

Fisheries Sensitive Watershed: Default-objectives and Designation Procedure

**Government Actions Regulation and
Environmental Protection and Management Regulation**

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Prepared by Provincial FSW Procedures Working Group



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Table of Contents

1. Introduction	4
1.1 Regulatory requirements	5
1.2 Definitions used under FRPA, GAR and in this Procedure	6
2. FSW Procedure	7
2.1 Context	7
2.1.1 Default-objectives category	8
2.1.2 Modified default-objectives category	9
2.1.3 Pre-pilot category	9
2.2 FSW Procedural Steps	10
2.2.1 Incorporating First Nations Values	13
3. Additional regulatory and order drafting information	17
3.1 Optimal FSW size	17
3.2 FSW Default-objectives	17
3.3 Using multiple aquatic regulatory actions (Co-location)	18
4. References	20
5. Appendices	
Appendix 1. Definitions	22
Appendix 2. Preparing or modifying a FSW Order under GAR	25
Appendix 3. Using the Watershed Evaluation Tool (WET) - Important Notes and Background Information	27
Appendix 4. Spatial Data Standards	29
Appendix 5. FSW Designation Types	33
Appendix 6. FSW Effectiveness Monitoring	35
Appendix 7. FSW Default-objectives list (spreadsheet)	36

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1. INTRODUCTION

Across the diverse landscapes characterizing British Columbia are vast networks of rivers and streams hosting world-renowned fisheries values. Over the millennia, these values have provided significant social, cultural, ecological, and economic benefits. In some instances, maintaining these important values while continuing to utilize forest and other natural resources requires modifications to management strategies and practices in order to sustain the multitude of benefits provided by these watershed-level ecosystems.

The *Forest and Range Practices Act* (FRPA) and *Oil and Gas Activities Act* (OGAA), provide authority for government to help achieve balance between resource conservation and use. Both these statutes allow government to provide special management direction to the forest, range, oil and gas sector activities in areas legally designated a “fisheries sensitive watershed” (FSW). Using FRPA’s Government Actions Regulation (GAR) and OGAA’s Environmental Protection and Management regulation (EPMR), the provincial government is able to evaluate the suitability and as required, designate a watershed as an FSW.

Under these statutes both the GAR and EPMR closely mirror one another in many respects, therefore the procedure described here is intended to be used for the evaluation and designation of an FSW under either regulation. Once an area is designated as an FSW, operators affected by either regulation will be required to undertake practices that maintain natural watershed processes and conserve the ecological attributes necessary to protect fish and the health of their habitat.

Recognizing the need to conserve limited resources, as well as the unique role licensees and permit holders play in the management of forest lands, in 2010, the Deputy Minister provided direction to develop and implement the procedure as laid out in this document. Consistent with the statutes noted above, along with their associated regulatory requirements, the FSW procedure was created as a science-based evaluation (and as warranted, designation) methodology. Accordingly, this provincial FSW procedure details the technical aspects of the regulatory designation process that government uses to determine if a watershed with the requisite fish values and sensitivity meets the required tests for FSW designation.

1.1 Regulatory Requirements

Prior to establishment of an FSW, the Minister must be satisfied that a series of regulatory tests have been completed. These can be broadly categorized as either “technical” or “administrative” tests. The technical tests are unique to each GAR action and value, and confirm the significance of the value and requirement for its special management. Administrative tests are those that apply universally to each proposed GAR action (i.e., GAR s.5 through s.15) regardless of the nature of the value being examined. For the purposes of the administrative tests, a detailed description of these is provided in the GAR guide titled “Government Actions Regulation Policy and Procedures” (see Anon. 2013). Other than high level discussion of administrative tests as they pertain to an FSW, the content of this procedures document focuses largely on the confirmation of the technical tests necessary to show that the value is relevant to an area and the area requires special management.

Authority to establish an FSW is provided in both s.14 of FRPA’s Government Actions Regulation (GAR) and s.27 of OGAA’s Environmental Protection and Management Regulation (EPMR). The definition provided in both regulations describes an FSW as an area of land having two primary characteristics: 1) significant fisheries values, and 2) significant watershed sensitivity.

For a watershed exhibiting these two characteristics, the Minister (or designate) responsible for the *Wildlife Act* has authority under regulatory provisions to establish:

1. spatial boundaries delineating the geographic area of a watershed to which an FSW Order applies, and
2. objectives¹ describing the specific desired condition(s) required to conserve fish values and their habitat in the FSW.

The legal establishment of an FSW requires that affected operators and operations achieve certain management goals outlined in GAR s.14:

- “(a) (conserve)
(i) the natural hydrological conditions, natural stream bed dynamics and stream channel integrity, and

¹ In the case of the EPMR, the Oil and Gas Commission (OGC) is the body responsible for evaluating and applying management conditions as part of the permit approval and issuance process. For more information on this topic, please contact FLNRO and the OGC.

(ii) quality, quantity and timing of water flow, or

(b) (prevent) cumulative hydrological effects that would have a material adverse effect on fish.”

When a watershed is designated as an FSW under GAR, provisions in the FRPA require that a *Forest Act* agreement holder’s Forest Stewardship Plan (FSP)² be consistent with the stated objectives in the Order for the FSW. Persons required to prepare operational plans under the FRPA would consider the hazards prevalent in a watershed (e.g., the effect of practices on natural watershed processes) and the risks these hazards pose to fish habitat. Considering this information, and consistent with an FSW’s objectives for the area, within two years of the establishment of an FSW, FSP content (i.e., results and/or strategies) must be prepared and the FSP amended. After public review, the FSP is submitted to the District Manager for the FSW area who must approve the plan if it is determined to be consistent with the objective(s). Once the plan is approved, a tenure holder must comply with their approved plan. Government will undertake compliance inspections and effectiveness monitoring activities (see Appendix 6) to ensure that applied practices are consistent with the order and plan content.

