

Environmental Best Management Practices: An annotated bibliography and searchable database.

Database housed at the stewardship BC website: <http://www.stewardshipcentre.bc.ca/>
(pending any comments and finalisation with stewardship centre...).

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Executive Summary

Purpose: This project was commissioned by the Lands Management Committee of the BC Conservation Lands Forum. The goal of the project was to provide an easily accessible and searchable bibliography and database of existing information sources that provide guidance on how to manage for a wide range of environmental values – often these practices are termed 'best management practices'.

Environmental 'best management' practices (BMP) are those designed to guide activities that promote stewardship of the environment. In addition, guidance, standards, approaches, principles may all offer advice to people interested in maintaining ecological values. To that end, this document provides an annotated bibliography and searchable database of best management practices and guidance for those interested in managing land with an emphasis of maintaining or restoring conservation values. The primary intended audience is land managers of private lands managed primarily for conservation (e.g. land trusts and conservancy organizations). The document is also relevant to a wider spectrum of managers including individual private landowners, ranchers, foresters, developers and municipalities.

Defining best management practices: In many cases, a wide variety of approaches to managing environmental values exist. Many are applied to very specific activities, and often under different circumstances. This project compiles information on stated best management practices and guidance documents, but does not critically evaluate the specific practices themselves in terms of their efficacy. Examples were included in this document when they appear to reflect an intent to maintain an environmental value, but some practices will result in 'better' conservation gains than others. Users of the database and bibliography must assess whether any individual example is appropriate for their own circumstances, and whether it does in fact constitute the 'best' practice in relation to a particular value or issue.

Scope: The bibliography and database focus on a wide range of management activities within terrestrial habitats and aquatic habitats, but with the exception of purely instream (e.g. fisheries management) or oceanic issues. In general, BMPs that focused on individual species management were not included, however a number of documents that dealt with groups of species were included. Scope also concentrated on practices related to operational management activities, rather than planning, inventory and monitoring (though these latter are included if they were readily accessible). The best management practices are organised as relevant to 15 different broad 'threats' or activities (based on the IUCN definition of threats), and are also scored as to their relevance to different broad ecosystem types in the province. This allows the manager to focus in on either ecosystems of interest (e.g. grassland), or activities of interest (e.g. access, invasive species etc.). The limitations of scope were simply a result of the limited funding available for the project.

Two documents are produced:–

- the first, this word document outlines the project, and includes the annotated bibliography divided into three sections: a) general terrestrial, b) general aquatic, and c) invasive species. Note there is often overlap between what is included in different documents and these categories are not mutually exclusive.
- the second is an excel spreadsheet that allows more efficient searching through the results. For each document included in the bibliography, the database shows: a) keywords that define the scope of the document, b) what aspect of management the document discusses, c) what threats are addressed, and d) which ecosystems the document applies to. This summary page can be used to search for any individual type of reference (e.g. to highlight all those relating to access issues in grasslands). In addition, a second page of the spreadsheet is hyperlinked to the text of the bibliography stored on a separate spreadsheet within the same document. This allows searching, or hiding of information within excel making it a more useable product. The database is 'protected' in excel to prevent accidental changes or deletion - however sorting and summarising the information is allowed in the database.

Results

The following are general findings from this compilation work:

Many BMPs exist, and can help to promote conservation and stewardship of ecological values for land managers. A total of 160+ references are included in this document. The breakdown of distribution is shown in Table 1. The majority of references deal with prevention of impacts and management of existing impacts - which is unsurprising, since we focused on these. However, a large number also include planning, and to a lesser degree 'inventory' – which were not priorities but are clearly important elements of any management activity.

Some (36) BMPs were not in relation to a particular threat. These tend to be the 'best' most ecologically based approaches and cover topics such as restoration, general stewardship principles, BMPs for individual species (e.g. raptors and herptiles), and wetland ecology. Ecological restoration is an area of activity where ecological goals tend to be foremost in the planning. However, ecological restoration is also a complex subject and is often presented in great detail (e.g. relatively complex scientific books). Guiding principles for ecological restoration are available from the Society for Ecological Restoration, Terrestrial Ecosystem Restoration Program and a new comprehensive guide to restoration principles has recently been compiled by Parks Canada. Many of the principles outlined in these documents are equally applicable to maintenance rather than restoration of ecological values, particularly the inventory, planning and monitoring aspects. 'Restoration' can therefore often be rephrased in terms of ecologically-based conservation management.

There are a large number of BMPs relating to invasive plant management issues (54), and these tend to be the most comprehensive BMPs, typically including planning, inventory and monitoring plus activities to prevent, manage existing impacts and restore sites. Many BMPs that deal with other activities (e.g. access and trails) also include information on invasive species management. Invasive species are recognised as a significant existing threats to biodiversity in BC (Austin 2009), and are expected to increase with climate change (Utzig and Holt 2009¹). BMPs for dealing with invasive species are fairly comprehensive in BC, and a number of documents exist that provide a strategic approach for assessing priority actions under different circumstances. It is also noted that the invasive species council (<http://www.invasiveplantcouncilbc.ca/>) assesses general provincial needs and gaps, and is well suited to the development of new BMPs as they are considered necessary. For example, appropriate management may include a strategic assessment of how climate change may influence future invasive species issues. The invasive plant council is likely most appropriately situated to undertake such an assessment.

Most BMPs (59) had some general relevance to a variety of ecosystems in BC. This includes for example, all the principles of stewardship, restoration, wildlife tree protection, fencing BMPs.

Many BMPs focused on a variety of aspects of management within a forestry context (forest management *per se* or access management within a forestry context – and many tend to be focused on mitigating the impacts of forest management and road building activities. Some of these specific BMPs would not be particularly relevant to direct conservation management. A broader framework of ecosystem-based management however may be relevant in some conservation land management scenarios, and a number of approaches to EBM are included in the BMP list (e.g. CIT #73 ; FSC #75; Silva #76).

Of terrestrial systems, grassland and dry forest ecosystems see the majority of the focus for BMPs. This likely stems from the combined focus of having a high density of values, being ecosystems in valley bottoms close to the major centres of development in BC, and being ecosystems at risk. However, many of these BMPs were fairly generic in nature. Conservation lands that combine

¹ Utzig, G. and R. Holt. 2009. Integrated Ecological Impact Assessment: Climate Change and BC's Forest and Range Ecosystems – Draft. Upbl. Rpt. prepared for Future Forest Ecosystem Initiative, Research Branch, BC Forest Service. Victoria, BC. 50pp.

ranching activities with conservation on high value grassland / open forest ecosystems is identified as a cost-effective approach to reducing potentially more damaging developments on these lands (e.g. vineyards, or housing developments). The recent handbook (#28) developed by the Ministry of Agriculture and Fisheries provides many BMPs that work to reduce the conflicts between these two goals. The handbook was written primarily for the ranching community, rather than a more specifically conservation focused property, and some BMPs may be too focused on mitigation rather than avoiding a significantly damaging activity. For example, careful use of pesticides may reduce impacts to biodiversity, but on conservation lands, use of organic methods may be more appropriate. A systematic analysis of how well existing BMPs maintain ecological values may be appropriate for these specific conservation lands.

Wildlife-friendly fencing. This issue is common to many conservation lands, and is dealt with by a number of documents, and is particularly comprehensively discussed in a new document (Paige 2008 #9).

MoE Parks and Protected areas branch has identified recreation as a significant threat to maintaining ecological values in BC parks. This conclusion is likely to be relevant to many privately managed conservation lands in BC. Recreation is very difficult to manage, and many of the existing BMPs on the subject are fairly generic (e.g. reduce human footprints by staying on trails, etc.). Development of a more strategic series of BMPs for recreation on conservation lands may be appropriate.

Access management itself presents a large management issue. A number of documents deal with specific elements of access management (e.g. creating vehicle barriers #89), or road maintenance (#20). However, compared to the importance of the impacts, and perhaps due to its complex nature, access management represents a significant gap in available BMPs.

Impacts to wetlands and riparian areas is identified as a significant threat to biodiversity in BC and this area appears to be well covered within BMPs. For example, a recent and very comprehensive summary of BMPs to mitigate impacts and to manage for wetlands is newly available (Cox 2009 # 161).

At the provincial scale, climate change is identified as the major threat to biodiversity (Holt et al. 2003²; Austin 2009³). Even though the scope of the expected impact of climate change on biodiversity values (Utzig and Holt 2009) is immense, there is a general lack of definitive approaches for coping with these potential impacts. This points to the suggestion that climate change impacts represent a significant gap in standards of practice for maintaining biodiversity values. A number of broad documents are becoming available that identify the crucial role that maintaining natural systems will play in terms of climate change adaptation and mitigation (e.g. #63 Colwell; Wilson and Hebda #70; #79 McGregor), but in general specific guidance is lacking.

Another key threat is general degradation of ecosystems (e.g. forest harvesting, oil and gas developments and access) - neither of which are covered well by BMPs because they are much larger planning issues that are not easily dealt with at the scale of individual property management. In relation to conservation lands, this information is likely more applicable in terms of purchase strategies rather than in relating to BMPs. The combination of degradation and climate change may alter purchase strategies for conservation organizations however.

Additional gaps, looking at threats include:

² Holt R.F, G. Utzig, M Carver, and J Booth. 2003. Biodiversity Conservation in British Columbia – Ranked Impacts and Conservation Gap Assessment. Unpubl. Rpt. for the Biodiversity Branch of the Ministry for Water Land and Air Protection. Victoria, BC. 90pp.

³ Austin. Et al. 2009. Taking Nature's Pulse. Available at: www.biodiversitybc.org

- a lack of easily identifiable information on fire management. Although much has been written on fire management issues, it tends not to be in the form of BMPs that could be easily applicable to conservation lands.
- A lack of information on how to manage drainage and flow regimes (e.g. to maintain water levels to maintain ecosystem functioning in complex wetland settings). Often BMPs focus on drainage issues, but do not consider water fluctuations patterns that are typically driven by engineering or dam-related water level management.
- A lack of BMPs applicable to moist and wet forests – these ecosystems cover the majority of the landbase in BC.
- A lack of BMPs applicable to alpine environments. Although typically outside the management realm, alpine ecosystems are predicted to be significantly impacted by climate change.

Finally, many BMPs are focused on mitigating impacts of activities that may be inappropriate on conservation lands. Strategic assessment of potential impacts should be a first step to determine whether the activity is appropriate, and whether a BMP is the most appropriate way to mitigate. For example deciding to NOT locate infrastructure (trails / huts) in ecologically sensitive areas may be the most appropriate BMP, rather than simply building such infrastructure in an ecologically sensitive fashion.

Introduction

Environmental 'best management' practices (BMP) are those designed to guide activities that promote stewardship of the environment. This document provides an annotated bibliography and searchable database of BMPs for land managers whose focus is on maintaining or restoring biodiversity values on an area of land. The primary audience is intended to be managers in charge of private lands managed primarily for conservation (e.g. land trusts, conservancy organizations etc), but the information is also relevant to a wider spectrum of managers including individual private landowners, ranchers, foresters, developers and municipalities.

It should be cautioned, that while in theory all environmental BMPs should be appropriate to apply by conservation stewards managing lands for a conservation purpose, in practice BMPs are often about mitigating the impacts of an activity, and that some activities themselves may be inappropriate on conservation lands. For example, BMPs for herbicide application are relevant for agriculture lands, but herbicide itself may not be an appropriate technique on conservation lands. BMPs should not be applied without careful land use planning and inventory to assess their appropriateness to specific values, types and levels of threat to those values and knowledge of potential interactions between the values and threats.

Scope and Structure of the Project

The project focused on terrestrial and freshwater aquatic (including estuarine) management issues, but does not include instream nor oceanic issues. The scope was limited to practices related to operational management activities, rather than planning, inventory and monitoring (though these latter are mentioned if they are part of a comprehensive BMP / planning document). This allows the manager to focus in on either ecosystems of interest (e.g. grassland), or activities of interest (e.g. access concerns, or invasive species).

The database is presented as a series of spreadsheets within an Excel Workbook to facilitate easy access. The main sheet (DATABASE) shows: a) key words that define the scope of the document, b) what aspect of management the document discusses, c) what threats are addressed, and d) which ecosystems the document applies to. This summary page can be used to search for any individual type of reference (e.g. to highlight all those relating to access issues in grasslands). In addition, a second page of the spreadsheet (FULL REFERENCES) provides the full text of the bibliography stored on a separate spreadsheet within the same document. This allows searching, or hiding of information within excel making it a more useable product.

The management stages include: **prevention** of impacts, **management of existing** impacts, **recovery/ post-event**, **planning/ decision-making** and **inventory/ monitoring**. The general framework used to define the threat classes is based on the IUCN list of threats (see Table 1). Broad ecosystem classes include: Grassland; Dry Forest; Moist forest; Wet forest; Alpine; Riparian; Wetland; Estuarine / coastal; Urban; Rural; Applicable to all.

As part of the project, a gap analysis of the BMPs was completed. A gap analysis is a systematic search for 'holes' or gaps in available information. It can be performed at different scales and intensities. The most obvious is simply to look at the list of 'threats' and 'ecosystems' and identify which appear to have little information available on BMPs.

A more useful gap analysis however is specific to a particular set of values. For example, knowing which threats or activities are most significant provincially, or to individual managers, allows a more focused gap analysis⁴. No BMPs may be available in a particular area, but if threats are low then this would be insignificant. *Vice versa*, a large number of BMPs may still be inadequate if those existing do not match the type or level of threat, or are not comprehensive enough, or have a sufficiently high standard of

⁴ Austin et al. 2009 (Taking Nature's Pulse) is the primary source for the statements on threats below.

practice to maintain the value of interest. This type of analysis could be undertaken for properties owned by individual conservation groups, or at the provincial scale, or within an individual management unit. At whichever scale, it requires an assessment of relative threats combined with an assessment of the standards set out in the BMPs.

Table 1. Threat classes used in the database.

Threat Class	Activities included
Not threat based	Some BMPs are specifically about maintaining ecological values, rather than about mitigating threats.
Residential / urban	Urban / rural development of residential infrastructure
Agriculture – crops	Crop production
Agriculture – grazing and associated activities	Includes grazing issues and infrastructure such as fencing
Energy production / mining	
Transportation/ utility corridors	Includes building of any structures on which to travel, including roads, hiking trails, board walks, parking lots
Resource use – forest / land management	Includes general forestry, plus stand level management such as wildlife tree management, non-timber forest products etc.
Human – access/ recreation management	Includes access issues caused by hiking, off-road vehicles, horses, skiers etc, but not the actual structures built to allow access (see transportation/ utility corridors)
Natural systems – fire suppression	Traditional fire suppression activities.
Natural systems – fire management	Fuel management / interface fire management
Natural systems – changes in natural disturbances	Ecological restoration of natural systems (may or may not include fire)
Natural systems- drainage and flow regimes	Water removal for wide variety of reasons, including agriculture, urban / rural. Plus other hydrologic changes, such as dams.
Invasives – non-native / alien	Invasives.
Pollution	All industrial/ light pollution
Climate change	

Table 2. Classes in each of the three primary database categories. The last row of the table summarizes the number of references in each of the various classes(see text above for description of classes). A total of 160 references are included. Note that many references occur in a number of different classes.

Stage of Management		Threat / Activities		Broad Ecosystem Groups	
97	Prevention	36	Not Threat based	59	Relevant to all
97	Management of existing	28	Residential/ Urban	58	Grassland
40	Recovery / post event	12	Agriculture - crops	14	Dry Forest
88	Planning/ Decision-making	26	Agriculture - grazing and associated activities	1	Moist Forest
62	Inventory / Monitoring	4	Energy production/ mining	3	Wet Forest
		30	Transportation/ Utility Corridors (roads, pipelines etc)	1	Alpine
		27	Resource Use - Forest / land management	23	Riparian
		25	Human - Access/ recreation management	25	Wetland
		0	Natural systems - fire suppression	16	Estuarine/ Coastal
		6	Natural systems - fire management	7	Urban
		6	Natural systems - changes in natural disturbances	8	Rural
		1	Natural systems - drainage and flow regimes		
		54	Invasives - non-native / alien		
		13	Pollution		
		8	Climate Change		

Overview of Results

Terrestrial and Aquatic Assessment

The range of factors relevant to conservation of terrestrial habitat elements is very large. The potential activities undertaken by conservation land managers in terrestrial ecosystems is also very broad. BMPs included in the dataset range from very specific guidance relating to groups of individual species, to those relating to specific activities (e.g. fencing or wildlife tree management), to very broad guidance on restoration or ecosystem-based management of forested landscapes.

