

BEAVER AND BEAVER DAM MANAGEMENT

The Ministry of Environment has done a good job setting up the Best Practice & Specific Standards on the topic. The website address is

www.env.gov.bc.ca/wod/BMP/beaver.html

This is only one of the many regulations that exist on the work in / about streams.

Of course, where the dam and resultant pond are all on private property, then that owner becomes liable to control and manage resultant damage that could/would occur from floods onto public property or other people's property.

Interim Standards and Best Practices for Instream Works

Specific Standards and Best Practices:

Beaver and Beaver Dam Management

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Background

Beaver impoundments often create flooding and other drainage related conflicts on adjacent lands, especially during fall, winter and spring. This results in conflicts, particularly at road and rail stream crossings, and on agricultural and forest resource lands.

Beaver biology

- Beavers live in colonies of between 3-9 individuals.
- The colony uses one or more lodges or burrows and will build one or more dams.
- Beavers are thought to forage as far as 800m upstream and within 50m inland of their dams.
- Active beaver systems are not permanent, as they typically run out of available food sources within easy reach of the pond within 2-3 years.
- Beavers prefer low gradient watercourses (<6%) and need ample access to herbaceous and woody materials

Beaver impoundments may also severely restrict fish passage. Juvenile fish are often able to migrate downstream through dams, making use of small rivulets through or at either end of the dam, but adult migration can be impaired, especially during low water conditions when the dams are not topped.

While the flooding cause by beaver dams can be problematic, beavers play an important role in creating off-channel ponds through their damming activities. Beaver ponds can be critical in supporting the ecological diversity and successional changes within streams. Flooding and renewal of riparian vegetation by beavers, followed by the collapse of the dam and renewal of stream cover, all serve to provide rich organic soils to the aquatic ecosystem. In that respect, beaver dams contribute to watershed health and biodiversity. Through their damming activities, these "natural engineers" can supply up to 25% of the low summer water reserves required for viable fish and aquatic wildlife habitat. Amphibian species thrive in created ponds, and salmonids found in habitats with beaver ponds have been shown to have higher growth rates (Bergstrom, 1985).

To "disturb, molest or destroy" a beaver house, den or dam is an offense under Section 9 of the *Wildlife Act* unless you are a trapper, licensed under that Act. Alteration or removal of a dam is permitted under the *Wildlife Act* "to provide irrigation or drainage under lawful authority for the protection of property" and under the *Water Act* for drainage purposes with specific restrictions. To remove a beaver dam, you must have the permission of the landowner and notify the Ministry at least 45 days in advance of your removal project. Be prepared to supply supporting documentation and justification for the works with respect to the size, scale, and location of the proposed works and the level of risk to existing buildings, roads, or services being threatened with flooding.

Objectives

The Ministry's objectives for the management of beavers and beaver dams are to encourage our coexistence with beavers, to allow beavers to

habitat" (HADD) unless authorized by DFO.

If your works may result in a HADD, you will need to contact DFO for an Authorization of your works.

If species at risk are present, the federal Species at Risk Act will also apply.

REMEMBER:

You must submit a Notification to the BC Ministry of Water, Land and Air Protection for your proposed works.

remain where appropriate, and to manage beaver populations in areas where beaver presence is not appropriate. For beaver dam removal activities, the Ministry's objective is to prevent harmful impacts to beaver populations, fish and wildlife species, water quality and quantity, and riparian and aquatic habitats.

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Standards for Beaver and Beaver Dam Management

All beaver dam removal works for which you are submitting instream works notifications or approvals must be compliant with the **General Standards** as listed in the *Standards and Best Practices* section of this document for:

- Compliance with Other Legislation;
- Land Ownership;
- Public Safety;
- Completion of Work;
- Protection of Water Quality;
- Protection of Species and Habitat;
- Protection of Other Water Users.

Specific Standards associated with this type of work (*Water Act* Regulation *Section 44(1)*) authorize beaver dam removal works completed as the following work type and under the following conditions:

Removal of a beaver dam under Section 9 of the Wildlife Act, provided that the removal is carried out in such a manner that downstream flooding and erosion do not occur (*Subsection 44(1)(v)*)

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Best Practices

Long term planning for beaver dam management is important. Any planning should ensure that any activities undertaken would be effective in the short and long term. A beaver management plan should include all of the following:

- Dam modification and debris management
- Population management
- Dam removal only where absolutely necessary

It is also important to consider that not all beaver problems can or should be handled in the same way. Dam removal as a tool is most effective when used in concert with other management techniques.

Disadvantages of Beaver Dams Removal

- Beaver removal works can result in very intrusive impact to streams and stream corridors;
- A flush of silty water can smother downstream fish spawning and rearing habitat;
- A rapid reduction of pond depth that can result in stranding and mortality of fish and other animals;
- Scouring and erosion of the downstream channel and banks, which can impact private property and infrastructure;
- Potential contamination of downstream wells; and

- The beaver, if left on site, will usually repair the breach immediately.