1.2 Definitions used under FRPA, GAR and in this procedure

Ambiguity in the meaning of terms and phrases used in regulation and policy can make the interpretation of a specific section(s) of a regulation or policy uncertain. Providing more detail can help provide clarity to the meaning of such terms or phrases. For example, definitions are provided in the Forest Planning and Practices Regulation (FPPR) to clarify the context, specific meaning and application in the various sections of the regulation.

In a similar way, the GAR and associated legal FSW orders use definitions for terms and phrases in the FRPA or applicable regulations made under it. Terms and phrases not defined in FRPA and its regulations can be defined in a GAR order. In the latter case, these definitions apply solely to the order in which the definition is found.

For the purposes of this procedure, definitions are provided for potentially ambiguous technical terms used in the GAR. Anyone using this procedure is strongly encouraged to familiarize themselves with these definitions, as they are essential for understanding how the procedure is to be applied and for

² While this document’s focus is largely on those *Forest Act* agreement holders requiring a forest stewardship plan (FSP), similar requirements may be applied to other tenure holders requiring a management plan such as range and woodlot tenure holders under FRPA.

providing context to GAR s.14. Definitions applying to the GAR s.14 and the FSW procedure can be found in Appendix 1.

2. FSW PROCEDURE

2.1. CONTEXT

The procedure described in this document details only the process used to determine the suitability of “Type III” FSWs (those that make up the vast majority of FSWs types in the province). This procedure is consistent with established government policy surrounding requirements assuring that the administrative tests under regulation (GAR and EPMR) have been met (i.e., Anon. 2013). Consequently, the main focus of this procedure is on the technical tests not covered by the GAR’s administrative tests (see Anon. 2013) including:

- (i) “significant watershed sensitivity”,
- (ii) “significant downstream fisheries values” and
- (iii) watershed requires “special management”.

GAR and EPMR species and habitat designations follow standardized procedures to evaluate their suitability prior to being proposed for designation. In the case of an FSW, there are four possible types of FSW. Once designated however, each FSW type has the same legal standing under regulation and is managed similarly. What differs between types is the process used to establish a watershed as an FSW (see Appendix 5 for a description of each FSW type).

Depending on the available information and the characteristics of a watershed, this procedure uses three tests to evaluate the technical suitability of a potential FSW: 1) default, 2) modified default, and 3) pre-pilot. In order to select the appropriate procedural category, the watershed of interest must meet certain criteria. In all three cases, “default-objectives” (see Section 3.2) will be used at some point in the evaluation and FSW order development process. To clarify the differences and help determine which procedural test to use for a particular watershed, the criteria for each are described below.

The benefit of early engagement with interested parties, especially industry (see Appendix 2) and First Nations (see Section 2.2.1), cannot be over emphasized. Government staff are encouraged to start a dialogue with these parties prior to the regulatory “consultation and

review” requirements (GAR s.3) to ensure that all available information is considered and included, as appropriate, in the drafting of the proposed FSW order. It is anticipated that this additional step will help bring all parties together to provide the best available information for the task and help streamline the formal regulatory consultation and review process.

Finally, the overall procedural method (for type III FSWs), from start to finish (i.e., assessment of all regulatory tests both technical and administrative), and leading to completion of an FSW package sufficient for decision maker consideration, is detailed in section 2.2 step 3.

2.1.1 Default-objectives

The majority of FSW evaluations processes will fall into the default-objectives category. Using this approach, government staff are responsible for conducting an overview evaluation of a given area of interest [e.g., Resource District, Timber Supply Area (TSA), or another logical grouping of watersheds] to identify and determine relative priority of all potential FSWs in that area (Steps 1 to 3 in section 2.2 below). Collaboration and input from licensees and First Nations would be sought to determine if there is additional information that might influence the content of an FSW order, and if so, this may shift the evaluation approach to the modified default-objectives variation. Where a watershed is considered to meet the technical requisite criteria (i.e., fish values and sensitivity) a draft Order will be prepared using FSW default-objectives to set management direction for the watershed. Licensees, during the regulatory “consultation and review” period (i.e., GAR s.3), will be provided with a formal opportunity to review and comment on the proposed order and indicate to government whether they: 1) support the Order with accompanying objectives in its entirety; 2) support it generally, but propose changes to the objectives based on their own analysis of the prospective FSW and default-objectives; or 3) reject the Order and objectives in its entirety based on their own analysis of the proposed FSW. Where analysis is conducted by a licensee, supporting modification or rejection of a proposed Order and/or its default-objective(s), the licensee must provide to government, and make public, this information in support of their conclusion(s) and rationale. Recommendations for modification(s) to an Order submitted by a licensee during the review and comment period will be considered by the appropriate government staff, and based on the quality (strength) of evidence, modifications to, or withdrawal of, the proposed FSW Order may be made.

2.1.2 Modified Default-objectives

In some situations there will be pre-existing information (e.g., historic watershed assessments, expert reports, Land and Resource Management Plan (LRMP) / Higher Level Plan (HLP) watershed analysis/direction, unique spatial data, or licensee held information; any of which may improve upon the information used to screen watersheds and inform the content of the order) that can be used to support augmentation or modification of a default-objective(s) to better reflect known watershed sensitivities and conditions. In these cases, the procedure would remain as described above, with an added step requiring compilation and interpretation of the existing information in an effort to either:

- (i) confirm that the provincial default-objective(s) is inconsistent with the new information, or
- (ii) support the modification(s)/elimination of a default-objective(s).