The vast majority of the best management practices (BMPs) regarding Aquatic Areas (water quality, water bodies, estuaries, wetlands and riparian areas) focused on stormwater, land development and agricultural activities. Citation 91 "Access Near Aquatic Areas: A Guide to Sensitive Planning, Design, and Management" provided BMPs for recreational access near aquatic areas. The review did not cover instream related BMPs, however detailed instream BMPs are provided in citation #98 (standards and practices for instream works). Most of the BMPs found focused on maintaining riparian buffer strips along aquatic areas, and minimizing land disturbance, pollution and sediment laden water delivery to riparian areas, wetlands, estuaries and watercourses from human related land use activities.

In addition to the specific areas listed, the following websites provides summary information on BMPs, or provide additional tools relevant to conservation land management which were outside the scope of this dataset, but remain pertinent to management of conservation lands:

MoE BMP Website: <http://www.env.gov.bc.ca/wld/BMP/bmpintro.html> : provides a general overview some BMPs, and will house updated BMPs as they are produced by government.

Stewardship Centre: <http://www.stewardshipcentre.bc.ca/> - a wide range of information is available on this website for those interested in conservation land management of large and small land parcels.

Land Trust Alliance of BC: founded in 1997, is a charitable, non-profit, member-based province-wide alliance of BC's land trusts, other organizations that steward or manage lands/water with ecological significance, and other interested citizens, primarily professionals working in the field. With a mandate to *provide education, research, communication and financial services*, the website <http://www.landtrustalliance.bc.ca/> provides hundreds of educational resources, research, case studies and links to organizations, relevant laws and agencies devoted to land conservation. They also have an on-line collection of Land Trust Best Practices and Template documents (sorted according to the Canadian Land Trust Standards & Practices) including template documents on effective organizational operations, land management, baselines, covenant registration and monitoring, tax consequences of land donations, and much more.

Species-at-Risk: <http://www.speciesatrisk.bc.ca/index.asp> : this website provides a primer for BC local governments around information on individual species of concern in BC. Mostly provides background information rather than many specific BMPs, but provides useful information for land managers interested in specific species.

Ontario BMPs: <http://www.omafra.gov.on.ca/english/environment/bmp/series.htm> - provides BMPs on a wide range of subjects. Primarily directed at mitigation of impacts of a variety of activities.

Wetkit: www.wetkit.net – is a very useful website that provides a wide variety of information for those interested in managing wetlands and riparian areas. It includes BMPs for a wide range of activities (many outside the scope of this project), and information on case studies, field guides, evaluation techniques, legislation, funding, incentives, etc.

Restoration: the international society for restoration activities (<http://www.ser.org/>) provides many good links and information sources.

Invasive Plants

Invasive species were considered separately within this database because of the large volume of information available. For the purposes of this document, "invasive plant" refers to alien invasive species that may or may not be listed as noxious within BC. Best management practices for invasive plant management, based on the concepts of integrated pest management, includes the following steps:

- Identify natural resource values and other high value sites (may include mapping existing lands and resources, and setting goals for invasive plant management);
- Assess invasive alien species threats (including invasive species and their pathways of introduction and spread) and vulnerable sites and habitats within the management area;
- Prevent the introduction and spread of invasive species (through good land management and prevention BMPs);
- Apply early detection and rapid response for new invaders;
- Inventory existing infestations (including correct identification of invasive plants);
- Prioritize species for management (e.g. risk assessment and decision-support tools, and/or species categories);
- Develop a weed management plan (considering mechanical, biological and chemical control methods and making decisions based on the biology of the weed species, characteristics of the site, density and size of infestation, potential damage caused by the invasive plant, cost of the control method, and type of land use); and
- Monitor and evaluate treatments and efficacy of program and adapt management accordingly.

There are few actual "Best Management Practices" for invasive plants in BC. However, there are a number of resources, templates and/or standards that are currently in use in the Province to support invasive plant management. This section includes a summary of those types of resources as well as existing BMPs. This document was not intended to include references to legislation or species-specific information (although we included them if readily available).

The Invasive Species Section of the bibliography is sorted into 5 stages of management activities, because documents in that field tend to be organised in that way:

- prevention (prior to damage occurring);
- management of existing (i.e. strategies for dealing with existing damage)
- recovery post event (i.e. recovery post damage)
- planning / decision making (broader scale strategies)
- inventory and monitoring.

The latter two categories were not a focus of this project (due to budget constraints), but are clearly an integral aspect of employing BMPs. There are many detailed documents on how to undertake planning, inventory and monitoring, but they are mentioned only secondarily here where they are part of a more operational / practices type document.

Some key references include:

#122 – an excellent overview document for steps as well as actual BMPs that could be easily applied

#128– the best source of data, and a guide to inventory and tools for data management in BC

#143– an overview of the steps involved in developing a weed management plan; easy to follow and use

- #145 – a great background document – a good place to start
- #118 – weed committees as a good source of local information

Other good references include:

- #127 – lists of BMPs, particularly for prevention
- #138– for a decision-making tool
- #148; #153, #154– for control methods

General Findings And Gap Analysis

The following are general findings from this compilation work:

Many BMPs exist, and can help to promote conservation and stewardship of ecological values for land managers. A total of 160+ references are included in this document. The breakdown of distribution is shown in Table 1. The majority of references deal with prevention of impacts and management of existing impacts - which is unsurprising, since we focused on these. However, a large number also include planning, and to a lesser degree 'inventory' – which were not priorities but are clearly important elements of any management activity.

Some (36) BMPs were not in relation to a particular threat. These tend to be the 'best' most ecologically based approaches and cover topics such as restoration, general stewardship principles, BMPs for individual species (e.g. raptors and herptiles), and wetland ecology. Ecological restoration is an area of activity where ecological goals tend to be foremost in the planning. However, ecological restoration is also a complex subject and is often presented in great detail (e.g. relatively complex scientific books). Guiding principles for ecological restoration are available from the Society for Ecological Restoration, Terrestrial Ecosystem Restoration Program and a new comprehensive guide to restoration principles has recently been compiled by Parks Canada. Many of the principles outlined in these documents are equally applicable to maintenance rather than restoration of ecological values, particularly the inventory, planning and monitoring aspects. 'Restoration' can therefore often be rephrased in terms of ecologically-based conservation management.

There are a large number of BMPs relating to invasive plant management issues (54), and these tend to be the most comprehensive BMPs, typically including planning, inventory and monitoring plus activities to prevent, manage existing impacts and restore sites. Many BMPs that deal with other activities (e.g. access and trails) also include information on invasive species management. Invasive species are recognised as a significant existing threats to biodiversity in BC (Austin 2009), and are expected to increase with climate change (Utzig and Holt 2009⁵). BMPs for dealing with invasive species are fairly comprehensive in BC, and a number of documents exist that provide a strategic approach for assessing priority actions under different circumstances. It is also noted that the invasive species council (<http://www.invasiveplantcouncilbc.ca/>) assesses general provincial needs and gaps, and is well suited to the development of new BMPs as they are considered necessary. For example, appropriate management may include a strategic assessment of how climate change may influence future invasive species issues. The invasive plant council is likely most appropriately situated to undertake such an assessment.

Most BMPs (59) had some general relevance to a variety of ecosystems in BC. This includes for example, all the principles of stewardship, restoration, wildlife tree protection, fencing BMPs.

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Of terrestrial systems, grassland and dry forest ecosystems see the majority of the focus for BMPs. This likely stems from the combined focus of having a high density of values, being ecosystems in valley bottoms close to the major centres of development in BC, and being ecosystems at risk. However, many of these BMPs were fairly generic in nature. Conservation lands that combine ranching activities with conservation on high value grassland / open forest ecosystems is identified as a cost-effective approach to reducing potentially more damaging developments on these lands (e.g. vineyards, or housing developments). The recent handbook (#28) developed by the Ministry of Agriculture and Fisheries provides many BMPs that work to reduce the conflicts between these two goals. The handbook was written primarily for the ranching community, rather than a more specifically conservation focused property, and some BMPs may be too focused on mitigation rather than avoiding a significantly damaging activity. For example, careful use of pesticides may reduce impacts to biodiversity, but on conservation lands, use of organic methods may be more appropriate. A systematic analysis of how well existing BMPs maintain ecological values may be appropriate for these specific conservation lands.

Wildlife-friendly fencing. This issue is common to many conservation lands, and is dealt with by a number of documents, and is particularly comprehensively discussed in a new document (Paige 2008 #9).

MoE Parks and Protected areas branch has identified recreation as a significant threat to maintaining ecological values in BC parks. This conclusion is likely to be relevant to many privately managed conservation lands in BC. Recreation is very difficult to manage, and many of the existing BMPs on the subject are fairly generic (e.g. reduce human footprints by staying on trails, etc.). Development of a more strategic series of BMPs for recreation on conservation lands may be appropriate.

Access management itself presents a large management issue. A number of documents deal with specific elements of access management (e.g. creating vehicle barriers #89), or road maintenance (#20). However, compared to the importance of the impacts, and perhaps due to its complex nature, access management represents a significant gap in available BMPs.

Impacts to wetlands and riparian areas is identified as a significant threat to biodiversity in BC and this area appears to be well covered within BMPs. For example, a recent and very comprehensive summary of BMPs to mitigate impacts and to manage for wetlands is newly available (Cox 2009 # 161).

At the provincial scale, climate change is identified as the major threat to biodiversity (Holt et al. 2003⁶; Austin 2009⁷). Even though the scope of the expected impact of climate change on biodiversity values (Utzig and Holt 2009) is immense, there is a general lack of definitive approaches for coping with these potential impacts. This points to the suggestion that climate change impacts represent a significant gap in standards of practice for maintaining biodiversity values. A number of broad documents are becoming available that identify the crucial role that maintaining natural

⁶ Holt R.F, G. Utzig, M Carver, and J Booth. 2003. Biodiversity Conservation in British Columbia – Ranked Impacts and Conservation Gap Assessment. Unpubl. Rpt. for the Biodiversity Branch of the Ministry for Water Land and Air Protection. Victoria, BC. 90pp.

⁷ Austin. Et al. 2009. Taking Nature's Pulse. Available at: www.biodiversitybc.org

systems will play in terms of climate change adaptation and mitigation (e.g. #63 Colwell; Wilson and Hebda #70; #79 McGregor), but in general specific guidance is lacking.

Another key threat is general degradation of ecosystems (e.g. forest harvesting, oil and gas developments and access) - neither of which are covered well by BMPs because they are much larger planning issues that are not easily dealt with at the scale of individual property management. In relation to conservation lands, this information is likely more applicable in terms of purchase strategies rather than in relating to BMPs. The combination of degradation and climate change may alter purchase strategies for conservation organizations however.

Additional gaps, based on an overview analysis of the threats include:

- a lack of easily identifiable information on fire management. Although much has been written on fire management issues, it tends not to be in the form of BMPs that could be easily applicable to conservation lands.
- A lack of information on how to manage drainage and flow regimes (e.g. to maintain water levels to maintain ecosystem functioning in complex wetland settings). Often BMPs focus on drainage issues, but do not consider water fluctuations patterns that are typically driven by engineering or dam-related water level management.
- A lack of BMPs applicable to moist and wet forests – these ecosystems cover the majority of the landbase in BC.
- A lack of BMPs applicable to alpine environments. Although typically outside the management realm, alpine ecosystems are predicted to be significantly impacted by climate change.

Finally, many BMPs are focused on mitigating impacts of activities that may be inappropriate on conservation lands. Strategic assessment of potential impacts should be a first step to determine whether the activity is appropriate, and whether a BMP is the most appropriate way to mitigate. For example deciding to NOT locate infrastructure (trails / huts) in ecologically sensitive areas may be the most appropriate BMP, rather than simply building such infrastructure in an ecologically sensitive fashion.

Potential Next Steps

This work could be expanded in a number of ways, including:

- Continue to develop the database, expanding the types of documents included. Focus on searching for key documents identified as missing from above. Additionally, a more focused search for planning, inventory and monitoring documents could be included.
- Develop new BMPs for key areas identified as gaps in this report and in the workshop
 - Climate change
 - Alpine environment management
 - Fire management issues (in concert with climate change predictions)
 - Water flows in relation to wetland management
- Combine existing BMPs into an 'ecosystem-based planning' framework. Application of BMPs on an activity-specific basis does not necessarily result in appropriate management overall. A strategic approach to management issues that combines BMPs into a more comprehensive framework may be useful to conservation land managers.

Results: Bibliography

The annotated bibliography below is primarily organised into three categories – information focusing on a) terrestrial elements and those focusing on b) aquatic elements and c) documents focusing on invasive species. This last group is separated into three categories: General BMPs, Decision-making tools and management planning, control and monitoring, and a limited number of species-specific documents.

Terrestrial Ecosystem Elements

Ref#: 1

Name in spreadsheet: MoE 2006a

Citation: Develop with care: environmental guidelines for urban and rural land development in British Columbia.

Weblink: http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare2006/develop_with_care_intro.html

Overview: Broad list of guidelines (BMPs) relating to general development of rural and urban areas. Includes region-specific information. Written from a development perspective, focusing on mitigation of unwanted impacts of development. Includes a simple risk assessment approach, focusing on species impacts (significance of resource * likelihood of impact * significance of impact).

The *Introduction* section that outlines approaches to planning and monitoring, and places the rest of the document into context.

The *'Community Planning'* section covers a wide range of issues – from concepts such as plan development, cumulative development and smart growth, and gives an overview of potentially relevant legislation. But also includes approaches to habitat protection (including wildlife trees, invasive species, sensitive ecosystems, riparian areas), plus water management issues, and ideas for adaptation to climate change.

The *Site Development* section builds on the previous chapter by providing specific approaches to protecting ecosystems and species, water, terrain and climate while developing, building trails etc.

The *Environmentally Valuable Resources* section provides background information plus links to other information relating to species and ecosystems that should be considered as particularly valuable. Guidelines covered include inventory, site planning, protection throughout development and restoration.

In addition, a regional summary of information is provided for 9 regions.

Appendices provide additional background information, including mapping and inventory resources, conservation evaluation assessments, and protection and conservation tools.

Throughout this comprehensive series, links are given to other more detailed BMPs, and useful management information is provided throughout.

Ref#: 2

Name in spreadsheet: Chutter 1997

Citation: BC Grasslands Stewardship Guide: A guide for ranchers and recreation users. (Stewardship Series). Published by Province of B.C.

Weblink: <http://www.stewardshipcentre.bc.ca/files/scnBC/publications/grassland.pdf>

Overview: Overview of grassland values and issues, including historic context. Aimed at providing basic information to ranchers and recreationists. Provides general guidance of how to reduce impacts to grassland values. Provides 'warning signs', and general 'solutions'.

Ref#: 3

Name in spreadsheet: Lanarc 1995

Citation: Community Greenway: linking communities to country, and people to nature. (Stewardship Series). Published by MoE and DFO.

Weblink: <http://www.stewardshipcentre.bc.ca/files/scnBC/publications/cg.pdf>

Overview: Focused on how to integrate greenways into community planning, but concepts are applicable to general land management and maintaining connected landscapes. Provides general arguments for why greenways / corridors are important for natural and human communities. Focused on the specifics of planning, and also includes general concepts and potential partners to be included in broader scale landscape planning. Includes broad suggestions on natural vegetation management, stormwater management and water quality management.

Ref#: 4

Name in spreadsheet: Penn 1996

Citation: Stewardship Options for private landowners in British Columbia. Issued by Government of Canada and Province of B.C.

Weblink: <http://www.stewardshipcentre.bc.ca/files/scnBC/publications/options.pdf>

Overview: Overview of how to gather and use ecological information in a planning exercise aimed at land stewardship. Also provides general stewardship guidance 'tips'. Largely focused on smaller areas of private land, but general concepts applicable at multiple scales. Is out of date on some aspects (e.g. references Forest Practices Code requirements). Also includes a summary of legal tools for long-term protection of private land.

