Mustard	Selective broadleaf weed control in right-of-way, industrial and other non-crop areas.	
Dycleer 24 (Dicamba & 2,4-D)	2.75 – 11.0 L		For control of broadleaf weeds on non-crop lands	Near desirable plants
Escort (Metsulfuron-methyl)	20 - 30 grams	Common Tansy Perennial Pepperweed Field Scabious Scentless Chamomile Canada Thistle	For control of brush woody species in pasture, and non-crop areas	All other species
Grazon (Picloram & 2,4-D)	3.7 - 7.0 L	Broadleaf invasive plants	For treatment on late flowering weeds	Some residue no coarse soils
Milestone (Aminopyralid)	0.25 - 0.5 L	Canada Thistle Common Tansy Knapweed Scentless Chamomile	Broadleaf weeds	
Roundup (Glyphosate)	1.5 – 2% solution wick application 33% solution	All plants (non selective)	All weeds on all soil types and under canopy Wick applied in riparian	Non selective so watch non-target plants

Table 11 cont. Herbicide Application Rates/Site Characteristics

Herbicide Trade Name (Active Ingredient)	Application Rate/ha *	Noxious Weed / Invasive Plant	Treatment Sites	Where cannot be used
Tordon 22K (Picloram)	2.25 – 4.5 L	Scentless Chamomile Diffuse Knapweed Spotted Knapweed Perennial Sowthistle Canada Thistle Russian Knapweed Leafy Spurge Dalmatian Toadflax Yellow Toadflax	Broadleaf weeds on medium to fine soils	Coarse textured soils or under canopy
Transline (Clopyralid)	0.42 - 0.83 L	Canada Thistle Scentless Chamomile Perennial Sowthistle Ox-eye Daisy Spotted Knapweed Diffuse Knapweed	Compositae family On medium to fine soils	Coarse textured soils
Vanquish (Dicamba)	2.1 – 4.6 L	Canada Thistle Leafy Spurge Tansy Ragwort Diffuse Knapweed	Controls deciduous and coniferous brush species and broadleaf weeds in non-crop lands.	Near desirable plants
Vantage (Glyphosate)	1.5 – 2% solution wick application 33% solution	All plants (non selective)	All weeds on all soil types and under canopy Wick applied in riparian	Non selective so watch non-target plants

*** All of the above application rates will be cross-referenced to the recommended label rates schedule prior to herbicide application on a particular noxious weed/invasive plant species.**

Herbicide active ingredients proposed for noxious weed/invasive plant control within RDNO are listed below:

2,4-D (Trade name: **2,4-D Amine 600** – PCP Act reg. no. 14726)
 (Trade name: **Dycleer 24** – PCP Act reg. no. 11547)
 (Trade name: **Grazon** – PCP Act reg. no. 26649)

2,4-D is a selective, non-residual herbicide that is most effective when the target plant is growing rapidly. It is more actively taken up by the foliage than by the roots. 2,4-D can persist in soil for one to four weeks and may prove injurious to subsequent crops of sensitive plants. Products containing the active ingredient 2,4-D will be applied as a foliar spray using backpack sprayers or truck mounted

spray tank with power hose and nozzle. Application equipment must be thoroughly cleaned with special materials before applying other herbicides to sensitive crops.

Aminopyralid (Trade name: **Milestone** – PCP Act reg. no. 28137)
(Trade name: **Clearview** – PCP Act reg. no. 29752)

Aminopyralid is a selective, post-emergent herbicide that controls a broad spectrum of broadleaf noxious weeds/invasive plants. It is mildly residual, and uses reduced application rates so to ensure a reduced herbicide loading on the site. Products containing the active ingredient aminopyralid will be applied as a foliar spray using backpack sprayers or truck mounted spray tank with power hose and nozzle.

Clopyralid (Trade name: **Transline** – PCP Act reg. no. 24085)

Clopyralid is a selective, post-emergent herbicide used to control herbaceous broadleaf noxious weeds/invasive plants. It has moderate soil residual activity. Clopyralid use is preferred in areas where herbicides of long residual soil activity should not be used. It is less persistent in soil and it does not kill many woody tree and shrub species. It is a good choice when an overstory of trees and shrubs is present at the infestation site and there is a need to minimize or prevent damage to these non-target plants. Products containing the active ingredient clopyralid will be applied as a foliar spray using backpack sprayers or truck mounted spray tank with power hose and nozzle.