2.1.3 Pre-pilots

Prior to the 2010 Deputy Minister's direction regarding the use of default-objectives, a small number of watersheds were at some stage of analysis toward their consideration as FSWs. These watersheds are referred to as "pre-pilot" watersheds as they did not follow the piloting process associated with creating this FSW procedure. Depending on the stage of development these prospective FSWs will not be required to explicitly adopt the default-objectives approach and are referred to as a "pre-pilot" FSW. However, some pre-pilot watersheds that did not advance to a stage where objectives had been developed for the watershed should use the default-objectives. The intention here is not to have to duplicate efforts made during the pre-pilot. A list of qualifying pre-pilot watersheds is provided in the GAR priority and implementation plan (see Anon. 2011, p. 47, Appendix G).

2.2. FSW PROCEDURAL STEPS

This FSW procedure is essentially a technical test of significance (fish values, and sensitivity) and the requirement for special management using expert elicitation and the best available information. Application of the procedure involves the sequential evaluation of fish values (Step 1), sensitivity (Step 2.1), and finally requirements for special management (Step 2.2). The full procedure is detailed below and illustrated in Figure 1. As described in section 2, in all cases (except some pre-pilots as described in section 2.1.3), this procedure requires the consideration and application of the list of FSW default-objectives (see Section 3.2 for details regarding the accompanying FSW default-objectives document). It also should also take into consideration the policy guidance Preparing and Modifying and FSW Order Under GAR in appendix 2.

Step 1. Fish-values test – Gap analysis of WET fish-values short-list

Generation of a fish-values short list is the first task required to conduct the FSW evaluation and is required as the basis for completion of subsequent steps. This step involves screening fish values of all watersheds in the area of interest. Integral to this step is consideration and integration of First Nations values into the FSW list prior to moving to Step 2 (First Nations involvement in this step is discussed further in Section 2.2.1). Step 1 uses a Watershed Evaluation Tool (WET)-generated watershed list to create a draft fish-values short-list. The short-list is refined by answering three fundamental questions about watersheds on the WET fish-values list:

1. What watersheds are missing from the list? Action: add missing watersheds.
2. What watersheds are ranked too low? Action: move inappropriately ranked watersheds to a higher ranked position.
3. What watersheds are ranked too high? Action: remove or move watersheds to an appropriate ranking lower on the list.

In addition, watersheds ranked as important from First Nations perspective should also be integrated into the list (see Section 2.2.1). In all cases, where a watershed's ranked position on the list is changed, a rationale for the change must be documented including a description of the strength/ quality of existing information (see Section 2.1.2 in Reese-Hansen et al. 2012) supporting the change (e.g., GIS or detailed field analysis; nature of the expert opinion, inventories, etc.). Step 1 is intended to be a quick and simple WET short-list creation and

confirmation exercise lead by 1 or 2 regional staff (e.g., a fish biologist(s), or ecosystem biologist(s), both of whom have a good understanding of fish values in the area of interest). Depending on the extent of fish values and resources available in a region, typically the review would be focused on a sub area within a region (e.g., Natural Resource District, TSA, etc.). Watersheds short-listed as a result of this step will advance to Step 2.

Step 2. Sensitivity and special management test – short-list refinement

Refining the fish-values short-list by assessing each watershed’s sensitivity and special management requirements completes the assessment of technical tests. The intent of the second step is to further resolve rankings to a final priority list of proposed FSWs.

This step has two parts and involves using a small group of local experts, including the contribution(s) of First Nation knowledge, to produce a list of proposed FSWs. Local experts should include: fish biologists and ecosystem biologists with a good understanding of fish values in the area of interest; hydrologist/geomorphologists; First Nations; and qualified industry staff. Use of expert elicitation (e.g., Martin et al. 2011), a modified Delphi method adapted for the purpose, or other defensible science-based decision process, can help ensure consistency and transparency in the process as it is applied across the province. A good working understanding of the relevant FSW definitions described in this document (see Appendix 1) is required to complete this step. In Step 2, experts will be asked to:

1. Examine WET sensitivity indicators (see Appendix 3 and Reese-Hansen and Parkinson 2006) for the proposed FSWs to determine if there is a reasonable expectation that the watershed has significant sensitivity.³ This will involve: (a) confirming the relative WET list sensitivity ranking, or (b) as appropriate, modification of ranks supported by additional existing information. Examination may consider process interactions between WET sensitivity indicators (e.g., adverse, additive or synergistic effects resulting from the combination of indicators such as equivalent clearcut area-related increases in peak flow in combination with fine-textured soils, etc.) and improvements over WET information using existing information including regionally-available data of a better

³ In some cases there may be better (more current or improved resolution, etc.) regional information, or additional sensitivity indicators, than are available in the WET. Where these exist and improve upon the FSW evaluation process they should be used in the FSW Procedure steps. An important proviso is that (a) better information is available for the entire area of interest (e.g., Natural resources district, TSA, etc.) and (b) the use of additional indicators must be indicators of sensitivity (e.g., measures of anthropogenic influence such as road density, etc.).

quality than used in provincial WET data inputs. This step must be documented describing the decision process and the rationale for each watershed ranking change. Developing a rationale may include using existing information/studies (e.g., watershed assessments, etc.) that support a conclusion about a given watershed's sensitivity and modified rank.

2. Apply the GAR s.14 "special management" test by asking: "Given the watershed's known sensitivities, does the watershed require special management to protect fish habitat values?"

Meeting the FSW special management test requires consideration of whether special management as addressed by the default-objectives (or modifications to them) is required to conserve or recover fish habitat values by using one, several, or all of the default-objectives, or modified default-objectives, in the FSW Order. When examining a (each) watershed it is important that sensitivities across the entire watershed, including, for example, the most downstream alluvial fan (as defined in Appendix 4A), are considered. Where the final list of objectives for a given watershed contains differences (e.g., an objective that has been modified, removed, or new objective added as per section 2.1.2) relative to the provincial default-objectives list, a rationale for each change to the default-objective list must be documented.