Ref#: 5

Name in spreadsheet: Min. Ag. Lands. 2008.

Citation: Min. Ag. And Lands. 2008-2009. Guide to best management practices in British Columbia for cereals, canola, field corn, field peas, grasses and legumes for forage and seed production. Min. Ag and Lands.

Weblink: <http://www.agf.gov.bc.ca/cropprot/fieldcrop/index.htm>

Overview: Provides an overview of "environmental farm planning", which identifies approaches to mitigating impacts of agriculture on biodiversity values within a risk assessment framework. In 6 chapters, it provides an overview organic farming, disease management, integrated pest management, weed/ invasive plant management and herbicide / pesticide information. The document is focused primarily on mitigation of agricultural practices.

Ref#: 6

Name in spreadsheet: Ministry of Forests 1995

Citation: Bark Beetle Management Guidebook. Published by B.C. Ministry of Forests.

Weblink: <http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/beetle/betletoc.htm>

Overview: Provides a background to bark beetle management and specific practices for managing mountain pine beetle, spruce beetle, and Douglas-fir beetle. The guidebook provides a lot of information on the distribution and host range, life cycles and dynamics, general impacts and management strategies. The guidebook contains three decisions trees, one for Douglas-fir beetle, one for mountain pine beetle and one for spruce beetle. Written originally in relation to the Forest Practices Code, this document provides background material on strategies for dealing with these species. It is out of date with respect to current population trends for these species, but provides useful background information relevant to any landowner with these species affected by mountain pine beetle.

Ref#: 7

Name in spreadsheet: Demarchi 2005

Citation: Demarchi, M.W. and M.D. Bentley. 2005. Best management practices for raptor conservation during urban and rural land development in British Columbia. Prepared for B.C. Ministry of Environment.

Weblink: http://www.env.gov.bc.ca/wld/documents/bmp/raptor_bmp_final.pdf

Overview: Document focuses on conservation of raptors (birds of prey) and their habitat during land development / management activities. Focuses on legal requirements and guidelines for best practices. Includes detailed species-specific requirements and implementation detail for a series of BMPs. Also includes an overview of a monitoring plan for raptors.

Ref#: 8**Name in spreadsheet:** MoE 2006**Citation:** Ministry of Environment. 2006. Wildlife guidelines for backcountry tourism / commercial recreation. Published by the Province of British Columbia.**Weblink:** <http://www.env.gov.bc.ca/wld/twg/index.html>**Overview:** Developed to guide development of backcountry recreation activities so that they do not compromise the current distribution of wildlife, the sustainability of their populations, or the integrity of their habitats. The guidelines define results, desired behaviours, indicators and limits for backcountry activities in relation to wildlife and habitats. Organised by category of recreation activity (aerial based, motorized, non-motorized, boating) and habitat types (grassland, alpine, freshwater, foreshore, forest). Additional information can be found in the background report:http://www.env.gov.bc.ca/wld/twg/documents/wilson_hamilton_strategy.pdf**Ref#: 9****Name in spreadsheet:** Paige 2008**Citation:** A landowner's guide to wildlife friendly fences: how to build fence with wildlife in mind. Landowner/ Wildlife Resource Program, Montana Fish, Wildlife and Parks, Helena, MT.**Weblink:** <http://fwp.mt.gov/content/getItem.aspx?id=34461>**Overview:** Comprehensive guide to wildlife-friendly fencing for different grazing / wildlife situations. Provides specific examples plus general guidance on how to locate and build fencing, including specific steps for fence building and maintenance of existing fencing. Alternatives to fencing are also discussed. Aimed at the landowner/ manager this is a comprehensive and useful guide.**Ref#: 10****Name in spreadsheet:** MoE 2004**Citation:** Ministry of Environment and Grasslands Conservation Council. 2004. Best management practices for recreational activities on grasslands in the Thompson and Okanagan Basins. WLAP BMP Series.**Weblink:** http://www.env.gov.bc.ca/wld/documents/bmp/grasslands_th_ok_bmp.pdf**Overview:** This document gives a comprehensive overview of the values, types of impacts and potential suite of guidelines dealing with a wide range of recreational activities in grasslands. It gives both general guidance for broad scale goals, and more specific guidance relating to individual recreational activities. It also identifies relevant legal requirements. The best management practices are well explained, and linked to the particular potential impacts. The document has a geographic focus of the Thompson and Okanagan, but the guidance would be relevant to a wider array of geographic areas.**Ref#: 11****Name in spreadsheet:** Min. Small Business and Tourism. 2001**Citation:** Ministry of Small Business and Tourism. 2001. Culturally modified trees of British Columbia. Version 2.0.**Weblink:** <http://www.for.gov.bc.ca/hfd/pubs/docs/mr/mr091.htm>**Overview:** This is an operational guide to the identification and recording of culturally modified trees in B.C.. It is designed for those interesting in documenting these trees. Focused largely on the coast, it also discusses interior BC CMTs. Information on CMT dating, plus protection and management is also provided.**Ref#: 12****Name in spreadsheet:** IMBA Undated**Citation:** International Mountain Biking Association. Undated. Trail building and maintenance. Guidance on the web.**Weblink:** http://www.imba.com/resources/trail_building/index.html
http://www.imba.com/resources/bike_management/managing_mountain_bikes.html

Overview: A comprehensive, web-based, series of guidance documents to aid in mountain bike trail building. The material focuses on how to create interesting mountain biking trails, how to layout trails, building in sensitive areas, how to deal with water and drainage and how to reclaim damaged trails. Note it does not assess whether trails are appropriate for a given area.

Ref#: 13

Name in spreadsheet: Birkby 1996

Citation: Birkby, B. 1996 (updated 2nd edition available). Lightly on the land: the SCA trail building and maintenance manual. Published by the Student Conservation Association.

Weblink: http://www.imba.com/resources/trail_building/lotl.html

Overview: Detailed information on how to build trails, including survey and design, construction techniques, drainage, maintenance, building in different environments, and environmental restoration. 300 pages long, this appears to be very comprehensive around building techniques. Book \$25 – available at website above.

Ref#: 14

Name in spreadsheet: Parker 2004

Citation: Parker, T.S. 2004. Natural surface trails by design: physical and human essentials of sustainable, enjoyable trails. Published by Naturescape LLC.

Weblink: <http://www.natureshape.com/pubs/nstbd.html>

Overview: Appears to be a comprehensive look at designing trails for multi-use (walkers, horseback riding, bicycles, wheelchair accessible, and motorized recreation). Includes a detailed discussion of layout and design, plus detailed description of different best management practices for ensuring sustainable trails. Book \$30 – available at website above.

Ref#: 15

Name in spreadsheet: IMBA 2007

Citation: Managing mountain biking: IMBA's guide to providing great riding.

Weblink: http://www.imba.com/resources/bike_management/managing_mountain_bikes.html

Overview: A focused look at mountain biking and how to provide great biking while reducing impacts. Primary focus is for mountain bikers, but provides detailed guidance on how and whether to build environmentally compatible trails. Book - \$35 – available at the website above.

Ref#: 16

Name in spreadsheet: Colorado State Parks 1998

Citation: Colorado State Parks. Planning trails with wildlife in mind: a handbook for trail planners. Prepared for the trails and wildlife task force.

Weblink: <http://www.fs.fed.us/outdoors/naturewatch/start/planning/Trails-for-Wildlife-Handbk.pdf>

Overview: A summary of the issues and considerations relevant to building trails in relation to wildlife and local habitat impacts. Focusing on planning, but provides a series of useful case studies. Fairly general, but good overview material for factors to consider.

Ref#: 17

Name in spreadsheet: Min. of Ag. 2005.

Citation: B.C. Ministry of Agriculture Food and Fisheries. 2005. A Guide to Developing Trails in Farm and Ranch Areas. British Columbia Ministry of Agriculture, Food and Fisheries.

Weblink: <http://www.al.gov.bc.ca/resmgmt/sf/trails/index.htm>

http://www.al.gov.bc.ca/resmgmt/sf/trails/TrailGuide_CompleteBook.pdf

Overview: Provides fairly generic guidance about trails in agricultural areas. Focused primarily on reducing the impacts of trails and access/ recreation on agricultural land (rather than the environment more generally).

Ref#: 18

Name in spreadsheet: Rangeland Management Branch 2009

Citation: Rangeland Management Branch. 2009. Recommended grazing best management practices in coniferous and deciduous cutblocks in Alberta. Sustainable Resource Development Lands Division. Alberta Provincial Government.

Weblink: <http://www.srd.gov.ab.ca/lands/managingpublicland/grazingtimberintegration.aspx>

Overview: Focused on co-management for cattle and timber requirements, with little attention on alternative land goals (e.g. biodiversity). Does include some information on invasive weed considerations. Provides an overview of compatibilities between timber and cattle management and how these can be fostered.

Ref#: 19

Name in spreadsheet: USFS 2003

Citation: USFS. 2003. Background road maintenance and weed management. USDA. 0371-2811-MTDC.

Weblink: <http://www.fs.fed.us/invasivespecies/documents/BackcountryRdMtceWeed.pdf>

Overview: Overview of specific practices relating to backcountry (non-paved) road maintenance that aim to reduce the spread of noxious weeds. Includes basic background on how weeds are spread by typical road maintenance practices, and the different elements of a strategy required to reduce future spread (including inventory, prioritization approach and maintenance techniques).

Ref#: 20

Name in spreadsheet: MoT 2004.

Citation: Ministry of Transportation. 2004. Best Management Practices for Highway Maintenance Activities.

Weblink: www.th.gov.bc.ca/Publications/eng_publications/environment/MoT_Hwy_Maint_BMP.pdf

Overview: Aimed at highway maintenance contractors, this lengthy document provides environmental BMPs for many aspects of highway maintenance. The document includes discussion of the 15 major 'routine' activities associated with maintenance (surface, drainage winter, roadside, structure, emergency maintenance and inspection). For each activity the document summarizes key environmental concerns that may arise, legislative requirements if they exist and associated BMPs. The document can be applied in a more general way to provide BMP guidance when maintaining any road system.

Ref#: 21

Name in spreadsheet: NSMBA Undated

Citation: Trail Tips: North shore mountain biking association.

Weblink: www.nsmba.bc.ca (follow link to: The Trails / Trail Building Tips).

Overview: focused on compatibility of mountain biking trails and native forests, this series of web-based 'tips' on how to build trails to avoid environmental and aesthetic damage provides a basic overview of reducing the impacts of mountain biking. Could be applied to general non-motorized trail building. Provides links to the more detailed information available in the books published by the International Mountain Bicycling Association (see references to www.imba.com in this document).

Ref#: 22

Name in spreadsheet: Leave No Trace Undated

Citation: Leave No Trace Principles.

Weblink: <http://www.leavenotrace.ca/programs/principles.html>

Overview: Leave No Trace is an organization that provides guidance on how to recreate in the backcountry with minimal impacts. A number of web-based guidance documents provide fairly information on planning trips, traveling with reduced impacts, disposing of waste, minimizing impacts of campfires, respecting wildlife and interacting with others most appropriately. Provides information that can be used to promote low impact recreation in specific areas. In addition, a research page provides links to a variety of scientific papers that provide evidence of impacts of different recreational activities (<http://www.leavenotrace.ca/programs/research.html>).

Ref#: 23**Name in spreadsheet:** CBVA Undated**Citation:** Commercial Bear Viewing Association: Best management practices**Weblink:** <http://www.bearviewing.ca/best-practices.htm>**Overview:** A web-based series of guidelines for how to minimize impacts of tourism viewing on bears, from both water and land. Written by the commercial organisation that oversees bear viewing, focuses on maintaining opportunities for bear viewing, rather than assessing whether viewing is appropriate on a site by site basis.**Ref#: 24****Name in spreadsheet:** Speleological Society**Citation:** Caving codes of conduct**Weblink:** <http://www.cancaver.ca/bcsf/cavethic.htm>**Overview:** Provides basic safety and environmental codes of conduct for caving activities.**Ref#: 25****Name in spreadsheet:** MoE 2006**Citation:** MoE. 2006. BMPs for hazard tree and non-hazard tree limbing, topping or removal.**Weblink:** http://www.env.gov.bc.ca/okanagan/documents/BMPTreeRemoval_WorkingDraft.pdf**Overview:** An overview of the legislative requirements, and best management practices for managing trees around riparian areas in particular while undertaking development activities.**Ref#: 26****Name in spreadsheet:** Grasslands Conservation Council 2003**Citation:** Best management practices for motorized recreation on BC's grasslands.**Weblink:** <http://www.bcgrasslands.org/docs/a66ac74d1788666d.pdf>**Overview:** Provides an overview of the values present in grasslands and how they can be impacted by a variety of aspects of motorized recreation. Provides general best management practices on how to avoid impacts to sensitive environmental values and ranching.**Ref#: 27****Name in spreadsheet:** CUFN Undated**Citation:** Canadian Urban Forest Network. Undated**Weblink:** http://www.treecanada.ca/programs/urbanforestry/cufn/resources_bmp.html**Overview:** Web-based information on all aspects of urban forestry. Includes strategic and operational planning, legislation issues, inventory and all aspects of maintenance of urban forests including dealing with hazard trees, maintaining trees through development of a site, common stresses of trees, stormwater management and urban forests, fire and rural interface areas, economic values and general awareness and stewardship issues. Many of the pages link to additional websites which have varying relevance to B.C. Overall, these pages contain a great deal of information on best management practices for maintaining trees in an urban/ rural setting.**Ref#: 28****Name in spreadsheet:** BC Min Ag. 2009**Citation:** BC Min of Ag, Food and Fisheries. 2009. Canada – BC Environmental Farm Plan: Planning workbook. Published by BC Agriculture Council.**Weblink:** http://www.ardcorp.ca/index.php?page_id=40**Overview:** Written aimed at the farming community, this lengthy document has a series of chapters, some of which focus on environmental best management practices for stewardship areas, soil, water, air and biodiversity. For each chapter, relevant legislation is summarised and fairly general best management practices are provided. It includes a specific riparian assessment worksheet to determine whether restoration activities are likely appropriate – seehttp://www.agf.gov.bc.ca/range/publications/documents/riparian_assessments.pdf

Ref#: 29**Name in spreadsheet:** USDI 2001**Citation:** US Department of the Interior. 2001. Biological soil crusts: ecology and management. Technical Reference 1730-2.**Weblink:** <http://www.blm.gov/nstc/library/pdf/CrustManual.pdf>**Overview:** A comprehensive scientific document on soil crusts, including a detailed assessment of species diversity and natural factors affecting population distribution. Potential disturbance factors are discussed in detail, as are management techniques intended to maintain populations. A final section summarizes how to monitor soil crusts.**Ref#: 30****Name in spreadsheet:** Elzinga. Undated**Citation:** Elzinga, C.L., D.W. Salzer and J.W. Willoughby. Undated. Measuring and monitoring plant populations. Published by the Bureau of Land Management. BLM Technical Reference 1730-1.**Weblink:** <http://www.blm.gov/nstc/library/pdf/MeasAndMon.pdf>**Overview:** A 500-page, extremely comprehensive discussion of how and why to monitor single species plant populations, intended for species such as indicator species, key species or specific weed species. It is useful for a technical audience if a thorough monitoring plan is required.**Ref #: 31****Name in spreadsheet:** Eubanks 2004**Citation:** Eubanks, E. 2004. Riparian Restoration. USDA 2300 Recreation Mgmt. 0423 1201 SDTDC.**Weblink:** <ftp://ftp.blm.gov/pub/nstc/techrefs/Final%20TR%201737-22.pdf>**Overview:** This comprehensive document includes background on riparian ecosystem values, how they are commonly impacted by recreation, and provides examples of planning, design and operational restoration activities. In addition, appendices provide detailed information on some specialized techniques for restoring vegetation, dealing with pests and weeds, and how to undertake campsite monitoring.**Ref#: 32****Name in spreadsheet:** Wyman 2006**Citation:** Wyman, S. et al. 2006. Grazing management processes and strategies for riparian-wetland areas. Riparian Area Management Technical Reference 1737-20. BLM. Denver, CO.**Weblink:** <ftp://ftp.blm.gov/pub/nstc/techrefs/Final%20TR%201737-20.pdf>**Overview:** This detailed document is aimed at providing livestock grazing strategies that ensure soil, vegetation, water and wildlife values are all maintained in a functioning manner. Background on wetland-riparian values is provided, and includes planning for appropriate resource management objectives, grazing treatments and monitoring plans. Many examples are provided. Although focusing on local riparian areas the document includes consideration of whole watersheds as the key to success of both grazing and riparian management.**Ref#: 33****Name in spreadsheet:** Lewis 2003**Citation:** Lewis, L. et al. 2003. Riparian Area Management: Riparian-wetland soils. Bureau of Land Management: Technical Reference 1737-29.**Weblink:** <ftp://ftp.blm.gov/pub/nstc/techrefs/Final%20TR%201737-19.pdf>**Overview:** Detailed reference document primarily describing the technical aspects of riparian and wetland soils. Includes riparian soil assessment methodologies to determine the state of the resource. Short section in appendices provides fairly general best management practices for maintaining riparian soils. Primarily a technical reference document.**Ref #: 34****Name in spreadsheet:** Sada 2001

Citation: Sada, D.W. et al. 2001. Riparian Area Management: A guide to managing, restoring and conserving springs in the Western United States. Technical reference 1737-17.