There are a number of design strategies that can address these circumstances and provide effective alternatives to repeated removal of these barriers. Effective planning and monitoring of beaver dam management techniques can reduce operational and liability costs.

Examples of Dam Replacement and Isolation Techniques

Information on several techniques recommended for beaver dam management is provided below. Note that all these works may require some form of maintenance.

Dam Removal:

Complete beaver dam removal should only be considered in the following circumstances:

- After all other management tools have been exhausted;
- Where an emergency situation has arisen; and
- Where measures can be taken to ensure that no harmful alteration to fish habitat will occur.

Dam removal can be frustrating and is generally ineffective when not used together with other management techniques, as beavers will usually repair the breach immediately, often within hours. There are a number of alternate design strategies that can address these circumstances and provide effective alternatives to repeated removal of dams. See below.

Remember:

Beaver impoundments can be critical in supporting the ecological diversity and successional changes within streams. Beaver dam removal works can result in very intrusive impact to streams and stream corridors and are often only short term solutions. There are a number of alternate design strategies that can address these circumstances and provide effective alternatives to repeated removal of dams.

Replacement of Road Culverts with Clean Span Bridging:

Beavers prefer to construct their dams in low gradient locations where there are natural constrictions in the stream flow and a ready source of food and building materials. This often means that road crossing culverts become prime targets for dam building activities. Where fish habitat and adjacent land values require free flowing stream conditions, it is recommended that these crossings be prioritized for eventual replacement with clean span bridges wherever feasible. The important feature of any replacement technique is to reduce the dam building response of the beaver to the sound of running water. Beavers do not normally exhibit dam building behavior when there is a consistent water level in the system.

Replacement of a culvert with a free span bridge requires submission of a notification and compliance with Section 9 of the *Water Act*.

Culvert screening devices:

Culvert design conversions, including upstream screening methods, should be considered on small low gradient systems where frequent maintenance problems and protection of fish access is desirable.

Where fish are present, the structure should be designed and installed to

promote fish migration patterns. These structures are typically affixed to the inlet end of a culvert. There is at least one proprietary design known as the "Beaver Stop" which includes a double walled wire cage assembly that is fastened to the upstream end of the culvert.

Perforated culverts:

A PVC pipe may be installed through the dam to form a one-piece screen and culvert. The pipe will have as many holes as possible drilled in the upstream end.

Log or rock fish ladders adjacent to beaver dams:

Log or rock fish ladders adjacent to beaver dams can be workable alternatives, used to promote fish access over beaver dams, however these structures may not adequately address flooding.

Fencing techniques:

Fencing should be designed to safely and effectively exclude the beaver from accessing upland vegetation while maintaining unrestricted stream flows. In order to ensure safe and effective beaver exclusion fencing, the following guidelines should be adhered to:

- Fence mesh openings should be small enough to prevent entry by beaver kits (<15 cm); and
- Fencing should be placed above the winter high water mark of the watercourse

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Operational Best Practices:

All individuals carrying out instream works should be made aware of and trained in the listed best practices. To comply with the *Water Act* Regulation's Protection of Habitat (Section 42(1)) and Protection of Water Quality (Section 41) standards, you should follow these best practices:

Monitoring

A suggested Environmental Monitoring Report outline is available in Appendix I at the end of this document.

- Construction activities should be monitored full-time during start-up and any instream works or sensitive activity, otherwise on a daily basis to the completion of the project. The environmental monitor(s) must be an *appropriately qualified professional(s)* and will be provided with written authority to modify and/or halt any construction activity if deemed necessary for the protection of fish and wildlife populations or their habitats. A sign should be posted listing the monitor's company name and phone number at the entrance to or immediate vicinity of the job site.
- Forward a copy of this document listing standards and best practices for your works, and all appropriate plans, drawings and

documents to the contractor/crew supervisor and keep it readily available at all times at the site while the work is proceeding.

- Hold a pre-construction meeting between the environmental monitor and the contractor undertaking the work on the site to ensure an understanding of the mitigative best practices for the project.
- Within 60 days of completion of this project the environmental monitor will complete and submit a minimum of one (1) copy of a monitoring report consistent with the recommended standard format to his/her client;

Further information on Timing of Works Best Practices may be found in Appendix II.

For more information see Appendix I: Monitoring.

Timing of Works (Subsection 42(1)(a))

- If works are scheduled for fish-bearing streams or if fish presence in the watercourse is not known, complete in-channel or bank work during the **instream reduced risk work window** approved for your region. To find out what the timing window requirements are for your area, contact your regional MOE office.
- Be advised that for certain fish and amphibian species at risk, there may be no window of least risk. Please contact your local WLAP office for more information.
- Only clear vegetation for worksite access and stream crossing right-of-way within the **vegetation clearing timing window**.
- Only undertake works during favourable weather and low water conditions.
- Complete the works as quickly as possible once started

For more information see Appendix II: Timing of Works.