Step 3. "Consultation and Review" – Preparing FSW orders with default-objectives

This step follows standardized GAR Order preparation practices consistent with the GAR Policy and Procedures Guide (see Anon. 2013). Using the list of proposed FSW(s) identified in Step 2, regions will prepare an FSW order and associated materials using the list of default- or modified default-objectives established at the conclusion of Step 2. The FSW package forms the basis for the GAR s.3 Consultation and Review process, and assuring that tests described in the GAR Guide (Anon. 2013) are met.

Depending on the number of proposed FSWs, regional priorities, risks associated with timing of establishment of potential FSWs (hazard/risk and capacity to deliver), all, or as a subset(s), of the refined FSW list will be advanced as "proposed FSWs" in this step.

The time required for Consultation and Review for FSWs is 40 days and, as required, there may be up to an additional 90 days for consultation, for a total of 130 days. In very unique circumstances, and depending on the complexity of the package, the period may be extended.

While it is anticipated that issues with the proposed FSW package will be resolved during the collaborative first two steps, during the Consultation and Review period *Forest Act* agreement holders who are required to prepare a Forest Stewardship Plan may propose additional changes. These include new/modified objectives or metrics based on their own analysis conducted by a qualified professional. All proposed changes to the order must be supported with a rationale accompanied with all supporting associated information/data.

Government will review changes proposed by a licensee(s), and this information will be: (a) incorporated into the order, or (b) rejected including provision of a written rationale for the rejection. This may involve a dialogue with the licensee to better understand their proposal and explore alternatives that meet the conservation goals the FSW order is intending to achieve. Where changes are accepted, all supporting information provided by licensees and external organizations will become part of the FSW establishment record and will be publically available.

Once the Consultation and Review process has concluded the order will follow standard GAR regulatory processing procedures. The flow chart below (Figure 1) depicts the steps through which a potential (Type III) FSW must go prior to submission to the Statutory Decision Maker for consideration. It should be noted that this flow chart does not reflect the process used in the pre-pilots (see Section 2.1.3) or other earlier iterations of FSW procedures. In the case of a pre-piloted FSW, assuming the technical review portion of the process is completed, the procedure will follow the steps beginning with the government administrative and regulatory review obligations (i.e., Figure 1., Step 3; Anon. 2013).

2.2.1 Incorporating First Nation's values & knowledge

Numerous court decisions have reinforced First Nations claims to rights and title of their traditional lands (e.g., *Tsilhqot'in* 2014). Consequently inclusion of First Nations and their values is critical to the resource management decision-making process in B.C. The unique legal relationship that First Nations have with both government and sectors affected by the regulatory requirements of both FRPA and OGAA operating within the traditional territory of a First Nation underlines the importance of early identification and engagement with

representatives from recognized First Nations organizations. First Nation's traditional fisheries knowledge and the long standing ties to their traditional territories can provide invaluable natural resource information about local fisheries values.

While the WET captures commercial harvest data of both Aboriginal and non-Aboriginal fisheries, it is unable to capture the diverse nature of First Nations throughout the province, their distinct connection with local fisheries resources, or important cultural, ceremonial, and food fishery values. For this reason, effectively integrating First Nation's fisheries values requires direct dialogue with, and input from, a First Nation(s) community(ies) whose territory(ies) is (are) included in the area for which the FSW evaluation is being conducted. This task is best suited to Step 1 of the procedure; however, an invitation to participate in Step 2 should also be extended to the same First Nation organizations.

Ultimately, the approach used to capture First Nations fisheries values will be reflected in the diversity of Indigenous communities making up an FSW evaluation area, and should be endorsed — where there is interest to do so on part of those communities — by the First Nation community(ies) that have a proposed FSW(s) within the geographic area of their traditional territory.

At a minimum, regional FSW leads are encouraged to engage First Nations and complete one or more of the engagement processes described below:

1. Meet with representatives from the First Nation community(ies) to introduce the FSW program and its purpose; discuss the FSW evaluation and designation procedure; review and discuss the WET list results; provide ongoing updates about the progress of the process, and request comments as the process unfolds.
2. Ask any First Nation within the evaluation area to develop and share their own methodology to prioritize important food-fishery and social/cultural/ceremonial fisheries values for watersheds that are located within their territory (see Reese-Hansen and Parkinson 2006). The results from this process should then be directly integrated into Step 1 of the procedure as described above.

3. Where applicable, request written endorsement of, or comments regarding concerns for, the final list of watersheds government proposes to designate as FSWs.

As the relationship between First Nations and other levels of government is constantly evolving, staff unfamiliar with various local protocols are advised to seek current Ministry policy and experts in their region to help assist in engagement with First Nations.