Weblink: <ftp://ftp.blm.gov/pub/nstc/techrefs/Final%20TR%201737-17%20%20copyright%20free%20version.pdf>

Overview: This detailed technical document provides information on different types of springs and how they are affected by varying developments (diversion, recreation, mining and pollution), and biological disturbances (introduced species, aquatic animals, terrestrial species). Management goals, assessment and restoration approaches are all described.

Ref#: 35

Name in spreadsheet: Friendly fencing. Undated.

Citation: Friendly fencing. Undated

Weblink: http://www.wildlifefriendlyfencing.com/WFF/Friendly_Fencing.html

Overview: With Australian examples, this website provides different technical solutions for building fences that are wildlife-friendly. Provides links to a variety of documents that provide fencing solutions for different environments (e.g. overwater, on grasslands etc).

Temp #: R36

Name in spreadsheet: Wildlife Friendly Fencing. Undated

Citation: Wildlife Friendly Fencing. Undated

Weblink: <http://www.nswg.org/april05fencing.htm>

Overview: California-based website, providing an overview of practices for wildlife-friendly fencing. Fairly basic, but provides a good overview of approaches to avoid wildlife damage from fencing.

Ref#: 37

Name in spreadsheet: Government of Montana Undated.

Citation: Building with wildlife: a guide to conservation-oriented development.

Weblink: <http://fwp.mt.gov/content/getItem.aspx?id=32900>

Overview: A document from Montana, intended to provide guidance on how to create developments that capitalize on the natural environment while protecting key environmental values. Provides a wide variety of guidelines to reduce impacts while developing an area.

Ref#: 38

Name in spreadsheet: BC Climate Exchange 2009

Citation: Web-based – no document.

Weblink: <http://www.ghgactionguide.com/>

Overview: A wide range of guidance or best practices that aim to reduce greenhouse gas emissions. Includes general guidance for a wide range of activities in relation to greenhouse gas emissions - includes afforestation, agriculture, buildings, education, employees, infrastructure, land use, transportation, waste and water. Mostly links to relatively simple suggestions and potential funding sources. Provides a starting point for incorporating greenhouse gas assessment into a general management plan.

Ref#: 39

Name in spreadsheet: GOERT 2007.

Citation: Garry Oak Ecosystems Recovery Team. 2007. Protecting Garry oak areas during land development.

Weblink: http://www.goert.ca/documents/GOERT_Fact_Sheets.pdf

Overview: Document that outlines the ecological and economic advantages to protecting Garry oak ecosystems, with case studies. Provides relatively broadscale approaches to protecting these ecosystems during development. Could be applied to many other sensitive ecosystems.

Ref#: 40

Name in spreadsheet: GOERT 2009

Citation: Garry Oak Ecosystems Recovery Team. 2009. The Garry Oak Gardener's Handbook.

Weblink: http://www.goert.ca/documents/GOERT_Gardeners_Handbook.pdf

Overview: Handbook that provides an overview, and plus detailed guidance on how individuals or groups can establish or restore a Garry oak ecosystem on their property. Directly relevant to areas where Garry oak is native, but also provides general guidance for how to approach such a project in other ecosystems. Includes Garry oak ecosystem species lists, and approaches for encouraging native animal species and reducing invasive species. Also includes detailed guidance on how and when to plant on different sites.

Ref#: 41

Name in spreadsheet: GOERT Undated

Citation: Garry Oak Ecosystems Recovery Team. Undated. Native Plant Propagation Guidelines.

Weblink: http://www.goert.ca/propagation_guidelines/introduction.php

Overview: A web-based compendium of individual species information and propagation details for plant species characteristic of Garry oak and associated ecosystems in British Columbia. Itemises information for trees, shrubs, forbs, grasses and sedges, and ferns and allies. Includes additional information on buying and establishing native plants. This document provides species-specific guidance and is a good companion to the Garry Oak Gardener's Handbook. (GOERT 2009).

Ref #: 42

Name in spreadsheet: Cocksedge 2006

Citation: Cocksedge, W. 2006. Incorporating non-timber forest products into sustainable forest management: an overview for forest managers. Royal Roads University.

Weblink: <http://cntr.royalroads.ca/files-cntr/Incorporating%20NTFPs.pdf>

Overview: A detailed overview of non-timber forest products in British Columbia. Includes sections on performing inventory of potential products and understanding available tools (e.g. ecosystem mapping). Approaches to designing compatible management strategies for NTFP (with timber management) are highlighted through case studies. Detailed appendices provide more in-depth information on a variety of potential products, including chanterelle management, plants and fungi in the Robson valley, managing for wild berries, managing for pine mushrooms in the Kootenays. Also includes an annotated bibliography. Does not really provide 'best management practices' but provides general guidance for specific instances.

Ref#: 43

Name in spreadsheet: Falk 2006

Citation: Falk, D.A., M.A. Palmer and J.B. Zedler. 2006. Foundations of restoration ecology. Available for purchase from Island Press.

Weblink: <http://www.ser.org/content/Falk.asp>

Overview: This is a book that advances the science behind the practice of restoring ecosystems while exploring ways in which restoration ecology can inform basic ecological questions. It provides a comprehensive overview of the theoretical foundations of restoration ecology, and is appropriate for people involved in restoration research, teaching, or practice. Appears to provide an ecological overview for restoration, rather than a mitigative approach.

Ref#: 44

Name in spreadsheet: SER 2005

Citation: SER International. 2005. Guidelines for developing and managing ecological restoration projects. 2nd Edition.

Weblink: http://www.ser.org/content/guidelines_ecological_restoration.asp

Overview: A series of guidelines that outline approaches to undertaking ecological restoration projects. Includes information for conceptual planning, preliminary tasks, implementation, post-implementation and evaluation.

Ref#: 45**Name in spreadsheet:** Brierley 2008**Citation:** Brierley, G. and K. Fryirs. 2008. River Futures: An integrative scientific approach to river repair. Published for Society for Ecological Restoration International. Available for purchase from Island Press.**Weblink:** http://www.ser.org/content/River_Futures.asp**Overview:** This detailed comprehensive book considers approaches to maximizing future river health, from an ecological restoration perspective rather than a mitigation of impacts perspective. Scientific foundations emphasizing cross-disciplinary understanding is provided and built upon. A set of guiding principles for approaching river restoration is also provided. Based on a range of case studies with a global perspective.**Ref#: 46****Name in spreadsheet:** Doyle 2008**Citation:** Doyle, M, and C.A. Drew. 2008. Large-scale ecosystem restoration. Five case studies from the United States. Available for purchase from Island Press.**Weblink:** http://www.ser.org/content/Large_Scale_Ecosystem_Restoration.asp**Overview:** Large-Scale Ecosystem Restoration presents case studies of five large-scale restoration projects in the United States: Chesapeake Bay, the Everglades, California Bay Delta, the Platte River Basin, and the Upper Mississippi River System. These projects embody current efforts to address ecosystem restoration in an integrative and dynamic manner, at large spatial scale, involving whole (or even multiple) watersheds, and with complex stakeholder and public roles. Representing a variety of geographic regions and project structures, the cases shed light on the central controversies that have marked each project. The book does not provide a series of best management practices, but does provide a general framework for approaching large-scale restoration.**Ref#: 47****Name in spreadsheet:** Apostol 2006**Citation:** Apostol, D. and M. Sinclair. 2006. Restoring the Pacific Northwest. Available for purchase from Island Press.**Weblink:** <http://www.ser.org/content/Apostol.asp>**Overview:** Restoring the Pacific Northwest gathers and presents the examples of state-of-the-art restoration techniques and projects. Focusing on the United States Pacific Northwest, the book discusses restoration issues relating to broad ecosystem types (Bunchgrass Prairies, Oak Woodlands and Savannas, Old-Growth Conifer Forests, Riparian Woodlands, Freshwater Wetlands, Tidal Wetlands, Ponderosa Pine and Interior Forests, Shrub Steppe and Mountains). The book then provides a discussion on a range of cross-cutting ideas – urban/ natural systems, stream systems, scales of management, restoring wildlife populations, managing invasive species and incorporating traditional ecological knowledge. The book does not provide a simple list of best management practices, but provides a framework for considering restoration of broad ecosystems from an ecological rather than mitigative perspective.**Ref#: 48****Name in spreadsheet:** Packard 2005**Citation:** Packard, S. and C. Mutel (editors). 2005. The tallgrass restoration handbook. Available for purchase from Island Press.**Weblink:** <http://www.ser.org/content/Tallgrass.asp>**Overview:** This book provides a hands-on manual of lessons learnt about restoration of prairie restoration worldwide. With a range of authors, it discusses restoration in native prairie, savannas and oak woodlands. It covers all aspects of restoration from planning through implementation and monitoring. Chapters include discussion of conserving biodiversity, restoring populations of rare plants, plowing and seeding, interseeding, obtaining and processing seeds, conducting burns, controlling invasive plants, restoring animal populations, and monitoring vegetation. Several comprehensive appendices include hard-to-find data on the plants and animals of prairies and savannas, seed collection dates,

propagation methods and sources of seed and equipment. Ecosystems not completely compatible with BC ecosystems, but likely some useful approaches to grassland restoration concepts and approaches.

Ref#: 49

Name in spreadsheet: Bainbridge 2007.

Citation: Bainbridge, D.A. 2007. A guide for desert and dryland restoration: New hope for arid land. Available for purchase from Island Press.

Weblink: <http://www.ser.org/content/bainbridge.asp>

Overview: This book discusses the ecology of desert plants, explores the causes of desertification and land abuse, and outlines the processes and procedures needed to evaluate, plan, implement, and monitor desert restoration projects. It outlines economical and practical field-tested solutions for understanding site characteristics, selecting and growing plants, and ensuring that they survive with a minimal amount of water and care. Each chapter represents a guide to a critical topic for environmental restoration; extensive photographs, diagrams and drawings give detailed information for immediate application, and additional resources are included in appendixes. The book will provide useful information for those involved in restoration, but also for anyone working in arid lands, including farmers, ranchers, gardeners, landscapers, outdoor recreation professionals, and activists. Ecosystems not completely compatible with BC ecosystems, but likely some useful approaches to dryland restoration concepts and approaches.

Ref#: 50

Name in spreadsheet: Morrison 2002

Citation: Morrison, M. 2002. Wildlife restoration: techniques for habitat analysis and animal monitoring. Available for purchase from Island Press.

Weblink: <http://www.ser.org/content/Morrisonbook.asp>

Overview: Wildlife Restoration links restoration ecology and wildlife management in a comprehensive guide to restoring wildlife and the habitats upon which they depend. It provides a thorough overview of the types of information needed in planning a wildlife-habitat restoration project and provides the basic tools necessary for developing and implementing a rigorous monitoring program. Chapters include discussion of habitat and species population concepts, considers alternative approaches to increasing wildlife populations, discusses integration into broader ecosystem restoration planning and provides an overview for monitoring of a restoration project. Case studies are provided. There is no specific list of BMPs, but the book provides basic tools for understanding ecological concepts that are integral to a well-designed restoration project.

Ref#: 51

Name in spreadsheet: MoF 2001

Citation: MoF. 2001. Best management practices handbook: hillslope restoration in British Columbia.

Weblink: <http://www.for.gov.bc.ca/HFD/Pubs/Docs/Mr/Mr096.htm>

Overview: This handbook represents a compilation of best management practices for hillslope restoration derived from Forest Renewal BC's Watershed Restoration Program and concurrent operational practices. Emphasis is on a risk-based approach to hillslope restoration that is intended to achieve effective and cost-efficient restoration. The intention of this document is to provide the best available technical information on hillslope restoration, while remaining independent of any present, or future, government program or funding mechanism.

Ref #: 52

Name in spreadsheet: Parks Canada 2009

Citation: Parks Canada. 2009. Principle and guidelines for ecological restoration in Canada's Protected Natural Areas.

Weblink: <http://www.pc.gc.ca/eng/docs/pc/guide/resteco/index.aspx>

Overview: These Principles and Guidelines for Ecological Restoration describe a detailed approach to restoration in areas managed for conservation. The intention is that parks and protected areas continue to safeguard ecological integrity while providing opportunities for meaningful engagement and

experiences that connect the public, communities, and visitors to these special places. The detailed document includes an overview of general restoration concepts and principles. A series of guidelines are presented that focus on restoration of natural disturbance factors, control of invasive species and management of over-abundant populations. In addition, restoration of biotic and abiotic interactions is discussed in detail. A step-by-step approach for undertaking restoration projects is given, including assessments, data management and monitoring. Three appendices provide additional information on legislation, ecosystem attributes for measurement and a prioritization strategy for restoration actions.

Ref# 53

Name in spreadsheet: SER 2004

Citation: Society for Ecosystem Restoration International. 2004. The SER International Primer on Ecological Restoration.

Weblink: http://www.ser.org/content/ecological_restoration_primer.asp

Overview: A series of guidelines that outline approaches to undertaking ecological restoration projects. Includes definitions of ecological restoration, attributes of restored ecosystems, exotic species information, monitoring, restoration planning, discussions of the relationships between practice and restoration ecology, and integration of restoration into a larger program.

Ref#: 54

Name in spreadsheet: TERP Undated

Citation: Terrestrial Ecosystem Restoration Program (TERP). Undated. Ecological Restoration Guidelines for British Columbia. Prepared for Biodiversity Branch, MoE.

Weblink: http://www.env.gov.bc.ca/wld/fia/TERP_eco_rest_guidelines/intro/index.html

Overview: This document provides an overview of how to undertake restoration and management for broad ecological values in BC. It provides the background philosophy and then outlines how to set restoration goals and objectives, determining future desired condition, using reference ecosystems, how to appropriately apply concepts of scale and ecological succession in relation to natural disturbance processes. It then outlines an approach for implementing a restoration plan, initiating a monitoring scheme and reporting on the work.

Ref #: 55

Name in spreadsheet: Durand 2006

Citation: Durand, R. 2006. A Guide to Baseline Inventories. Prepared for the Land Trust Alliance of BC.

Weblink: http://www.landtrustalliance.bc.ca/docs/LTABC_Guide_to_Baseline_Inventories_2006.pdf

Overview: This guide provides an overview on how to undertake inventories, and then directs the reader to appropriate methods for completing baseline inventories, dependent on their needs and the long-term management, and conservation objective of the land. It provides an introduction to a baseline inventory process, an inventory report, a summary of information to be provided to the land title office, information on data storage and additional resources.

Ref#: 56

Name in spreadsheet: CivicInfo

Citation: CivicInfoBC. Practices and Innovations.

Weblink: <http://civicinfo.bc.ca/100.asp>

Overview: This website, which is the home for local government news in BC, provides a 'practices and innovations' page where reports on a wide range of practices and projects undertaken by local governments in BC are available. Although not specifically a source for 'best management practices' there is a wide range of information and project ideas that may be useful. A large number of topic areas are included, but those specific to the environment are: brownfields, climate change, environmental management and protection, green buildings, invasive plant management, land use and planning, parks and recreation, sustainability, watershed and watercourse protection.

Ref#: 57

Name in spreadsheet: Steeger, C. 2002a.

Citation: Steeger, C. and M. Machmer. 2002. Field guide for wildlife tree retention in operational forestry. Prepared for the Science Council of BC.