Dicamba (Trade name: **Vanquish** – PCP Act reg. no. 26980)
(Trade name: **Banvel II** – PCP Act reg. no. 23957)
(Trade name: **Dycleer 24** – PCP Act reg. no. 11547)

Dicamba is a selective, post-emergent herbicide used to control herbaceous broadleaf noxious weeds/invasive plants. It provides a wide spectrum of broadleaf control and has low to moderate soil residual activity. Products containing the active ingredient dicamba will be applied as a foliar spray using backpack sprayers or truck mounted spray tank with power hose and nozzle.

Glyphosate (Trade name: **Roundup** – PCP Act reg. no. 13644)
(Trade name: **Vantage** – PCP Act reg. no. 26172)

Glyphosate is a non-selective and non-residual herbicide used to control a very large number of noxious weeds/invasive plants. It kills all vegetation on contact and is only effective for treating plants that have germinated, emerged above the soil, and are actively growing at the time of application. It is most useful near wells, water bodies and other environmentally sensitive areas where low soil residual is required. It can be applied to cut vegetation or young seedlings which emerge following cutting or hand pulling, or where physical control methods do not provide effective control. Since it kills valuable grasses as well as noxious weeds/invasive plants, its use is very limited. Products containing the active

ingredient glyphosate will be applied as a foliar spray using backpack sprayers, truck mounted spray tank with power hose and nozzle or by wick application to the foliage. Application is generally by wick and is used when other herbicides can not be used close to water.

Imazapyr (Trade name: **Arsenal** – PCP Act reg. no. 23713)

Imazapyr is a non-selective, post-emergent herbicide used all season to control annual and perennial broadleaf plants. It provides a wide spectrum of broadleaf control and has moderate soil residual activity. Products containing the active ingredient imazapyr will be applied as a foliar spray using backpack sprayers or truck mounted spray tank with power hose and nozzle.

Metsulfuron-methyl (Trade name: **Escort** – PCP Act reg. no. 23005)
(Trade name: **Clearview** – PCP Act reg. no. 29752)

Metsulfuron methyl is a selective, post-emergent herbicide used to control biennial, perennial and annual broadleaf noxious weeds/invasive plants as well as brush/woody plant species. It provides a wide spectrum of broadleaf control and has moderate soil residual activity. Products containing the active ingredient metsulfuron-methyl will be applied as a foliar spray using backpack sprayers or truck mounted spray tank with power hose and nozzle.

Picloram (Trade name: **Tordon 22K** – PCP Act reg. no. 9005)
(Trade name: **Grazon** – PCP Act reg. no. 26649)

Picloram is a selective, residual herbicide used for the control of a wide variety of noxious weeds/invasive plants. It can remain in the soil for several years and continue to control susceptible plants. Care must be taken to avoid areas where soil may be moved or where there are shallow aquifers or domestic water intakes and wells. The mode of action and soil persistence allow for a broader application window. Picloram is absorbed by foliage and roots and translocated. It is similar to 2,4-D but somewhat more active and acts as a growth regulator. Products containing the active ingredient picloram will be applied as a foliar spray using backpack sprayers or truck mounted spray tank with power hose and nozzle.

The following is a description of each type of spot application equipment that will be used under this PMP:

- **Backpack Sprayer:** A portable, manually operated, low pressure container with a nozzle and a positive shut-off system used for spot application of herbicides onto foliage. It is particularly useful for spraying small areas or individual plants.
- **Truck Mounted Tank with Handgun Sprayer (power hose and nozzle):** A hand-held spray gun and hose attached to a portable tank filled with herbicide solution, usually with a power driven pump to provide pressure

to the herbicide solution in the hose. Handguns are generally used at sites where large areas of noxious weeds/invasive plants have to be controlled. The vehicle used to transport the portable tank may be a four-wheel drive truck or all terrain vehicle.

- **Wick/Wipe On Applicators:** Wick/wipe on application may be used to selectively apply herbicides containing the active ingredient glyphosate by wiping it directly onto plants. Only small amounts of glyphosate are applied, so the need for pumps, control devices and spray tanks is eliminated. Wick/wipe on applications is ideal for areas where no spray drift can be tolerated.