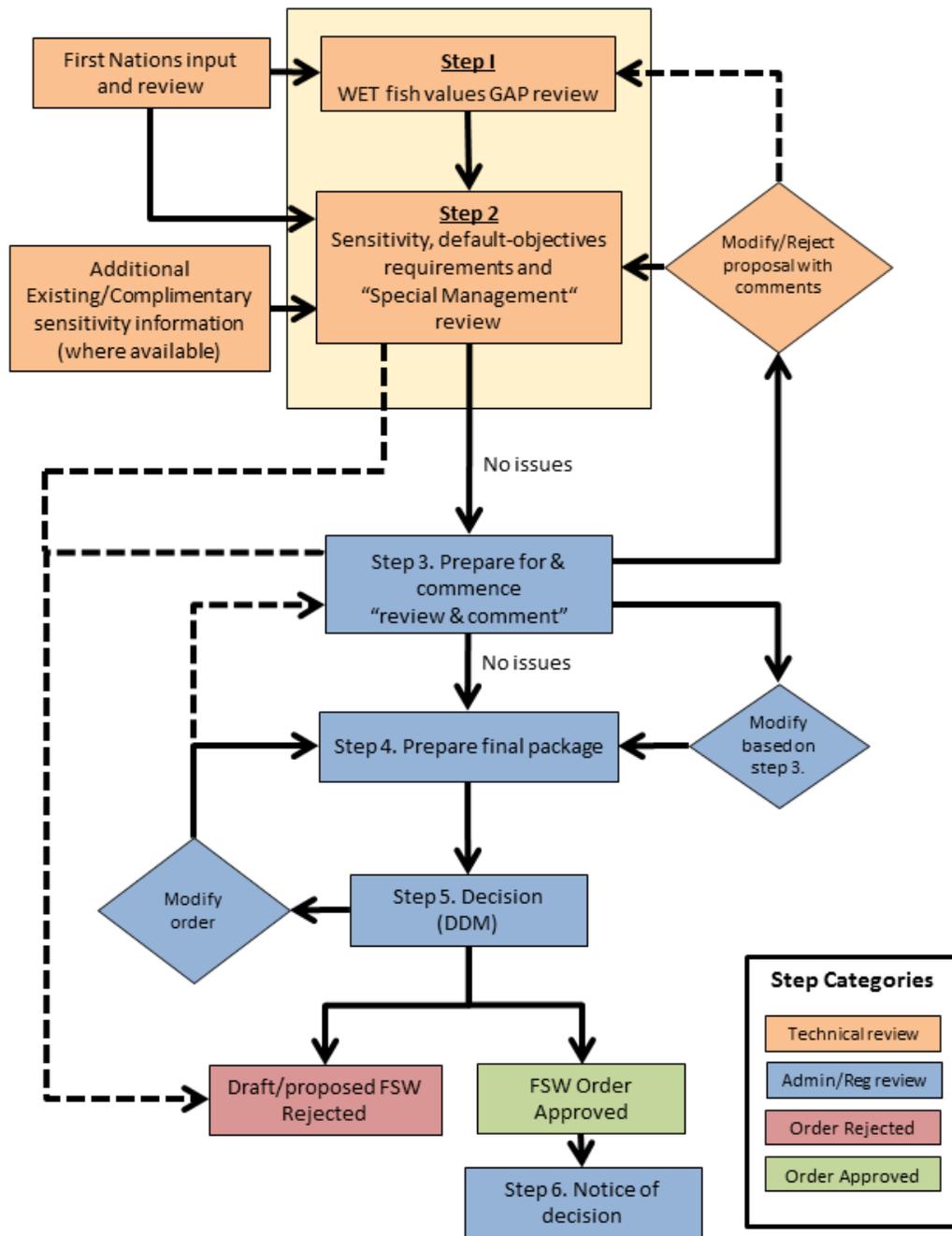


Figure 1. Flow chart depicting steps required to meet GAR FSW tests and prepare an Order for consideration by a statutory decision maker (Anon 2013).

3. ADDITIONAL REGULATORY & ORDER DRAFTING INFORMATION

3.1 Optimal size for a Fisheries Sensitive Watershed

Selecting a watershed of the appropriate size as an FSW will improve the effectiveness of the FSW designation (including the selection of special management objectives applying to it). Selecting too large a watershed can lead to using generalized, or homogenized, objectives and associated benchmark metrics that address an 'average' condition throughout a watershed. A generalized approach over large basins may not meet the habitat conservation requirements for areas within the FSW that are most sensitive (e.g., peak flows, steep terrain, sensitive soils, etc.) and require specific types or additional levels of "special management". Therefore it is recommended that FSWs be no more than ~250 km² in size.

Where larger (e.g., >250km²) watersheds are considered for FSW designation, management requirements (i.e., objectives) are best applied at the sub-basin level within the larger watershed (note that sub-basin level identification and management may also be appropriate for smaller FSWs). Although the upper limit for FSWs and FSW sub-basins is recommended to be ~250km², smaller watersheds may also be appropriate (e.g., ~50km²) if these meet the requisite GAR technical tests. However, if larger (e.g., up to a ~400 kms²) homogenous (i.e., watersheds with no requirements for sub-basin management delineation) FSW designations are being considered, the benefits of this approach should be examined closely, including documenting a strong rationale for making the larger FSW designation. Licensees may be able to provide important information regarding the nature of sensitivities in a watershed; therefore their involvement in defining optimal FSW size (including identifying sub-basins with specific sensitivities) can greatly improve the content and metrics used in an FSW order.

3.2. FSW Default-objectives

Inherent natural variability between watersheds means that no two watersheds are alike. While basic watershed processes are similar, inherent vulnerabilities may require differing management approaches to maintain desired conditions of an FSW. The FSW procedure and the accompanying FSW default-objectives were created based on the explicit Deputy Minister direction recognizing natural variability between watersheds. Recognized professionals created the default-objectives using a science-based Delphic expert solicitation process (Anon. 2004; Martin et al. 2011). The default-objectives list is

intended to be used as a base-case picklist, or starting point, for the creation of objectives suited to the inherent sensitivities in a particular watershed that will (in whole or part) form a FSW order. With additional and improved information the procedure allows for the modification of each default-objective (including dropping or creating new objectives or revising the benchmark metric as warranted to reflect the unique characteristics in a given watershed). Please see companion default-objectives document for a list of all default-objectives (Appendix 7).