Weblink: Available from: Chris at : csteeger@netidea.com

Overview: An overview of types and values of wildlife trees, with some operational guidelines on how to ensure appropriate wildlife trees are maintained during forestry (or other development) operations. Includes a series of 'targets' for appropriate retention of wildlife trees in a range of biogeoclimatic zones. This document is aimed at operational users. Based on the more detailed document (#61).

Ref#: 58

Name in spreadsheet: Riley, 2004.

Citation: J.L. Riley et al., 2004. Stewardship Manual. Published by the Nature Conservancy.

Weblink: Available by email from: bcstewardship@natureconservancy.ca

Also available at: http://www.ltabc.ca/bp/BPFiles/12c/NCC_Stewardship_Manual_2ndEdition.PDF
(password may be required from LTABC).

Overview: This comprehensive document has three parts: a) the Stewardship Blueprint: an overview of NCCs stewardship goals and direction, b) Stewardship Framework – a general approach to stewardship, including specific standards expected within the NCC and c) Stewardship Procedures – which provides general practices that can be applied in a wide range of situations. This third section is most relevant to this 'best management practices' document, and includes practices relating to signage, risk management, stewardship agreements, site documentation and planning, monitoring, stewardship activities, and stewardship budgeting.

Ref#: 59

Name in spreadsheet: NCC 2009

Citation: Effectiveness monitoring: quick reference guide.

Weblink: Available by email from: bcstewardship@natureconservancy.ca

Overview: This reference guide provides an overview of how to undertake effectiveness monitoring (the process of determining if an action has achieved its stated objectives). It is based on a much longer report (NCC 2007; #60).

Ref#: 60

Name in spreadsheet: NCC 2007

Citation: Effectiveness monitoring for biodiversity conservation: toward a framework and guidelines for the Nature Conservancy of Canada. Version B2. Prepared for the Nature Conservancy of Canada.

Weblink: Available by email from: bcstewardship@natureconservancy.ca

Overview: This comprehensive document outlines why and how to undertake effectiveness monitoring. It provides the more detailed background to accompany NCC 2009 (#59).

Ref#: 61

Name in spreadsheet: Steeger 2002b.

Citation: Steeger, C. and M. Machmer. 2002. Ecological and management of wildlife trees in southern interior British Columbia.

Weblink: Available from: Chris at : csteeger@netidea.com

Overview: Detailed technical background document on wildlife trees – their values, and how they can be maintained during operational forestry. Provides additional reference material to the operational summary document (#57).

Ref#: 62

Name in spreadsheet: Durand 2003

Citation: Durand, R. 2003. Baseline Inventory Protocol: A guideline for inventorying and mapping protected areas. Prepared for Nature Conservancy of Canada and Habitat Acquisition Trust.

Weblink: Available by email from: bcstewardship@natureconservancy.ca

Overview: Similar to #55, this document provides a comprehensive account of how to undertake baseline inventories, including baseline data collection, what to include in a baseline report, and data storage.

Ref#: 63

Name in spreadsheet: Colwell 2004

Citation: Colwell. 2004. Strategies for managing the effects of climate change on wildlife and ecosystems. Prepared for the Heinz Centre.

Weblink:

http://www.heinzctr.org/publications/PDF/Strategies_for_managing_effects_of_climate_change_on_wildlife_Nov_4_2008.pdf

Overview: This document reviews the scientific literature on climate change adaptation as it relates to biodiversity conservation and wildlife management. From this, a number of general strategies that could help to mitigate impacts are developed. For each, a brief summary and discussion of its advantages and disadvantages are provided, as is a decision tree to help determine the strategies most appropriate for individual situations.

Ref#: 64

Name in spreadsheet: Ontario BMP

Citation: Various.

Weblink: <http://www.omafra.gov.on.ca/english/environment/bmp/series.htm>

Overview: Ontario government has a BMP website that provides a wide range of BMPs which seem to be focused on avoiding impacts associated with a variety of development options. **BMPs must be bought online, or by direct ordering (and therefore were not individually assessed for this project).** The table below provides the list of available titles from that website: Farm Forestry and Habitat Management; Soil Management; Water Management; Irrigation Management; Integrated Pest Management; Fish and Wildlife Habitat Management; No-Till: Making It Work; Water Wells; Keeping Your Well Water Safe to Drink (An Information Kit to Help You Care for Your Well); Pesticide Storage, Handling and Application; Nutrient Management Planning (revised edition 2006); Buffer Strips; Manure Management; Greenhouse Gas Reduction in Livestock Production Systems; Agroforestry Series Volume 1 - Woodlot Management ; Streamside Grazing; Managing Crop Nutrients; Agroforestry Series Volume 2 - Establishing Tree Cover ; Deadstock Disposal.

Ref#: 65

Name in spreadsheet: Biolinx 2004

Citation: Ovaska, K. et al. 2004. Best management practices for amphibians and reptiles in urban and rural environments in British Columbia.

Weblink: <http://www.env.gov.bc.ca/wld/BMP/herptile/bmp/herptile.html>

Overview: This detailed document sets out Best Management Practices designed to help maintain the viability of native amphibian and reptile populations in urban and rural areas of British Columbia subject to land development activities. Its primary purpose is to provide developers, consultants, landscape architects, local and regional governments, urban planners, land use managers and the public with the practical, cost-effective tools and supporting scientific information necessary for mitigating development activity impacts on amphibian and reptile populations in the province. The document provides a literature review of key approaches for maintaining these species, and an appendix provides species accounts for key species.

Ref#: 66

Name in spreadsheet: Southam 1996

Citation: The wetlandkeepers handbook: a practical guide to wetland care. B.C. wildlife federation, Surrey, B.C.

Weblink: <http://www.stewardshipcentre.bc.ca/files/scnBC/publications/wetland.pdf>

Overview: This document provides background information for those interested in wetland stewardship. Background information on wetland values are provided, as is a summary of relevant legislation. Specific BMPs are not provided.

Ref#: 67

Name in spreadsheet: BC FireSmart Undated

Citation: Firesmart BC. The homeowners Firesmart Manual.

Weblink: http://www.pep.bc.ca/hazard_preparedness/FireSmart-BC4.pdf

Overview: Provides an overview of firesmart planning for buildings located in areas susceptible to impact by wildfire. 16 pages.

Ref#: 68

Name in spreadsheet: AB FireSmart Undated

Citation: FireSmart Alberta. Protecting your community from wildfire.

Weblink: <http://www.partnersinprotection.ab.ca/downloads/>

Overview: Provides a detailed assessment of how to undertake a firesmart assessment, and to reduce fire risk to properties in areas susceptible to impact by wildfire. A similar document to the BC FireSmart document, but with additional details.

Ref#: 69

Name in spreadsheet: Morgan 2009

Citation: Morgan, G. et al. 2009. Best practice approaches for characterizing, communicating and incorporating scientific uncertainty in climate decision-making. Synthesis and Assessment Product 5.2. Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research.

Weblink: <http://www.climate-science.gov/Library/sap/sap5-2/final-report/sap5-2-final-report-all.pdf>

Overview: Although not directed at practical best management practices, this document addresses a novel and emerging issue, that of considering and incorporating ideas of climate change and uncertainty into planning. Primarily a technical discussion on types of uncertainty, the document provides a useful overview of how such uncertainties can be incorporated into decision-making.

Ref#: 70

Name in spreadsheet: Wilson 2008

Citation: Wilson, S.J. and R.J. Hebda. 2008. Mitigating and adapting to climate change through the conservation of nature. Land Trust Alliance.

Weblink: <http://www.landtrustalliance.bc.ca/docs/LTAClimateChangeWebSingleP.pdf>

Overview: This document provides an overview of how nature conservation of the ecosystems of BC contributes to climate change adaptation and mitigation. Assesses individual ecosystems according to their sensitivity to climate change, carbon storage capability and degree of human impacts. This framework can aid in guiding a protection and management strategy for areas of the province. Does not develop specific BMPs.

Ref#: 71

Name in spreadsheet: Fitch 2003b

Citation: Fitch, L. et al. 2003 b. Caring for the green zone: Riparian Areas and Grazing Management. Third Edition. Lethbridge Alberta. Cows and Fish Program.

Weblink: http://www.ltabc.ca/bp/BPFiles/12c/Riparian_Areas_Grazing_Management.pdf

Overview: This handbook provides rationale on why riparian areas are valuable and how they fit into a watershed context. They provide some techniques of how to reduce the impacts of grazing and other related activities on riparian areas. A quick assessment of determining riparian health is also provided.

Ref#: 72

Name in spreadsheet: MoE Undated

Citation: Ministry of Environment. Undated. Identified Wildlife Management Strategy.

Weblink: <http://www.env.gov.bc.ca/wld/frpa/iwms/>

Overview: The series of documents available on the MoE website provide background species accounts and the habitat measures required for the 85 species and communities tagged as 'identified wildlife' in B.C. This does not include all listed species in BC, but does include a large number of species at risk and other regionally important wildlife. The 'accounts and measures' section of the page identifies species management strategies for these 85 species. These strategies provide good guidance for management, but some may not constitute possible 'best' practices as defined in purely ecological terms.

Ref#: 73

Name in spreadsheet: CIT 2004

Citation: Coast Information Team. 2004. Ecosystem Based Management Planning Handbook. Produced for the Coast information Team.

Weblink: <http://ilmbwww.gov.bc.ca/citbc/c-ebm-hdbk-fin-22mar04.pdf>

Overview: Created for input into the great bear rainforest planning work, this handbook provides a framework for implementing EBM in coastal forest ecosystems. It provides a broadscale framework for forestry planning at multiple scales, with the intention of ensuring maintenance of basic ecological values.

Ref#: 74

Name in spreadsheet: CIT 2004b.

Citation: Coast Information Team. 2004b. The Hydroriparian Planning Guide.

Weblink: <http://ilmbwww.gov.bc.ca/citbc/c-hpg-final-30Mar04.pdf>

Overview: This guide provides general approaches, and specific guidance, to maintaining fully functioning hydro riparian ecosystems within a managed forest context.

Ref#: 75

Name in spreadsheet: FSC 2005

Citation: Forest Stewardship Council BC. 2005. FSC Standards and FSC Guidance document.

Weblink: Standards: <http://www.fscCanada.org/docs/48B4F585905BF469.pdf>

Guidance: <http://www.fscCanada.org/docs/1BD8555831CD7ECF.pdf>

Overview: The FSC BC Standards for certification (in addition to outlining the specific requirements for FSC certification) provides guidance for sustainable forest management. Specifically including approaches for riparian management, maintenance of biodiversity values and identification of high conservation value forests.

The Guidance document, written as a companion piece to the standards, provides an approach to environmental risk assessment and guidance on applying concepts of natural disturbance.

Ref #: 76

Name in spreadsheet: Silva Various

Citation: Silva Forest Foundation: Principles of Ecosystem Based Conservation Planning.

Weblink: <http://www.silvafor.org/ebcp>

Overview: The Silva Forest Foundation have developed principles of ecosystem based conservation planning, and applied them in a variety of forestry contexts. A number of different links from this website provide principles and examples of application throughout the ecosystems of Canada.

Ref#: 77

Name in spreadsheet: Gayton 2001

Citation: Gayton, D. 2001. Ground work: basic concepts of ecological restoration in British Columbia. Published by Forrex.

Weblink: http://www.ltabc.ca/bp/BPFiles/12c/Forrex_Restoration_Paper.pdf

Overview: This guide provides an introduction to ecological restoration for anyone interested in restoration projects. It emphasizes the underlying concepts common to all restoration – ecological concepts of succession, disturbance, and the historic range of variability. Does not include specific BMPs.

Ref#: 78**Name in spreadsheet:** Glick 2009**Citation:** Glick, P, A. Staudt and B. Stein. A new Era for Conservation: review of climate change adaptation literature. National Wildlife Federation.**Weblink:** <http://www.nwf.org/globalwarming/pdfs/NWFClimateChangeAdaptationLiteratureReview.pdf>**Overview:** This literature review provides background on climate change and how it may affect different ecosystem types. The review provides background on concepts of climate change adaptation, and provides overarching principles and barriers experienced to date in adaptation planning and implementation. It then provides specific examples of potential adaptation strategies for four broad habitat types: forests, grasslands/shrublands, freshwater systems and coasts/estuaries.**Ref#: 79****Name in spreadsheet:** McGregor 2008**Citation:** McGregor et al. 2008. Ecological processes in Victoria: policy priorities for sustaining biodiversity.**Weblink:** http://www.victorianaturally.org.au/documents/file/Ecological_Processes.pdf**Overview:** This strategic planning document provides a practical summary of types of ecological processes and why they are important. It then focuses on an analysis of the state of ecological processes in the state of Victoria (Australia) and outlines a policy framework for integrating these processes into effective management. Links to development of effective climate change adaptation strategies.**Ref #: 80****Name in spreadsheet:** Maslovat 2003**Citation:** Maslovat, C. 2003. Best management practices for marking, building and maintaining trails in open, rocky areas. Prepared for the Capital Regional District Parks.**Weblink:** Available from CRD Parks: mfuchs@crd.bc.ca**Overview:** Using the case study of Mount Wells Regional Park close to Victoria, BC, this document provides detailed suggestions for marking, building and maintaining trails in sensitive, steep, rocky areas. The pros and cons of alternate strategies are discussed. The document is based on an overview of trail development in other similar habitat types, and provides options that are low impact, ecologically sustainable and mitigate safety hazards for hiking trails.**Ref#: 81****Name in spreadsheet:** Ontario Government Undated**Citation:** Ontario Government. Undated. Best management practices: fish and wildlife habitat management.**Weblink:** <http://www.omafra.gov.on.ca/english/environment/bmp/wild.htm>**Overview:** Provides general approaches for BMPs to maintain wildlife habitat in general, on farmlands and woodlands. Also includes discussion of wetlands and aquatic habitats. Booklet available through website (hardcopy only). Do not know the extent to which these BMPs are applicable to situations in B.C.**Ref#: 82****Name in spreadsheet:** Fraser 2006**Citation:** Fraser, D.A. 2006. Range resources assessment procedures. BC. Min. For. Range, Kamloops. BC Rangeland Health Brochure 9.**Weblink:** http://www.for.gov.bc.ca/hra/Publications/brochures/Rangeland_Health_Brochure9.pdf**Overview:** This document does not provide specific BMPs. However the brochure does provide approaches to managing 'range' (grasslands / dry forest systems) to ensure proper functioning condition. Approaches for measuring (and therefore for managing) proper functioning condition are provided, and a number of different management approaches (using natural disturbances, managing grazing pressure etc) are summarised.**Ref#: 83**

Name in spreadsheet: Rocky Mountain Undated

Citation: Various – fire effects discussions

Weblink: <http://www.fs.fed.us/database/feis/index.html>

Overview: This website provides access to six comprehensive documents that discuss the potential impacts of wildland fire on ecosystems and ecosystem components (fauna, flora, soil/water, air, and non-native species). Although no direct BMPs are included, this background information provides useful knowledge for those planning to manage for climate change, or planning to use prescribed fire in local ecosystems. The documents focus on ecosystems of the United States, however many of the general principles, and specific ecosystems are relevant to those occurring in British Columbia.

Ref#: 84

Name in spreadsheet: Hockings 2000

Citation: Hockings, M. et al. 2000. Evaluating effectiveness: a framework for assessing the management of Protected Areas. World Commission on Protected Areas. Best Practice Protected Areas Guidelines Series No. 14.

Weblink: <http://data.iucn.org/dbtw-wpd/edocs/PAG-014.pdf>

Overview: Provides a framework for assessing the effectiveness of a diversity of aspects of management planning, focused on protected areas.

Ref#: 85

Name in spreadsheet: Eagles 2002

Citation: Eagles, P. et al. 2002. Sustainable tourism in protected areas: guidelines for planning and management. Best Practice Protected Area Guidelines Series No. 8.

Weblink: http://cmsdata.iucn.org/downloads/pag_008.pdf

Overview: This lengthy document knowledges to importance of linking tourism strategies to protection of ecosystem strategies, and provides a number of case studies to link sensitive tourism development to maintenance of biodiversity. Focuses primarily on planning and development of eco-friendly infrastructure. Also provides guidance on use of park tourism data with suggestions for improving the tourist experience. Provides case studies that outline how tourism can contribute to the conservation of natural and cultural diversity, and promote positive relationships with local communities.