6.0 REPORTING, NOTIFICATION AND CONSULTATION

RDNO is committed to following the *IPMR* when managing noxious weeds/invasive plants. RDNO will maintain a high standard of communication, record keeping and professionalism when developing and consulting on this PMP and any future amendments. Specific activities in these areas, as well as requirements under *IPMA* are outlined in this section.

6.1 REPORTING

Accurate record keeping allows both RDNO and the Administrator, *IPMA*, to:

- Monitor the quantity of herbicides used;
- Ensure compliance with the *IPMR*;
- Ensure compliance with the commitments made in this PMP; and
- Ensure compliance with the contents of the Pesticide Use Notice.

6.1.1 Confirmation Holder Use Records

Section 37(1) of the *IPMR* describes the requirements for these records as follows:

- the date and time of the herbicide use;
- the name of the noxious weed/invasive plant targeted for treatment;
- the trade name of each herbicide used and its registration number under the federal Act;
- for each herbicide used, the method and rate of application and the total quantity used;
- the prevailing meteorological conditions including temperature, precipitation and velocity and direction of the wind measured at the beginning of each day before starting treatment, re-measured if obvious changes in environmental conditions occur throughout the day, and re-measured at the end of any treatment day; and,
- a record of each piece of the holder's herbicide application equipment that requires calibration showing when the equipment was calibrated and the data upon which its calibration was based.

In addition to maintaining daily records of herbicide use, all users of the PMP will retain records of site assessments and noxious weed/invasive plant inventory as well as operational herbicide and other treatment records. These records will include:

- Site assessment and noxious weed/invasive plant inventory forms;
- Maps of noxious weed/invasive plant sites, treatment and biological control;
- Pre and post treatment records of sites; and
- Project checklists including equipment, First Aid and spill kit.

6.1.2 Annual Report for Confirmation Holders

In accordance with *Section 39* of the *IPMR*, RDNO will provide to the Regional Administrator, *IPMA*, the following information for a calendar year by January 31 in the next calendar year for operations conducted under this PMP during the calendar year:

- Name and address of the confirmation holder, and their confirmation number;
- Trade name including active ingredient of the herbicide(s) applied, including their PCP number;
- Locations and total area treated (ha); and
- Quantity of each active ingredient applied (kg).

6.2 NOTIFICATIONS

RDNO commits to providing the following notifications with respect to this PMP:

6.2.1 Notification of PMP Confirmation

Within 7 days of the PMP confirmation date, RDNO will make available, for the term of the confirmation, a copy of the confirmation and the PMP with relevant maps at RDNO office to allow inspection by the public.

6.2.2 Annual Notice of Intent to Treat

At least 21 days prior to treatment in each year during which the PMP is in effect, an Annual Notice of Intent to Treat (NIT) for the following year will be sent, in writing, to the Regional Administrator, *IPMA*. This NIT will identify:

- Name and business location of confirmation holder;
- Proposed treatment areas;
- Proposed treatments;
- Herbicides proposed for use and their method of application; and,
- The total area proposed for treatment.

6.2.3 Requests to Amend the PMP

RDNO will forward to the MOE in writing, amendments requested for the PMP. Amendment requests to add new application techniques or similar changes will not require further public advertising or First Nations consultation, provided that the amendment request is within RDNO PMP area. Amendments to add new active ingredients will require further public advertising and consultation.

6.2.4 Notification of Contravention

Section 72(1)(d) of the *IPMR* requires that a confirmation holder give written notice to the Administrator on a contravention of the *IPMA* or *IPMR* that involves the release of a pesticide into the environment. RDNO commits to abiding by this requirement.

6.2.5 Notification Prior to Treatment

Notification of individuals, communities, organizations and First Nations in the time and manner as agreed during the consultation process will be completed prior to treatments. RDNO will maintain a record of all notifications for each treatment area.

Prior to treatment the Splots'in First Nation will be notified if herbicide applications are considered north of Otter Lake under the authority of this PMP.

Prior to treatment the Cherryville Water Stewards will be notified if herbicide applications are considered within Electoral Area "E" under the authority of this PMP.