3.3 Using multiple regulatory aquatic actions (co-location)

The GAR and EPMR have multiple provisions that can influence and conserve aquatic habitat conditions. These EPMR/GAR tools include FSWs, (aquatic) Wildlife Habitat Areas (WHA), and Temperature Sensitive Streams (TSS). Used together, these can beneficially influence a targeted conservation value by directing management in a manner that a singular regulatory requirement (or action) may not provide alone.

For example, where subsurface water is intercepted and subjected to warming influences (e.g., localized atmospheric temperatures and solar radiation) as a result of road construction and other forestry activities, and these activities pose additional impacts to a stream's temperature regime, a FSW designation could be used along with TSS riparian protection provisions. A water quality objective might be established using FSW provisions to emphasize the need for special management of streams upstream and upslope of a TSS in order to prevent additional adverse thermal changes that a TSS alone cannot achieve.

Another example would be to use a Wildlife Habitat Area (WHA) designation in conjunction with a FSW designation to highlight the need for special management over a small instream area (i.e., non-watershed-based unit) that would protect site-specific habitat requirements for a species at risk such as Bull Trout (e.g., areas of cold water hyporheic or groundwater inflows to streams, congregation sites, etc.). In either example, a combination of TSS-FSW or WHA-FSW designation would overlap and work together to address a different set of processes affecting stream habitat that the other regulatory tool cannot. It is expected that multiple designations would only be used in specific instances, based on the specific requirements of the area in question.

Furthermore, there may be situations where terrestrial habitat conservation requirements also overlap with a FSW for recognized species, another example of co-location. In these situations WHAs or

Ungulate Winter Ranges may be located in the watershed to achieve government's commitment to co-location. It is prudent to consider synergies achieved when using multiple regulatory tools.

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Appendix 1. Definitions

Adaptive Management

“...a process for testing hypotheses through management experiments in natural systems, collecting and interpreting new information, and making changes based on monitoring information to improve the management of ecosystems” (FREP 2001).

Cumulative (Adverse) Effects

The sum of effects from human and (or) natural disturbances within a watershed which have adversely impacted a stream channel(s) and fish habitat(s). The sources of impact, whether individually large⁽¹⁾ or small, are collectively significant both spatially and over time. Disturbances that occurred in the past may still be having effects currently, which can continue into the foreseeable future and be compounded by other, more recent effects. Consideration of the sum of effects should also take into account the potential for impacts from effects in the reasonably foreseeable future. (Definition adapted from Reid 1998a and 1998b).

¹ *An individually large event, such as a landslide, often has cumulative cascading effects. For example a large slide can significantly change ‘large woody debris’ processes and sediment balances both immediately and over time, and similarly can cause changes to stream channel morphology.*

Cumulative Hydrologic Effects

For the purposes of the GAR and EPMR this term is defined to mean the resulting cumulative adverse impacts associated with altered watershed hydrological processes on a stream channel and fish habitats. It includes all watershed processes involving the movement and storage of surface and ground water through a watershed, including water-related mobilization, transport, and deposition of mineral sediments and organic debris (see “watershed process” below).

DFO

Department of Fisheries and Oceans Canada

EPMR

Environmental Protection and Management Regulation; an enactment under OGAA

Fisheries Values

For the purposes of the GAR and EPMR, “fisheries values” is a general term used to describe any fish(es) relying on an FSW (or watershed) at some point during the fish(es’) life cycle. The definition includes all associated: social, cultural, economic, or ecological characteristics attributed to one or more fish species. Examples of watersheds with significant fish values include at least one of the following: (a) a species that is sensitive to disturbance(s); (b) species richness; (c) rare or endangered species/population(s) (e.g., listed species); (d) species/population(s) of cultural or social importance (e.g., species that have significance to First Nations); and (e) species/population(s) that support a commercial or recreational fishery. Because fish species and habitats are inextricably linked, the habitat of any of the species described above is also considered to have fisheries values. Therefore, for the purposes of defining fisheries values under the GAR and EPMR any one (or more) of the above characteristics would constitute a “fisheries value” of significance.

Fisheries Sensitive Watershed (FSW)

A Fisheries Sensitive Watershed is an area of land making up a watershed that has been designated through legal Order under the Government Actions Regulation of FRPA or the Environmental Protection and Management Regulation of the OGAA. An FSW must comprise both significant fisheries values, and sensitivity to disturbance(s), requiring “special management” to conserve the habitat and fisheries values in the watershed. For the purposes of the GAR and EPMP, “downstream” fisheries values associated with the FSW may occur either downstream of an area within the FSW, or outside of but immediately downstream of the FSW itself.

FLNRO

Ministry of Forests, Lands, and Natural Resource Operations

FRPA

Forest and Range Practices Act

FPPR

Forest Planning and Practices Regulation; a regulation under FRPA

FSP

Forest Stewardship Plan

GAR

Government Actions Regulation; a regulation under FRPA

HLP

Higher Level Plan

LRMP

Land and Resource Management Plan

MOE

Ministry of Environment

FLNRO

Ministry of Forests, Lands and Natural Resource Operations

OGAA

Oil and Gas Activities Act

Sensitivity (watershed)

Using the technical criteria set out in the GAR and EPMP, to be an FSW, a watershed must be “sensitive”, at least in part. The dictionary definition of “sensitive” is a condition where something is susceptible to being “easily... damaged, especially by a physical activity or effect.” For the purposes of an FSW, sensitivity is further defined as the natural or *inherent* susceptibility of a watershed to be adversely affected and ultimately damaged by natural and/or anthropogenic disturbances (e.g., see cumulative adverse effects). Impacts can include changes to watershed processes essential to the maintenance of productive downstream fish habitats. The consequence of such an impact(s) can lead to damaging and adverse changes including but not limited changes in the magnitude, timing and frequency of peak flows, rates of mass wasting or surface erosion, water quality, stream-bank erosion, recruitment and

supply of large woody debris, channel morphology resulting in aggradation and debris jams with blockages to fish passage. Therefore, for the purposes of defining sensitivity under the GAR and EPMP, the term means susceptibility to an impact(s) or alteration(s) that potentially can cause an adverse effect to the fisheries values and fish habitat associated with the watershed.