Ref#: 86

Name in spreadsheet: Cramer 2005

Citation: Cramer, P.C. and J.A. Bissonette. 2005. Wildlife crossings in North America: The state of the Science and Practice. International conference on ecology and transportation 2005 Proceedings. 442-447.

Weblink: http://www.icoet.net/ICOET_2005/proceedings/06IPCh9-442-460.pdf

Overview: This science paper presents the findings from a survey of practitioners on the effectiveness of installed wildlife crossings across North America. It discusses the different types of crossings, and the different types of species they have been employed for. It itemises key reasons why these crossings may fail to be effective. Key findings are summarised, and recommendations are made to increase the future effectiveness of wildlife crossing projects. A much longer full report from this work is available (Bissonette 2007) from the following website: http://www.trb.org/NotesDocs/25-27_FR.pdf

Ref#: 87

Name in spreadsheet: Hunter 2007

Citation: Hunter, M. et al. 2007. A comprehensive guide to fuels treatment practices for ponderosa pine in the Black Hills, Colorado Front Range and Southwest. USDA FS Gen Tech Rep RMRS-GTR-198.

Weblink: http://www.fs.fed.us/rm/pubs/rmrs_gtr198.pdf

Overview: This paper provides management recommendations for fuels treatment in ponderosa pine ecosystems, based on a synthesis of existing knowledge acquired from literature and the expertise of US practitioners. The paper documents specific conditions and practices where management intervention is appropriate to reduce fuels hazards while attempting to restore the forest to a more natural condition. Recommendations are provided that relate to where, how and how often fuels treatments may be

prescribed to achieve desired outcomes. Not focused on BC ecosystems, but many principles will be relevant in drier systems in BC.

Ref#: 88

Name in spreadsheet: Seng 2008

Citation: Seng, P. et al. Stewardship education best practices planning guide. Produced by Association of Fish and Wildlife Agencies' North American Conservation Education Strategy.

Weblink: http://www.fishwildlife.org/pdfs/Stewardship-Education_Best-Practices-Guide_7-08.pdf

Overview: This document sets out an approach for effectively engaging the public in stewardship education, and sets out a series of principles that would help to undertake an effective stewardship education program.

Ref#: 89

Name in spreadsheet: Eubanks 2006

Citation: Eubanks, E. 2006. Vehicle barriers: their use and planning considerations. USDA 2300-recreation mgmt 0623 1201.

Weblink: <http://www.fs.fed.us/t-d/pubs/pdf/06231201.pdf>

Overview: This publication discusses vehicle barrier types, appropriate uses and planning considerations. Barriers here are appropriate for forest and grassland trailheads, picnic areas, campgrounds and other areas where control is needed to protect natural resources.

Aquatic / Riparian

Ref#: 90

Name in spreadsheet: Nener 1997

Citation: Nener, J., J. Heinonen, G. Derksen and B. John. 1997. Watershed Stewardship: A Guide for Agriculture. Stewardship Series. Published by MoE and DFO.

Weblink: http://dev.stewardshipcanada.ca/sc_bc/stew_series/pdf/ag.pdf

Overview: An general stewardship guide for agricultural practices in British Columbia to minimize or prevent impacts to the aquatic environment. Stewardship practices focus on site planning, livestock, waste, soil, and pest management, water management including irrigation, ditches, drainage and working near water.

Ref#: 91

Name in spreadsheet: Sharp 1997

Citation: Access Near Aquatic Areas: A Guide to Sensitive Planning, Design, and Management. Stewardship Series. Published by MoE and DFO.

Weblink: http://dev.stewardshipcanada.ca/sc_bc/stew_series/pdf/access2.pdf

Overview: A generic guide for planning and management of recreational access near sensitive areas. The document focuses on a conservation based approach for recreational access planning and management, recreational access routing near sensitive areas, and design and construction standards for various access methods. Some useful guidelines and several case examples are provided.

Ref#: 92

Name in spreadsheet: Chilibeck 1992

Citation: Chilibeck, B. 1992, G. Chislett and G. Norris. Land Development Guidelines: For the Protection of Aquatic Habitat. Stewardship Series. Published by MoE and DFO.

Weblink: http://dev.stewardshipcanada.ca/sc_bc/stew_series/pdf/ldg.pdf

Overview: This document provides a set of guidelines focused on protecting Pacific salmon and freshwater fish species in British Columbia from land development related activities. The guidelines in this document are generalized and focus on leave strips, sediment and erosion control, water runoff, instream work, control of deleterious substances and maintenance of fish passage. This guide provides

some moderately detailed guidelines regarding erosion and sediment control. Some of the contact numbers and names of government agencies are out of date.

Ref#: 93

Name in spreadsheet: Adams 2002

Citation: Adams, M. 2002. Shoreline Structures Environmental Design: A Guide for Structures along Shorelines and Large Rivers. Stewardship Series. Published by Canadian Wildlife Service and DFO.

Weblink: http://dev.stewardshipcanada.ca/sc_bc/stew_series/pdf/ShorelineStructures.pdf

Overview: This guide provides planning and management guidelines along the coastal shores of British Columbia. In addition, it also provides detailed environmental design concepts and practices with which to mitigate shoreline development on fish and wildlife. Primary audiences include local government, land owners, developers and stewardship groups. There is a detailed discussion on the legislation and project review process, however some of the information and names of government agencies are out of date.

Ref#: 94

Name in spreadsheet: Twolan-Strutt 1995

Citation: Twolan-Strutt, L. 1995. Wetlands and Woodlots. Prepared for: North American Wetlands Conservation Council (Canada). Sustaining Wetlands Issues Paper, No. 1995-1. Ottawa, ON.

Weblink: <http://www.wetlandscanada.org/Wetlands%20Woodlots%201995-1.pdf>

Overview: This paper was prepared for woodlot owners in Canada and provides an introduction to wetlands and their ecological role in the environment. It briefly discusses conservation measures and management of wetlands, along with a number of general "tips" best management practices to mitigate impacts from forestry activities.

Ref#: 95

Name in spreadsheet: Sheehy 1993

Citation: Sheehy, G. 1993. Conserving Wetlands in Managed Forests. North American Wetlands Conservation Council (Canada). Sustaining Wetlands Issues Paper, No. 1993-2. Ottawa, ON.

Weblink: <http://www.wetlandscanada.org/1993-2%20en%20Conserving%20Wetlands%20in%20Mgd%20Forests.pdf>

Overview: This paper describes the role of wetlands in the forested regions of Canada and the potential impacts of forestry practices on wetland ecosystems. It provides measures to prevent or reduce impacts from forestry practices. This is an older paper but it does have some applicable best management practices at end of the document.

Ref#: 96

Name in spreadsheet: MoF 1995

Citation: Min. of Forests and Min. of Environment. 1995. Riparian Area Management Guidebook. Published by MoF and MoE.

Weblink: <http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/riparian/rip-toc.htm>

Overview: This guidebook helps managers, planners, and field staff to comply with the Forest and Range Practices Act and to set and achieve the management objectives for riparian management areas (RMA). It provides guidance on planning and conducting operations within the RMA and fisheries- and marine-sensitive zones. It addresses wetland classification and establishing wetland RMA boundaries. The main objectives of the document are to mitigate or prevent impacts of forest and range uses on aquatic resources. This document is relatively old and was one of the guidebooks under the Forest Practices Code, but the detailed guidelines (best management practices) are still applicable today.

Ref#: 97

Name in spreadsheet: Seagrass undated

Citation: Seagrass Working Conservation Group. Protecting Eelgrass. Website accessed June 2009.

Weblink: <http://www2.stewardshipcentre.bc.ca/eelgrass/factsheet.pdf>

Overview: The Seagrass Working Conservation Group developed this factsheet which discusses the importance of eelgrass in our estuaries and how it is impacted by various activities. The document provides a short list of best management practices to protect eelgrass habitat for shoreline residents. This is a useful factsheet for a specific type of estuary habitat.

Ref#: 98

Name in spreadsheet: MoE 2004.

Citation: Min. of Water, Land and Air Protection. 2004. Standards and Best Practices for Instream Works. Min. of Water, Land and Air Protection.

Weblink: <http://www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf>

Overview: Provides a comprehensive guide to completing instream works in BC. It gives a good background to the regulatory and approval process for instream works, along with a detailed breakdown of best practices. Particular areas of interest include best practices for urban stormwater management, stream bank and lakeshore stabilization, stream crossings, habitat enhancement and restoration and other types of works. The appendices provide good information on monitoring, sediment and erosion control, vegetation management and site restoration. This is one of the more useful reference documents for completing works around aquatic areas in BC. Located under the Min. of Environment website, but was formerly released by Min. of Water, Land and Air Protection (WLAP).

Ref#: 99

Name in spreadsheet: MoE Undated

Citation: Min. of Environment. Municipal Best Management Practices. Min. of Environment. Website accessed June 2009.

Weblink: http://www.env.gov.bc.ca/wat/wq/nps/BMP_Compodium/Municipal/Municipal_Home.htm

Overview: These municipal practices provide guidance to minimizing or preventing pollution of stormwater or management of stormwater through source control and treatment, which in turn protects the water quality of the aquatic environment. It provides some guidance to manage and protect aquatic and riparian habitat along with other areas including urban "green" planning, urban maintenance, and treatment of stormwater. It also provides some practices for constructing wetlands to improve water quality. Document provides relatively detailed practices for minimizing or preventing pollution of water in rural or urban areas.

Ref#: 100

Name in spreadsheet: Horner 1999.

Citation: Horner, R., C. May. 1999. Regional study supports natural land cover protection as leading best management practice for maintaining stream ecological integrity. Proceedings of the Comprehensive Stormwater and Aquatic Ecosystem Management Conference, Auckland, New Zealand, February 1999, pp. 233-247.

Weblink: <http://www.stormwater.ucf.edu/Bioassessment/PugetSoundfinalreport.pdf>

Overview: This paper provides evidence that best management practices that focus on retaining natural vegetation surrounding aquatic areas (i.e. streams) is the best method to maintain stream integrity. It does not provide a lot of different best management practices, but instead provides evidence that maintaining leave strips or riparian buffers is the best way to maintain aquatic/ riparian habitat functioning.

Ref#: 101

Name in spreadsheet: Planiden 2009

Citation: Planiden, A., L. Sielecki. Environmental Best Practices for Highway Maintenance Activities. Prepared for Min. of Transportation and Infrastructure. Queen's Printer.

Weblink:

http://www.th.gov.bc.ca/publications/eng_publications/environment/references/Best_Practices/Best_Practices_Manual_Complete.pdf

Overview: This document provides standardized best management practices to protect aquatic resources that are designed to be applicable across the province for contractors providing highway maintenance. It also gives guidance to meet regulatory agency requirements that is "up to date". These practices can be applied to any existing transportation or utility corridor and addresses both the terrestrial and aquatic environment. Supplementary best management practices are also provided for sediment and erosion control and invasive weed species. The document is useful and provides checklists and tables detailing potential impacts from particular activities and applicable performance standards and legal requirements, followed by a list of best practices that can be employed. This is a useful resource.

Ref#: 102

Name in spreadsheet: Idaho Department of Environmental Quality 2005

Citation: Idaho Department of Environmental Quality. 2005. Catalogue of Stormwater Best Management Practices. Published by Idaho Department of Environmental Quality.

Weblink: http://www.deq.state.id.us/water/data_reports/storm_water/catalog/index.cfm

Overview: The target audiences for this document are design professionals, such as landscape architects, geologists, engineers, and soil scientists, and local public officials and staff responsible for the review and approval of development applications. It is comprised of 5 volumes, and focuses on a management process to mitigate and / or prevent a reduction in water quality. Volumes 2 to 3 are the most useful and provide a wide variety of best management practices covering sediment and erosion control and low impact development to maintain a healthy aquatic environment.

Ref#: 103

Name in spreadsheet: Backhouse 2003

Citation: Backhouse, D., A. Lohvinin and H. Rueggeberg. 2003. Coastal Shore Stewardship: A Guide for Planners, Builders and Developers on Canada's Pacific Coast. Stewardship Series. Published by DFO and MoE.

Weblink: http://dev.stewardshipcanada.ca/sc_bc/stew_series/NSCbc_stewseries.asp

Overview: This document provides information that describes how coastal shore areas are living ecosystems and provides guidelines to planning and developing in a sensitive manner along these areas. It discusses coastal activities and structures that can impact the environment and provides a series of best management practices to use to protect the coastal shore. Stewardship resources are also provided in the document.

Ref#: 104

Name in spreadsheet: MoE 2006

Citation: Min. of Water, Land and Air Protection. 2006. Riparian Areas Regulation Implementation Guidebook. Published by Min. of Water, Land and Air Protection, Environmental Stewardship Division, Biodiversity Branch.

Weblink:

http://www.env.gov.bc.ca/habitat/fish_protection_act/riparian/documents/ImplementationGuidebook.pdf

Overview: This guidebook provides the legislated direction needed by local governments to achieve improved protection of fish and fish habitat in British Columbia. The Riparian Areas Regulation applies to riparian fish habitat affected by new residential, commercial and industrial development on land under local government jurisdiction (private land and the private use of Crown land). This is principally a management guidance document that also provides some specific requirements by government for the protection of riparian areas adjacent to aquatic habitat.

Ref#: 105

Name in spreadsheet: MoF 2002

Citation: Min. of Forests. 2002. Fish-stream Crossing Guidebook. Published by Min. of Forests, Forest Practices Branch.

Weblink: <http://www.for.gov.bc.ca/tasb/LEGSREGS/FPC/FPCGUIDE/FishStreamCrossing/FSCGdBk.pdf>

Overview: This guidebook is designed to help resource managers and practitioners plan, prescribe, and implement sound practices for fish-stream crossings that comply with both provincial and federal laws. The guidebook provides some regulatory agency discussion, and then process guidance for selecting and designing fish-stream crossings on resource roads. The primary purpose of this document is to provide guidance and to avoid harming fish and fish habitat, and provide fish passage at stream crossing sites. This is a useful document that can be applied to any proposed or existing fish-stream crossings, including footpaths, which provides general and specific guideline practices.

Ref#: 106

Name in spreadsheet: Cowan 1998

Citation: Cowan, S., C. Wilson, B. Austin. 1998. Caring for our Shores: A Handbook for Coastal Landowners in the Strait of Georgia. Published by the Cowichan Community Land Trust Society and the Marine Ecology Centre.

Weblink: <http://www.cowichanlandtrust.ca/contents.html>

Overview: This document was produced by the Cowichan Community Land Trust (CCLT) and advises coastal landowners in the Strait of Georgia on how to conserve the marine environment. It begins with an introduction to marine life and associated habitats, and discusses various aspects and impacts of living on the coastal shores including waste water, sewage, boaters, use of the shore, and commercial use. It also covers mapping and monitoring the shore, and legal rights and responsibilities. This is intended as a general guidance document to minimize impacts along coastal shore areas. This guidebook has been in and out of print and can be ordered from the CCLT.

Ref #: 107

Name in spreadsheet: Kipp 2002

Citation: Kipp, S., C. Calloway. 2002. On the Living Edge: Your Handbook for Waterfront Living. Published by the BC Federation of Naturalists.

Weblink: <http://www.livingbywater.ca/main.html>

Overview: On the Living Edge is a recent publication of the Living by Water Project (LWP), which focuses providing programs, services and materials to promote the value of shores of different types (e.g. coastal / riverine/ lakes). The book provides practical guidance for waterfront landowners to enjoy and protect their natural surroundings and investments, and some best management practices are provided. The weblink provides access to LWP homepage that provides generic "tips" for marine and freshwater homes all based from the publication. The book itself can be purchased – see links on the website. \$\$

Ref#: 108

Name in spreadsheet: Granger 2005

Citation: Granger, T., T. Hruby, A. McMillan, D. Peters, J. Rubey, D. Sheldon, S. Stanley and E. Stockdale. 2005. Wetlands in Washington State - Volume 2: Guidance for Protecting and Managing Wetlands. Washington State Department of Ecology. Olympia, WA.