6.2.6 Posting of Treatment Notices

Prior to treatment, Treatment Notices will be posted in locations so that they are clearly visible and legible from each approach maintained by RDNO for public/employees/contractors to access the treatment area or at locations where due diligence would require them. The signs will remain posted for 24 hours following herbicide application and contain the following information:

- The trade name and active ingredient of the herbicide that was used;
- The date and time of the herbicide application;
- The purpose of the treatment;
- The method of application;
- Precautions that can be taken to minimize exposure to people entering the treatment area;
- The PMP confirmation number; and,

- RDNO contact information.

For each treatment location, the applicator will maintain a record of where notices were posted.

The Treatment Notices shall be:

- A minimum size of 550 cm²;
- Water resistant; and,
- Display the title “**Notice Herbicide Spot Treatment of Invasive Plants**” in bold letters that are clearly legible to a person approaching the treatment area. Substitution of “pesticide” with “herbicide” is permissible.

6.3 CONSULTATION

As per *Section 61(1)* of the *IPMR*, at least 45 days before submitting a Pesticide Use Notice, the first of 2 notices, at least 40 cm² in size, will be published within a 2 week period in local newspapers within the geographic boundaries of the plan. The consultation process will be carried out with the public and First Nations. The objectives of conducting consultations when the PMP is at the draft stage are:

- To increase public and First Nations awareness of the PMP process;
- To increase public and First Nations awareness of the principles of IPM;
- To ensure that the public and First Nations have an opportunity to identify concerns;
- To allow RDNO to address concerns, before the PMP is finalized and submitted to the MOE for confirmation;
- To ensure a transparent and accountable review process for the PMP;
- To educate the public and First Nations on the need to manage noxious weeds and invasive plants; and,
- To explain how the PMP recognizes the need to protect human health and the environment.

6.3.1 Public Consultation Plan

RDNO will encourage public input into the draft PMP. To engage the public in providing input into this PMP, the following steps will occur:

- Develop for review and comment a draft PMP that includes related government and RDNO policy, procedure, standards and information;
- Develop for review and comment a draft PMP that incorporates the principles of IPM as the basis for decision-making options; and,
- Publish advertisements in newspapers advising the public of the PMP, and inviting their comments.

During the public consultation process, the draft PMP will be accessible to the public at the RDNO office in Coldstream, at municipal offices within the

geographic boundaries of the plan, as well as on the RDNO website, as stated in the public notifications.

6.3.2 Public Consultation Report

RDNO will prepare and maintain a Consultation Report that contains:

- A summary of written and verbal responses by the public, including the names and addresses of those who provided input, the nature of their concerns and/or recommendations, and a summary of written and verbal responses by RDNO to the input from the public;
- Any agreement made to an individual or group stating notification before herbicide use; and,
- A list of newspapers in which notification of the draft PMP submission appeared, along with the publication dates and a photocopy of the advertisements.

RDNO will submit to the Administrator, *IPMA*, the Public Consultation Report.

6.3.3 First Nation Consultation Plan

In addition to the objectives for public consultation outlined above, RDNO will consult with First Nations in order to identify aboriginal interests that may be impacted by the PMP activities, and identify ways to address or mitigate any impacts. RDNO not only has an obligation to consult with First Nations, it must also attempt to address their concerns and accommodate their cultural interests. Consultation processes must take into account the BC Treaty negotiation process and the current litigation actions by First Nations respecting aboriginal land use or sovereignty. In light of the above sensitivities and special concerns, RDNO is committed to establishing and maintaining positive relationships with First Nations through meaningful and respectful consultation.

First Nation consultation will follow policy and procedures outlined in the *DRAFT – August 2011* publication entitled *Ministry of Environment Draft Guidelines for IPM Proponents Conducting Consultations with First Nations*, published by the MOE, Integrated Pest Management Program. Results of the consultation process with First Nations and RDNO will be documented and available for review in the Consultation Report.

6.3.4 First Nation Consultation Report

In order to facilitate MOE consideration of the adequacy of First Nations consultations and of the plan holder response to any issues raised, the plan holder will prepare a report that describes the consultation process and outcomes. This report will be submitted to the Administrator, *IPMA*, in

conjunction with the submission of the Pesticide Use Notice application. A copy of this report will also be provided to the First Nations with whom consultation was conducted and to the MOE prior to initiation of pesticide use. When the report is sent to a First Nation, a letter will be included that indicates to the First Nation that they may submit comments or concerns regarding the report to the MOE.