Significant

“Significant” is a term used to refine a technical requirement (i.e., regulatory test) that must be satisfied when assessing the suitability of a watershed as an FSW under FRPA or OGAA regulation (i.e., to meet the test the watershed must have *significant* watershed sensitivity and *significant* fisheries values). Dictionary definitions describe the term as something large enough to be notable or likely to have an effect. Defining this term in this way recognizes that both requirements can be assessed for their respective significance. Alternatively, significance can also be determined by considering one in relation to the other. For example, very high fish values can be a reasonable basis for accepting a lower level of accompanying watershed sensitivity; conversely, very high sensitivity may be a reasonable basis for accepting a lower level of accompanying fish values. Accordingly, for the purposes of a FSW under GAR or the EPMP, as appropriate, significance can be tested by using the approaches described above.

Watershed

A watershed is defined as a drainage basin or catchment area where natural landscape units from which hierarchical drainage networks are formed. Watershed boundaries are the geographically-defined height of land dividing two areas that are drained by different river systems or stream networks (Beaudry et al. 2006). For most uses of this term, understanding the definition’s purpose and scale of application are important when defining a watershed’s spatial extent. For the purposes of defining an FSW boundary, these will typically follow watershed boundaries used in the 1:20,000 scale Freshwater Atlas, with small modifications to account for a fan or estuary at the watershed’s lowest point (confluence with another stream and watershed) (see Appendix 4A) for further details about inclusion of alluvial fans as an integral part of the FSW boundary.)

Watershed processes

Watershed processes are the principle, naturally occurring, and interacting physical and biological processes that shape and maintain a watershed and its biological communities. In the case of a FSW, the processes that shape and maintain the functional characteristics of the stream channel environment and fish habitats are most important. Throughout the province the predominate watershed processes shaping and maintaining fish habitat include (but are not limited to): (i) watershed hydrology (timing and quantity of flows); (ii) generation, transport, and storage of sediments; and (iii) riparian function (e.g., recruitment and delivery of large wood to the stream channel; stream bank stability provided by mature and stable riparian vegetation; the creation of habitat heterogeneity resulting from the interplay between flowing water, large wood in the stream, and sediment, etc.).

WET

The Watershed Evaluation Tool is a spatially-explicit tool used to help understand fish values and potential for watershed sensitivity (Reese-Hansen and Parkinson 2006). The tool was constructed using the 1:50,000 scale BC Watershed Atlas (Anon. 1996) and designed to derive information about watersheds that are 3rd order and larger.

Appendix 2. Preparing or modifying an FSW Order under GAR

DRAFT (10/10/25) Updated (12/05/12)

Background

Under FRPA, the Ministry of Forests, Lands, and Natural Resource Operations (FLNRO) uses the Government Actions Regulation (GAR) to conserve fish, wildlife, and habitat in one of two ways: 1) using “practice” requirements; or 2) using “planning” requirements. Both of these approaches involve establishment and approval of a legal Order by Ministry of Forest, Lands and Natural Resource Operation’s (FLNRO) Statutory Decision Maker (SDM)

When establishing conservation measures under GAR, FLNRO uses species-specific practice requirements called “general wildlife measures” (GWM). Examples of these are seen in Ungulate Winter Range (UWR) and Wildlife Habitat Area (WHA) Orders. Once an Order containing GWMs is signed by the SDM, the Order: (a) comes into effect (immediately, once the required GAR notifications are made); (b) does not require an amendment to a Forest Stewardship Plan (FSP) as it is a practice requirement as described under s.69 of the *Forest Planning and Practices Regulation* (FPPR); and (c) applies to anyone holding an agreement under the *Forest Act* (e.g., permit to cut timber or build roads, etc.).

In the case of an FSW, FLNRO establishes conservation measures using planning requirements, called “objectives”. While all GAR orders containing either objectives or GWMs may look similar, those containing objectives use somewhat different rules in their implementation. Objectives apply only to *Forest Act* agreement holders who require an approved Forest Stewardship Plan (FSP) to operate. Also, once an Order with objectives is legally established by the SDM, there is a two-year amendment (phase-in) period within which the agreement holder is required to update and receive approval for their FSP reflecting the content of the Order and its objective(s).⁴

The establishment of an Order containing objectives requires the *Forest Act* agreement holder amend their FSP by adding appropriate “results” and/or “strategies” consistent with both: the area of land described; and, each objective contained in the FSW Order. The amended FSP is then submitted for review and approval to the FLNRO District Manager responsible for the area. While considering the content of the FSP, the District Manager may elect to work with FLNRO FSW leads, and specialists with watershed and fisheries management expertise, to help ensure proposed that the FSP content is consistent with the intent of the Order.

Application

On occasion a licensee may encounter a condition or circumstance where a planned site-specific activity is not explicitly consistent with an objective in an Order. Some examples are provided here to illustrate how these situations may be dealt with while meeting both regulatory requirements and the intent of an FSW Order.