Weblink: <http://www.ecy.wa.gov/biblio/0506008.html>

Overview: This document is the second part of a two-part document addressing wetlands in Washington and their protection and management. Volume 2 contains guidance primarily for local governments on protecting and managing wetlands and their functions based on the synthesis of the science provided in Volume 1. This is a comprehensive document that addresses protection, management, best practices and monitoring of wetlands in Washington State through regulatory and non-regulatory tools. The ecological aspects of the document are relevant to ecosystems in BC.

Ref#: 109

Name in spreadsheet: MoE 2006

Citation: Min. of Environment. 2006. Best Management Practices for Lakeshore Stabilization. Min. of Environment, Environmental Stewardship Division. Penticton, B.C.

Weblink: http://www.env.gov.bc.ca/wld/documents/bmp/BMPLakeshoreStabilization_WorkingDraft.pdf

Overview: The Ministry of Environment produced this document to guide any proposed works along lakeshore areas. The intent is to protect water quality and the aquatic and shoreline habitats necessary for aquatic and terrestrial species that rely on these riparian areas. It describes provincial and federal legislation applicable lakeshores and the best management practices are directed to the design, construction and maintenance of lakeshore stabilization works in the Okanagan Region of BC MoE. Specific limits and applicable regulatory requirements are included where applicable in these best management practices.

Ref#: 110

Name in spreadsheet: MoE 2006

Citation: Min. of Environment. 2006. Best Management Practices for Small Boat Moorage on Lakes. Min. of Environment, Environmental Stewardship Division. Penticton, B.C.

Weblink: http://www.env.gov.bc.ca/wld/documents/bmp/BMPSmallBoatMoorage_WorkingDraft.pdf

Overview: The Min. of Environment produced these best management practices to help guide works to protect fish and wildlife habitat and avoid conflicts with the Fisheries Act and other applicable legislation. They are directed to the design, construction and operation of small boat moorage facilities on lakes of the Okanagan Region of BC MoE. Specific limits and applicable regulatory requirements are included where applicable in these best management practices.

Ref#: 111

Name in spreadsheet: USEPA 2005

Citation: U.S. Environmental Protection Agency. 2005. National Management Measures to Protect and Restore Wetlands and Riparian Areas for the Abatement of Nonpoint Source Pollution. Best Management Practices for Small Boat Moorage on Lakes. U.S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds, and Office of Water, Nonpoint Source Control Branch.

Weblink: <http://www.epa.gov/nps/wetmeasures/pdf/guidance.pdf>

Overview: This guidance document describes practices to reduce nonpoint source (NPS) pollution of surface waters and ground water through the protection and restoration of wetlands and riparian areas. It also describes the use of vegetated treatment systems. This document is written from a broad standpoint and includes many diverse wetland and riparian area NPS topics. It provides a good background discussion about NPS pollution, including where it comes from and how it enters water; discusses the broad concept of assessing and addressing water quality problems on a watershed level; and presents recent technical information about how certain types of NPS pollution can be reduced effectively through the implementation of a number of management measures.

Ref#: 112

Name in spreadsheet: Urban Systems 2003

Citation: Urban Systems. 2005. Best Management Practices for the Topping Creek Watershed Study Area. Prepared for City of Rossland.

Weblink: None – Contact City of Rossland.

Overview: This set of best management practices was developed for the City of Rossland to provide guidance for the protection of Topping Creek. A significant amount of recent development has been occurring in the watershed over the past several years due to ski hill expansion and residential developments. The practices focus on protecting water quality, quantity, riparian habitat and resident fish. This gives a good example of guidelines of general nature, in the aim of applicability to the whole watershed.

Ref#: 113

Name in spreadsheet: Hanson 2008

Citation: Hanson, A. et al. 2008. Wetland ecological functions assessment: an overview of approaches. Technical Report Series 497. Canadian Wildlife Service.

Weblink: http://www.wetkit.net/docs/WA_TechReport497_en.pdf

Overview: This detailed document provides detailed information on how to undertake an assessment of wetland functions, particularly in relation to undertaking Environmental Assessments.

Ref#: 114

Name in spreadsheet: Fitch 2003

Citation: Fitch, L and N. Ambrose. 2003. Riparian Areas: A user's guide to health. Lethbridge, Alberta: Cows and fish Program.

Weblink: http://www.ltabc.ca/bp/BPFiles/12c/Waterways_Health_SS.pdf

Overview: This document provides an overview of riparian health and why riparian areas are valuable. It then provides some general measures on how to improve riparian and watershed health, plus sources for additional information. A website password may be required – contact LTABC.

Ref#: 115

Name in spreadsheet: SWS 2009

Citation: Society of wetland scientists. 2009. Current practices in wetland management for mosquito control.

Weblink: http://www.sws.org/wetland_concerns/docs/SWS-MosquitoWhitePaperFinal.pdf

Overview: This document provides an overview of the ecological values and potential human impacts associated with mosquitoes. The document does not provide BMPs *per se*, but provides a discussion of the alternate management options regarding mosquito control.

Ref#: 116

Name in spreadsheet: Getsinger 2005

Citation: Getsinger, et al. 2005. Aquatic Plant Management: Best Management Practices in Support of Fish and Wildlife Habitat. Aquatic Ecosystem Restoration Foundation.

Weblink: http://www.aquatics.org/aquatic_bmp.pdf

Overview: This handbook provides general and specific management practices primarily for controlling a number of key aquatic invasive plant species, with a focus on maintaining and enhancing aquatic ecosystems and fish habitat. The handbook also provides general principles to create a site-specific integrated weed management plan for aquatic systems. CBMPs are provided for the following control categories: biological, mechanical, cultural and chemical. The invasive species with specific guidance included are: Eurasian watermilfoil (*Myriophyllum spicatum* L.) – submersed; Water chestnut (*Trapa natans* L.) – floating; Giant salvinia (*Salvinia molesta* Mitch.) – floating; Hydrilla (*Hydrilla verticillata* (L.f.) Royle) – submersed; Water hyacinth (*Eichhornia crassipes* (Mart.) Solms) – floating; Purple loosestrife (*Lythrum salicaria* L.) – emergent; Brazilian elodea (*Egeria densa* Planch.) – submersed; Algae.

Ref#: 117

Name in spreadsheet: Biebighauser Undated

Citation: Biebighauser, T.R. Creating vernal ponds: all the information you need to build and maintain an ephemeral wetland.

Weblink: <http://herpcenter.ipfw.edu/outreach/VernalPonds/VernalPondGuide.pdf>

Overview: With practical examples based in Kentucky, Ohio and Minnesota, this guidebook provides basic pond building principles and are linked to concepts of vernal pond ecology. Some of the specifics will not be applicable to ecosystems in BC, however some of the general principles could be useful.

Ref#: 161

Name in spreadsheet: Cox 2009

Citation: Cox, R., C. Cullington. 2009. Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia. Prepared for the Wetland Stewardship Partnership.

Weblink: http://www.env.gov.bc.ca/wld/documents/bmp/wetlandways2009/wetlandways_docintro.html
Or: <http://bcwetlands.ca/tools/>

Overview: This comprehensive document provides guidance on the protection and management of wetland ecosystems in BC. It is written primarily for people who are planning some form of activity or

development near wetlands, as well as those looking for guidance on ways to best maintain the high ecological values in these areas. The guidelines cover a wide array of human related activities (general, agriculture, grazing, forestry, mining, oil and gas, recreation, transportation corridors, urban / rural land development, restoration, and monitoring and reporting. For each of these broad categories, relevant legislation is identified and best management practices are identified. This document is currently considered 'interim' and it is intended that it will be updated with input from stakeholders over the next two years.)

Invasive Species

Invasives: General BMPs

Ref#:118

Name in spreadsheet: Weed Committees No date

Citation: Local weed committees in BC and the Invasive Plant Council of BC

Weblink: <http://www.invasiveplantcouncilbc.ca/regional-committees>

Overview: The Invasive Plant Council of BC's Regional weed committees have developed regionally-specific plant priority lists, regional strategies for invasive plants, fact sheets, and/or best management practices for their region. The entire Province, with the exception of the Sunshine Coast, is within a regional weed committee jurisdiction.

Ref#:119

Name in spreadsheet: Rankin 2004

Citation: C. Rankin and Associates et al. 2004. Invasive Alien Species Framework for BC: Identifying and Addressing Threats to Biodiversity. A working document to address issues associated with biodiversity in British Columbia. Prepared for Biodiversity Branch, Ministry of Water, Land and Air Protection.

Weblink: http://wlapwww.gov.bc.ca/wld/documents/alien_species_framework_BC_0205.pdf

Overview: The Invasive Alien Species Framework is a background document on invasive alien species issues that affect biodiversity in British Columbia. It sets out a framework for the use of science, and coordinated involvement of partners, to address the threats to BC's environment and economy posed by invasive alien species. This document includes an invasive alien species decision and management matrix on p. 16 as well as useful guiding principles, objectives, and priority action items.

Ref#:120

Name in spreadsheet: Klym 2007b

Citation: Klym, C. 2007. A summary of invasive plant best management practices in British Columbia. Prepared for the Ministry of Environment..

Weblink: Not available. Contact judy.millar@giv.bc.ca for the report.

Overview: A summary of the status of existing invasive plant BMPs within the BC Provincial Government Ministries including whether or not each MOE, MAL and MOFR office/region has BMPs or is developing them. Invasive plant species with existing BMPs are listed, and a summary of what BMPs are needed (a BC government "wish list" is included. Recommendations from this report have been followed by the IPCBC in developing the T.I.P.S. series. Virtually all species-specific BMPs identified are the fact sheets produced by the Garry Oak Ecosystems Recovery Team. BMPs are not actually listed.

Ref#:121

Name in spreadsheet: McCoy 2007

Citation: McCoy, M. 2007. A summary of invasive alien plant best management practices used by non-Provincial Government agencies across British Columbia. Prepared for the Invasive Plant Council of BC (IPCBC) Technical and Operational Support Committee. DRAFT.

Weblink: Not available. See www.invasiveplantcouncilbc.ca for more information.

Overview: A summary of which BMPs (if any) have been developed by or are being used by non-government organizations in BC. BMPs identified are for carpet burweed (by the IPCBC), and fact sheets of the Garry Oak Ecosystems Recovery Team. Recommendations from this report have been followed by the IPCBC in developing the T.I.P.S. series. (see # 123).

Ref#:122

Name in spreadsheet: Miller 2006

Citation: Miller, V.A. and B. Wikeem. 2006. Invasive Plants in British Columbia Protected Lands: Best Management Practices. Prepared for Ministry of Environment, Victoria, BC.

Weblink: Not available. For information contact Laura.Darling@gov.bc.ca

Overview: Describes BMPs for invasive plants including prevention, early detection and rapid response, inventory, invasive plant treatments, and monitoring and evaluation. It includes a decision-making tool for selecting invasive plant treatments based on plant, water and soil criteria, a mechanical and cultural control guide, and herbicide recommendations. This report references standards from the MOFR Invasive Alien Plant Program.

Ref#: 123

Name in spreadsheet: IPCBC 2007a

Citation: Invasive Plant Council of BC. 2007. Targeted Invasive Plant Solutions (TIPS): Forestry Operations.

Weblink: http://www.invasiveplantcouncilbc.ca/publications/TIPS/Forestry_Oper_TIPS.pdf

Overview: A summary of forestry best management practices for invasive plants focusing on prevention (including early detection, rapid response) and integrated pest management. Includes general strategies as well as those for silviculture and reconnaissance surveys, road building and maintenance, and harvesting and site preparation.

Ref#:124

Name in spreadsheet: IPCBC 2008a

Citation: Invasive Plant Council of BC. 2008. Targeted Invasive Plant Solutions (TIPS): Highways Operations.

Weblink: http://www.invasiveplantcouncilbc.ca/publications/TIPS/Highways_Operations_TIPS.pdf

Overview: A summary of road maintenance best management practices for invasive plants focusing on prevention (including early detection, rapid response) and integrated pest management. It includes general strategies as well as those for shoulder, ditch and watercourse maintenance, roadside vegetation, rest area and facilities maintenance, and gravel pits.

Ref#:125

Name in spreadsheet: IPCBC 2008b

Citation: Invasive Plant Council of BC. 2008. Targeted Invasive Plant Solutions (TIPS): Seed Mixtures.

Weblink: http://www.invasiveplantcouncilbc.ca/publications/TIPS/Seed_Mixtures_TIPS.pdf

Overview: A summary of best management practices designed to assist in reducing the introduction of new invasive plants via seed mixtures including bird seed, wildflower and ornamentals, and re-vegetation mixes.

Ref#:126

Name in spreadsheet: Klym 2007a

Citation: Klym, C. 2007. A Guide to Best Management Practices. Report for the Ministry of Environment. DRAFT.

Weblink: Not available. Contact Judy.Millar@gov.bc.ca for the report.

Overview: A summary of sources of existing BMPs for invasive plants including descriptions and links of each reference. It includes sources of general invasive plant BMPs (e.g. forest vegetation, grazing management, utility corridors) as well as species-specific information. There is also a helpful list of other

relevant resources and their links. Actual BMPs are not listed. Note some links in this document are out of date.

Ref#:127

Name in spreadsheet: USFS 2002

Citation: US Forest Service. 2002. Best Management Practices For Noxious Weed Prevention and Management : Port-Orford-cedar Root Disease Prevention and Management Sudden Oak Death Prevention and Management --Interim Direction for the ROR/SIS National Forests--February 15, 2002

Weblink: <http://www.fs.fed.us/r6/rogue-siskiyou/projects/foresthealth/pdfs/weedprevention.pdf>

Overview: A list of BMPs for road activities, recreation and wilderness areas, cultural resources, fish and wildlife, grazing and range management, forestry, mining, soil and water management, fire, land and special uses, and general activities to manage for invasive plants. It also includes a risk-rating procedure for ranking species.

Ref#:128

Name in spreadsheet: MOFR 2009

Citation: Ministry of Forests and Range. 2009. Invasive Alien Plant Program Reference Guide.

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

Overview: This four part guide includes current standards and practices for invasive plant management in BC, particularly inventory, data collection and management. Part I contains detailed information on invasive plant management including methodology, other field-related activities, and legislation. Part II contains comprehensive information on the Invasive Alien Plant Program application, a database used by most agencies (government and non-government) in BC to store, extract, and map invasive plant data including location of and characteristics of site, species present (with density and distribution code), treatment (chemical, mechanical and biological) and monitoring information. Part III is a manual for Map Display which is a mapping application that displays invasive plant information contained in IAPP and is available to the public (see http://webmaps.gov.bc.ca/imf5/imf.jsp?site=mofr_iapp). Finally, Part IV contains useful and practical appendices. IAPP also includes a list of field forms that are useful for conducting inventories, recording treatment information, and monitoring sites. IAPP can be considered the leading warehouse for invasive plant information in BC.

Ref#:129

Name in spreadsheet: Perron 2008

Citation: Perron, C. 2008. Best Management Practices for roadside invasive plants. New Hampshire Department of Transportation.

Weblink:

<http://www.nh.gov/dot/org/projectdevelopment/environment/documents/BMPsforRoadsideInvasivePlants.pdf>

Overview: A listing of general BMPs for invasive plants and transportation corridors that are specific and useful, including soil disturbance and stabilization, movement and maintenance of equipment, mowing, disposal of plants, and excavated material. It also includes listings of BMPs that are species-specific, some of which pertain to species in BC.

Ref#:130

Name in spreadsheet: WCF 2009a

Citation: Wisconsin Council of Forestry. 2009. Wisconsin's Forestry Best Management Practices for Invasive Species: A field manual for foresters, landowners, and loggers.

Weblink: <http://council.wisconsinforestry.org/invasives/forestry.php>

Overview: A manual developed by a large technical team and advisory committee that outlines BMPs for invasive plants and insects related to forest stewardship activities including prevention, early detection rapid response, control, monitoring and restoration. The document details practices related to management access, forest access, reforestation and re-vegetation, wildlife habitat management, fire

management and transport of woody material. BMPs for urban forestry and utility and transportation rights-of-way are in progress.

Ref#:131

Name in spreadsheet: WCF 2009b

Citation: Wisconsin Council of Forestry. 2009. Draft Best Management Practices for preventing the spread of invasive species by outdoor recreation activities in Wisconsin: DRAFT.