The *Land Development Guidelines for the Protection of Aquatic Habitat* document may be found at:
<http://www.dfo-mpo.gc.ca/Library/165353.pdf>

Deleterious Substance Control/Spill Management (Subsections 41(a) (b) & 42(1)(d))

- Prevent the release of silt, sediment or sediment-laden water, raw concrete or concrete leachate, or any other deleterious substances into any ditch, watercourse, ravine or storm sewer system. The recommendations for sediment and erosion control outlined in the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck *et al*, 1992) can also be used for reference.
- Ensure equipment and machinery is in good operating condition (power washed), free of leaks or excess oil and grease. No equipment refueling or servicing should be undertaken within thirty (30.0) metres of any watercourse or surface water drainage
- Ensure all hydraulic machinery to be used instream uses environmentally sensitive hydraulic fluids which are non-toxic to aquatic life, and which are readily or inherently bio-degradable
- Keep a spill containment kit readily accessible on-site in the event of a release of a deleterious substance to the environment.

For more information on acceptable wood products to use in or near water, consult the document "*Guidelines to Protect Fish and Fish Habitat From Treated Wood Used in Aquatic Environments in the Pacific Region*"
<http://www.wwpinstitute.org/pdffiles/>

[treatedwoodguidelines.pdf](#)

Train on-site staff in its use. Immediately report any spill of a substance toxic to aquatic life of reportable quantities to the Provincial Emergency Program 24 hour phone line at **1-800-663-3456**

- Do not use treated wood products in any construction below the high water mark of the stream channel to prevent the release of preservatives toxic to fish.

For more information see [Appendix III: Deleterious Substance Control/Spill Management](#).

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Concrete Works (*Subsections 41(e) & 42(d)*)

Report any spill of a reportable quantity of a listed substance to the Provincial Emergency Program (PEP) at 1-800-663-3456

- As concrete leachate is alkaline and highly toxic to fish and other aquatic life, ensure that all works involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials (concrete) will **not** deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse. Concrete materials cast in place must remain inside formed structures.
- A CO₂ tank with regulator, hose and gas diffuser must be readily available during concrete work to neutralize pH levels should a spill occur. Train staff in its use.
- Provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment.
- Report immediately any spills of sediments, debris, concrete fines, wash or contact water to **1-800-663-3456**. Implement emergency mitigation and clean-up measures, like use of CO₂ and removal of the material immediately.
- Completely isolate all concrete work from **any** water within or entering into **any** watercourse or stormwater system.
- Monitor the pH frequently in the watercourse immediately downstream of the isolated worksite until completion of the works. Emergency measures will be implemented if downstream pH has changed **more than 1.0 pH unit**, measured to an accuracy of +/- 0.2 pH units from the background level, or is recorded to be **below 6.0 or above 9.0 pH units**.
- Prevent any water that contacts uncured or partly cured concrete during activities like exposed aggregate wash-off, wet curing, or equipment washing from directly or indirectly entering any watercourse or stormwater system.
- Isolate and hold any water that contacts uncured or partly cured concrete until the pH is **between 6.5 and 8.0 pH units**, and the turbidity is **less than 25 nephelometric turbidity units (NTU)**, measured to an accuracy of +/- 2 NTU;

For more information see [Appendix IV: Concrete Works](#).

Isolation of the Work Area (*Subsections 42(b) & 44(x)*)

- Isolate your work area from all flowing water, but do not cut off flow to downstream portions of the stream at any time during construction.
- Temporarily divert, enclose or pump the water around the work site. Ensure the point of discharge to the creek is located immediately downstream of the work site to minimize disturbance to downstream populations and habitats;

For more information see Appendix V: Isolation of the Work Area.

Salvage of Fish and/or Wildlife (*Subsection 42(1)(e)*)

- Complete a fish and amphibian salvage for works prior to the start of works if any portion of the wetted channel will be isolated and/or dewatered. An appropriately qualified professional(s) must complete the salvage. It is the responsibility of the salvage crew to obtain the necessary permits required by the British Columbia Fisheries Regulations or Canada Fisheries Act prior to conducting the salvage activities;

For more information see Appendix VI: Salvage of Fish and/or Wildlife.