Weblink: <http://dnr.wi.gov/forestry/usesof/bmp/pdf/FinalDraft-RecreationBMPS-090204.pdf>

Overview: This report includes a set of voluntary guidelines that addresses issues common to all recreational activities, along with issues unique to each type of recreation activity and issues faced by managers of recreational lands. The document includes a list of the BMPs as well as "considerations" and techniques to achieve the BMP. It is a comprehensive set of BMPs for general recreation as well as animal-based activities, bicycle activities, camping, motorized activities, pedestrian-based activities, and practices for hunters, anglers and trappers. It will also include a section for land managers (in progress).

Ref#:132

Name in spreadsheet: Wittenberg 2001

Citation: Wittenberg R. and M. J. W. Cock (eds). 2001. Invasive Alien Species: A toolkit of best prevention and management practices. Global Invasive Species Programme.

Weblink: <http://www.gisp.org/publications/toolkit/Toolkiteng.pdf>

Overview: This book contains global strategies for prevention, early detection, assessment and management of invasive species, as well as reference sources and case studies for further information. However, it is focused too globally or nationally to be useful at the specific land management level.

Ref#:133

Name in spreadsheet: MAL 1

Citation: Ministry of Agriculture and Lands. No date. Integrated weed management, an introductory manual.

Weblink: <http://www.agf.gov.bc.ca/cropprot/weedman.htm>

Overview: A manual describing various aspects of invasive plant management including a list of noxious weeds in BC, weed management strategies (prevention, cultural, mechanical, chemical and biological control methods). Detailed BMPs for application of herbicides.

Ref#:134

Name in spreadsheet: MOFR 2008

Citation: Ministry of Forests and Range. 2008. Forest and Range Practices Act Invasive Plant Considerations.

Weblink: Not available. Contact val.miller@gov.bc.ca

Overview: A listing of best management practices for prevention of invasive plant spread and establishment for forestry. Includes prevention strategies for controlling seed and plant part dispersal, and for maintaining healthy competitive vegetation.

Ref#:135

Name in spreadsheet: LBWMA No date

Citation: Long Beach Weed Management Area. No date. Best Management Practices for Land Managers: What every land manager needs to know about invasive plants. The Nature Conservancy.

Weblink: <http://www.invasive.org/gist/products/wma/li-managers.pdf>

Overview: A four-page fact sheet on invasive plant management that includes prevention strategies and steps in weed management. It provides information on steps in weed management, but little detail on how to carry-out these activities.

Ref#:136

Name in spreadsheet: CSP 2005

Citation: Colorado State Parks. 2005. Best Management Practices: Weed Management Techniques and Prevention BMPs. Colorado State Parks.

Weblink: <http://parks.state.co.us/NR/rdonlyres/8901496B-35E7-49EE-9D0F-9C4AD3237285/0/WeedManagementTechniquesandPreventionBMP.pdf>

Overview: A listing of mechanical, cultural, grazing, chemical, biological and prescribed burning control methods as well as prevention best management practices for invasive plants in parks. Some general and some specific information.

Ref#:137

Name in spreadsheet: MacNaughton No date

Citation: MacNaughton C. No date. Best Management Practices for Invasive Plant Management on Conservation Lands.

Weblink: Not available

Overview: A one page overview of steps in integrated pest management.

Invasives: Decision-making tools and management planning

Ref#:138

Name in spreadsheet: GOERT 2007

Citation: Garry Oak Ecosystems Recovery Team. 2007. Garry Oak Ecosystems Recovery Team (GOERT) Decision Process for Managing Invasive Species in Garry Oak and Associated Ecosystems.

Weblink: http://www.goert.ca/documents/General_Decision_Process_revised.pdf

Overview: A series of questions to help users decide whether, and how, to manage invasive plant species in any GOE. The tool includes a series of questions including ecosystem characteristics, the risk of action versus no action, and prioritizing species for treatment based on priority of species and degree of infestation. The report also includes the MOFR IAPP Species Scoring Algorithm, a tool developed by MOFR to prioritize species for management.

Ref#:139

Name in spreadsheet: Murray 2002a

Citation: Murray, C. and K. Jones. 2002. Adaptive management strategy for the decision-support tool in Garry Oak and associated ecosystems. Prepared for the Garry Oak Ecosystems Recovery Team, Victoria, BC.

Weblink: http://www.goert.ca/documents/goe_dst_ams.pdf

Overview: An adaptive management strategy to support the GOERT decision-support tool focusing on monitoring, evaluating, and adjusting the decision-support tool over time.

Ref#:140

Name in spreadsheet: Murray 2002b

Citation: Murray, C. and C. Pinkham. 2002. Towards a Decision-Support tool to address invasive species in Garry oak and associated ecosystems in BC. Prepared for the GOERT Invasive Species Steering Committee, Victoria, BC.

Weblink: <http://www.goert.ca/documents/GOEDSTreport.pdf>

Overview: Background report prepared in preparation for the Decision-Support Tool (see GOERT 2007). It includes an overview of current decision-support tools being developed or used by land managers for invasive species in BC and elsewhere, a gap analysis of decision-support tools in BC, and a proposed framework for decision-making in Garry Oak ecosystems. The framework helps users decide whether to manage for invasive species, and if so, which species. It also provides an adaptive management framework for helping users decide how to actually undertake the management/control efforts. Finally, a ranking system for invasive plants is described with a final list of the "top ten" species of concern.

Ref#:141

Name in spreadsheet: Burrows 2006

Citation: Burrows, J. 2006. IAPP Species-scoring algorithm and associated Priority Index Explanation and Questionnaire. Ministry of Forests and Range, Nanaimo, BC.

Weblink: Not available. Contact j.hallworth@gov.bc.ca

Overview: An excel spreadsheet that is used to score invasive plant species (based on biological criteria, impacts, controllability and containability) to prioritize them for management actions.

Ref#:142

Name in spreadsheet: Suderman 2006

Citation: Suderman, B. 2006. Invasive Plant Management for Urban Municipalities. Prepared for the City of Burnaby & the Greater Vancouver Regional District's Biodiversity Working Group. Professional project in partial fulfillment of the requirements of a Master of Arts in Planning degree, University of British Columbia, 2006.

Weblink:https://dspace.library.ubc.ca/dspace/bitstream/2429/330/1/SCARP_2006_Grad_Project_Beverly_Suderman.pdf

Overview: A planning and decision-support tool for urban land managers and planners. A step-by-step questionnaire that helps land managers identify the management area, characterize the ecosystems, assess risks and prioritize invasive species, and conduct management planning. It includes reference materials on invasive plants, timing of control, how the tool was developing, and species rankings.

Ref#:143

Name in spreadsheet: MAFF 2002a

Citation: Ministry of Agriculture, Food and Fisheries. 2002b. Seven Steps to Managing Your Weeds. Ministry of Agriculture, Food and Fisheries and Open Learning Agency.

Weblink: <http://www.weedsbc.ca/pdf/7StepsToManagingYourWeeds.pdf>

Overview: A short manual written for land managers that describes seven steps to managing weeds including mapping and inventory, setting weed management goals and objectives, setting priorities for weed management, selecting weed management strategies, developing an integrated management plan, and developing a monitoring program.

Ref#:144

Name in spreadsheet: Tu 2001a

Citation: Tu, M. and B. Meyers-Rice. 2001. The Nature Conservancy Site Weed Management Plan Template. The Nature Conservancy.

Weblink: http://maccweb.org/documents/TNC_Weed_Template.doc

Overview: A template that guides the land manager through steps in weed management including describing site, conservation targets and management goals, identifying how weeds present interfere with management goals, inventory of weed species, prioritizing species, and developing a management plan. This document is similar to Seven Steps to Managing Your Weeds (MAFF 2002b).

Ref#:145

Name in spreadsheet: Tu 2009

Citation: Tu, M. 2009. Assessing and Managing Invasive Species within Protected Areas. Protected Area Quick Guide Series. Editor, J. Ervin. Arlington, VA. The Nature Conservancy.

Weblink: <http://www.cbd.int/invasive/doc/ias-tnc-guide-2009-en.pdf>

Overview: An overview of steps involved in invasive species management including identifying species likely to become invasive in your protected area, identifying sites and habitats that are vulnerable, estimating risk and identifying pathways of introduction and spread, prevention strategies, early detection and rapid response (EDRR), management decision-tree, setting priorities, and creating a management plan.

Ref#:146

Name in spreadsheet: CNAP 2000

Citation: Colorado Natural Areas Program. 2000. Creating An Integrated Weed Management Plan: A handbook for owners and managers of lands with natural values. Caring for the Land Series, Volume IV. Colorado Natural Areas Program, Denver Colorado.

Weblink: <http://parks.state.co.us/NR/rdonlyres/E4FAAC68-00B4-44A8-A4E3-4C88B185BC78/0/IWMhandbooktext.pdf>

Overview: A guide to developing a weed management plan including mapping management area, inventory, setting weed management goals and objectives, setting priorities, weed management techniques, integrated weed management, and monitoring and evaluation. This guide is very similar to "Seven Steps to Managing Your Weeds" which is a BC-based (see #143).

Ref#:147

Name in spreadsheet: Free No date

Citation: Free, J. et al. No date. Guidelines for Coordinated Management of BMPs: Development of weed management areas. US Department of Agriculture.

Weblink: <http://www.weedcenter.org/management/guidelines/tableofcontents.html>

Overview: A manual describing how to develop a weed management plan, and listing BMPs within it. Sections on education and awareness, early detection and rapid response, inventory and mapping, integrated weed management, and monitoring and evaluation. Specific and relevant BMPs.

Invasives: Control and monitoring information

Ref#:148

Name in spreadsheet: Tu 2001b

Citation: Tu, M., C. Hurd, and J. Randall. 2001. Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas. The Nature Conservancy.

Weblink: <http://www.invasive.org/gist/products/handbook/methods-handbook.pdf>

Overview: An overview of management techniques including manual control, fire, grazing, biocontrol and herbicides. This is an American-based document but most information is applicable to BC.

Ref#:149

Name in spreadsheet: Powell 1994

Citation: Powell, G.W., A. Sturko, B. Wikeem and P. Harris. 1994. Field Guide to the Biological Control of Weeds in British Columbia. Land Management Handbook Number 27, Ministry of Forests.

Weblink: <http://www.for.gov.bc.ca/hfd/pubs/docs/Lmh/Lmh27.pdf>

Overview: A description of biological control agents that are used in BC and their target plants. It includes a description of each target species, including its biology, geographic distribution, ecological description and available biocontrol agents. Descriptions of each biocontrol agent are also provided including their life cycle, target plants and habitat, and protocols for collecting, shipping, handling, releasing and monitoring the agents.

Ref#:150

Name in spreadsheet: MOFR No date

Citation: Ministry of Forests and Range. No date. Biological Control Agents and Host Plants in BC.

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

Overview: A matrix of the biological control agents available in BC and the plant species that they attack. Website also includes protocols for collecting, shipping and releasing bioagents, and a life-cycle schedule to plan timing.

Ref#:151

Name in spreadsheet: Haber 1997

Citation: Haber, E. 1997. Guide to monitoring exotic and invasive plants. Prepared for Ecological and Monitoring Assessment Network, Environment Canada.

Weblink: <http://www.eman-rese.ca/eman/ecotools/protocols/terrestrial/exotics/intro.html>

Overview: An overview of monitoring, including its importance, examples of monitoring projects, and tools. Little information on how to actually inventory, map and monitor invasive plants. IAPP is a more useful and consistently used methodology for BC (see references # 128 and 141).

Ref#:152

Name in spreadsheet: PMPs various

Citation: Various Pest Management Plans

Weblink: <http://www.for.gov.bc.ca/hra/publications/> and http://www.rdno.ca/services/nwi/docs/pmp2007_2012/pest_management_plan_2007_2012.pdf

Overview: A PMP is a plan that describes a systematic program for managing pest populations (e.g. invasive plants) or reducing the damage caused by pests based on the principles of integrated pest management. They generally include treatment strategies by species, and decision-making criteria that are based on the invasiveness of the plant species, the intent of the treatment (eradication, containment, control), the degree of infestation of that species in the region, and/or ecological factors like soil type or BEC zone. 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 noxious weeds and invasive plants on more than 50 hectares a year of public land (e.g. provincial Crown land).

Invasives: Species-specific information and identification

Ref#:153

Name in spreadsheet: MAFF 2002b

Citation: Ministry of Agriculture, Food and Fisheries. 2002a. Guide to Weeds in British Columbia. Ministry of Agriculture, Food and Fisheries and Open Learning Agency.

Weblink: <http://www.weedsbc.ca/pdf/GuidetoWeeds.pdf>

Overview: A description of over 75 invasive plants including information on identification, impacts, habitat and ecology and management. Management information includes biocontrol, mechanical, fire, herbicide and cultural/preventive information. A helpful resource for species control information.

Ref#:154

Name in spreadsheet: IPCBC Various

Citation: Invasive Plant Council of BC. Various dates. Targeted Invasive Plant Solutions (T.I.P.S.): Species name.

Weblink: <http://www.invasiveplantcouncilbc.ca/resources/targeted-invasive-plant-solutions-tips>

Overview: Species-specific BMPs for invasive plants. Each T.I.P.S. publication focuses on the best management practices, and Integrated Pest Management (IPM) principles, for either an operational activity or a specific invasive plant species. T.I.P.S. publications are developed with input from a board range of technical and industry advisors to ensure that prevention and management options are comprehensive and current. Includes information on the legal status, distribution, identification and legal status of the species, as well as control methods.

Ref#:155

Name in spreadsheet: MAL Undated

Citation: Ministry of Agriculture and Lands. No date. Invasive Plant Alert: Species name.

Weblink: <http://www.agf.gov.bc.ca/cropprot/invasiveplant.htm>

Overview: A series of weed alerts that include descriptions of invasive plant species and control strategies. General information. More detailed and current information found in T.I.P.S.

Ref#:156

Name in spreadsheet: Cranston 2002

Citation: Cranston, R. and D. Ralph. 2002. Field Guide to Noxious and Other Selected Weeds in BC. Ministry of Agriculture, Food and Fisheries.

Weblink: <http://www.agf.gov.bc.ca/cropprot/weedguid/weedguid.htm>

Overview: Colour photo and description of weeds in BC. Contains more than just non-native invasive species. Produced for general public.

Ref#:157

Name in spreadsheet: GOERT various

Citation: Garry Oak Ecosystems Recovery Team. Various dates. Field Manual: Invasive species in Garry Oak and associated ecosystems in BC. Garry Oak Ecosystems Recovery Team, Victoria, BC.

Weblink: http://www.goert.ca/pubs_invasive.php

Overview: A series of species-specific fact sheets and annotated bibliographies for invasive plants that pose a threat to Garry Oak ecosystems. Well-researched and contain comprehensive information.

Ref#:158

Name in spreadsheet: KCNWCP No date

Citation: King County Noxious Weed Control Program. Various dates. Best Management Practices. King County, Washington.

Weblink: <http://www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds/weed-control-practices/bmp.aspx>

Overview: A series of fact sheets on various species of invasive plants that contain detailed control information. Although they are US-based, these fact sheets are used regularly by land managers in BC.

Ref#:159

Name in spreadsheet: Wilson 2007a

Citation: Wilson, L. M. 2007. Key to Identification of Invasive and Native Hawkweeds (Hieracium spp.) in the Pacific Northwest - Revised March 2007. Ministry of Forests and Range, Forest Practices Branch.

Weblink: http://www.for.gov.bc.ca/hra/Publications/invasive_plants/Hawkweed_key_PNW_2007.pdf

Overview: A key for identifying hawkweeds, particularly the many species of yellow hawkweeds, in BC.

Ref#:160

Name in spreadsheet: Wilson 2007b

Citation: Wilson, L.M. 2007. Key to Identification of Invasive Knotweeds in British Columbia. Ministry of Forests and Range, Forest Practices Branch.

Weblink: http://www.for.gov.bc.ca/hra/Publications/invasive_plants/Knotweed_key_BC_2007.pdf

Overview: A key to identifying knotweeds, including Japanese, Giant, Bohemian and Himalayan, in BC.

Acronyms

BMPs: Best Management Practices

IPCBC: Invasive Plant Council of BC

MOE: Ministry of Environment

MOFR: Ministry of Forests and Range

T.I.P.S.: Targeted Invasive Plant Strategies (produced by IPCBC)

PMP: Pest Management Plan