Sediment Control (*Subsections 41(a)(b)(c) & 42 (1)(c)(d)(f)*)

For information on the Replacement Tree Criteria required by Provincial and Federal agencies, try the following website:

http://srmwww.gov.bc.ca/sry/csd/downloads/forms/vegetation_riparian/treereplcrit.pdf

- Ensure material, such as rock, riprap, or other materials placed on the banks or within the active channel or floodplain of the watercourse, is inert and free of silt, overburden, debris or other substances deleterious to aquatic life.
- Ensure machinery works from the bank of the stream and not in the stream channel to minimize impacts and to better enable mitigation of sedimentation.
- Minimize the disturbance to existing vegetation on and adjacent to the stream banks.
- Place sediment control measures before starting any works that may result in sediment mobilization.
- Construct any ditches, water bars or water diversions within the work area so they do not directly discharge sediment-laden surface flows to the stream. Divert such flows to a vegetated area where flows can slowly infiltrate.
- Remove excavated material and debris from the site or place it in a stable area above the high water mark or active floodplain of the stream, as far as possible from the channel.
- Protect this material from erosion and reintroduction to the watercourse by using mitigating measures including, but not limited to covering the material with erosion blankets or seeding/planting with native vegetation.

For information regarding riparian restoration criteria, contact local, provincial, or federal agencies for information or look at the Watershed Restoration Program documents available (check under series) at:

<http://www.env.gov.bc.ca/wld/pub/pubsearch.html>

No-net-loss of fish and wildlife habitat?

Minimize impacts of your activities and leave the stream better than you found it!

- When material is moved off-site, dispose of it in such a manner as to prevent its entry into any watercourse, floodplain, ravine, or storm sewer system;

For more information see Appendix VII: Sediment Control.

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Vegetation Management (Subsections 41(c) & 42 (f)(g))

- Limit vegetation clearing for access and at your work area.
- Consider other options when contemplating the need to remove vegetation. It is very often not the best choice for fish and wildlife habitat and species.
- Wildlife trees are important for many wildlife, bird, and amphibian species. You should avoid vegetation activities that will impact trees used for nesting or roosting. Section 34(b) of the Wildlife Act prohibits your interference with bird nests, young, or eggs. This means that a wildlife tree containing an active nest, or a nest of species listed under the Act (i.e., raptors or species at risk), even outside of the breeding season, may not be felled.
- If you are proposing to top or remove trees, have the trees within the riparian area assessed by an appropriately qualified profession who is also a Wildlife Danger Tree Assessor to determine the presence and nature of the hazard.
- Where the danger can be removed by topping or removal of the dead limb this should be undertaken in preference to removal of the entire tree.
- Where the entire tree must be removed then the tree replacement criteria should be applied.
- Also in consideration of the importance of large woody debris to the stream/fish habitat and the importance of large diameter trees to wildlife populations, the stub of the trees should be retained where it is deemed safe to do so.
- Fall or top all trees so that the branches do not enter the stream channel. If any branches do inadvertently end up in the channel they should be removed offsite to where they will not enter the channel during high flows. Removal of limbs from the channel must be completed in a manner that will not disturb aquatic organisms.
- Fall the tree across the stream when falling across the stream cannot be avoided because of safety reasons (faller safety, buildings etc) and all methods of tree removal have been considered but cannot be safely employed. Removal of the felled tree must be completed in a manner that does not damage the banks and the bed of the stream. If possible, leave and anchor the trunk as large woody debris to be left within the riparian zone.
- Fall the tree away from the channel unless there is an immediate threat to life and limb and remove the material within the

instream work window.

- Equipment used for vegetation removal should comply with this document's listed best practices for deleterious substance control.
- Danger trees/limbs prior to the instream window to allow works to be scheduled within the timing window.

For more information see [Appendix VIII: Vegetation Management](#).

Restoration of the Site (*Subsections 41(a)(c) & 42(1)(c)(f)(g)*)

- Grade disturbed areas to a stable angle of repose upon completion of the work. These areas should also be revegetated to prevent surface erosion and subsequent siltation of the watercourse.
- Protect disturbed soil areas on the banks and areas adjacent to the stream from surface erosion by hydroseeding with a heavy mulch, tackifier, seed mix; by installing erosion blankets; and/or by heavily revegetating;
- Plant native trees, shrubs, and herbaceous plants that are appropriate to the site conditions to revegetate and replace impacted riparian vegetation.
- Restore all in-channel or active floodplain habitats that have been disturbed during the completion of works to a condition that is enhanced from their original state. The restoration will be consistent with a no-net-loss of fish and wildlife habitat
- Remove any remaining sediment and erosion control measures (*i.e.*, silt fence). Ensure all equipment, supplies, and non-biodegradable materials have been removed from the site.
- Complete post-construction multiyear monitoring to ensure your revegetation meets full survival.

For more information see [Appendix IX: Restoration of the Site](#).

REMEMBER:

Your project will not be considered to be in compliance with the *Act* or the Regulation if any or all of the standards have not been addressed or if there are any outstanding best practices for mitigating the works.

Habitat Enhancement and Restoration | Watercourse Channelization and Realignment

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