Known information, total chance planning, and FSW Order preparation

⁴ 2009. Effects of orders made under the *Forest and Range Practices Act*, Government Actions regulation on Forest Stewardship Plans. FRPA General Bulletin #17. <http://www.for.gov.bc.ca/ftp/hth/external/!publish/Web/frpa-admin/frpa-implementation/bulletins/frpa-general-no-17-effects-of-orders-made-under-the-frpa-gar-on-fsp-feb-19-2009.pdf>

If a forest licensee is aware of a condition or circumstance through their regular development, operational or total chance planning processes *prior* to the approval of an Order that will make some aspect of the Order impracticable to implement, the condition or circumstance should be brought to the attention of the Regional FLNRO staff responsible for preparation of the FSW Order. Discussion at this stage of the Orders' development will ensure that the condition or circumstance is dealt with appropriately while the Order is in preparation, or during the regulatory GAR Review & Comment and Consultation period, prior to SDM approval and legalization. Development of a total chance plan is seen as a valuable tool to identify conditions and circumstances that would benefit from inclusion in a FSW Order.

Amending a FSP to reflect FSW Orders' content

During the phase-in period used to amend a FSP and reflect a new FSW Order, a licensee may encounter an unforeseen condition or circumstance where it is anticipated that meeting the explicit intent of an objective may be impracticable⁵. In these circumstances the licensee should ensure the content of an FSP (i.e., result or strategy) is crafted accordingly, following the current requirements for FSP preparation and approval consistent with FRPA and its regulations⁶, while maintaining the overall intent of the FSW order (for example, but not limited to, FPPR s.12(7) and s.25.1).

New information

FSW Orders are established based on the best available information (e.g., science) and a thorough consultative process with affected licensees and partners. If, subsequent to the Orders' establishment, new information showing that a particular metric or management criterion can be modified (e.g., adjusting a stipulated benchmark described in an objective of the Order) and is consistent with the technical tests provided in GAR, the Order can be amended to reflect the new information. In these cases, the licensee would simply be required to modify their FSP based on the amended FSW Order, and then submit an FSP amendment to the FLNRO District Manager for their approval.

In examples such as those provided above, licensees are encouraged to work closely with the Regional FLNRO staff member responsible for coordinating FSW evaluation and Order preparation to help ensure the appropriate content of the FSW Order and an efficient FSP amendment review process.

⁵ 2005. Use of term "practicable" under FRPA and regulations. FRPA General Bulletin #3

<http://www.for.gov.bc.ca/ftp/hth/external/!publish/Web/frpa-admin/frpa-implementation/bulletins/frpa-general-no-3-defining-practicable-under-frpa-jun-9-2005.pdf>

2007. Use of term "practicable in results and strategies. FRPA General Bulletin #12

<http://www.for.gov.bc.ca/ftp/hth/external/!publish/Web/frpa-admin/frpa-implementation/bulletins/frpa-general-no-12-use-of-practicable-in-results-or-strategies-mar-30-2007.pdf>

⁶ 2005. Interpretive guidance respecting Forest Stewardship Plan questions. FRPA Administrative Bulletin #3.

<http://www.for.gov.bc.ca/ftp/hth/external/!publish/Web/frpa-admin/frpa-implementation/bulletins/frpa-admin-no-3-interpretive-guidance-respecting-fsp-questions-nov-7-2005.pdf>

Appendix 3. Using the Watershed Evaluation Tool (WET) - Important Notes and Background Information⁷

The Watershed Evaluation Tool (WET) is a 1:50,000 scale GIS based tool developed in 2004 as an attempt to rank and understand both (a) watershed fisheries values and (b) watershed sensitivity of potential FSWs across a landscape (Reese-Hansen and Parkinson 2006). As such the WET is essentially two separate tools, one aimed at understanding the relative ranking of fisheries values and the other of sensitivity.

Due to inherent natural variation between watersheds and inadequate provincial data sets necessary to the tool's performance, the sensitivity portion of the tool was not representative of real world conditions and could not be used to determine watershed sensitivity over large areas (note: on an individual watershed basis and looking at the independent indicators that informs the tools evaluation of sensitivity, may have some utility in understanding a watershed's sensitivities).

The fisheries values portion of the WET has performed consistently and provides a reasonable representation of watershed-based fisheries values. For this reason, it is still used as a starting point in the FSW evaluation and selection process described in this procedure.

It should also be noted that the WET is built on the Watershed Atlas, a nested 1:50,000 scale provincial watershed model (Anon. 1996). Due to the Watershed Atlas' nested representation of watersheds, and consequently the WET's spatial structure, very large watersheds become homogenized and those watersheds smaller than 3rd order are lost altogether. For this reason, smaller watersheds meeting the FSW criteria and falling in this group will need to be considered separately and added to the proposed FSW list as required (i.e., as per Step 1 and 2 of this procedure).

The following information provides some background about the status of the WET and how it was used in 2010 to help establish provincial priorities for the GAR Implementation Plan (Anon. 2011).

Method used for determination of provincial priority FSWs (2011/12)

1. All watersheds identified as FSWs and currently undergoing a process toward regulatory designation.
2. Watersheds identified by the WET (v5) used the following steps (see Excel file: 2011-12 GAR FSW Workplan):
 - 2.1. Sort "Fish Value" score (N=9254 watersheds).
 - 2.2. Filter by top scoring quartile (n=2314).
 - 2.3. Filter by watersheds ranging in size from 250 to 2500km² (n=303).
 - 2.4. Sorted by region and appended under each regional tab in the GAR Implementation Schedule.

Notes about WET (v5)

1. This tool is in a beta version. For this iteration of the GAR planning process, the WET is intended for use as the basis for further refinements of a list of watersheds in a given geographic area such as a district, region, etc. (i.e., it is a starting point for the identification of a FSW list, some of which will lead to legal designations). It is expected that in the future, a methods paper for the WET will be available; currently there is a preliminary draft that can be forwarded to interested staff upon request.

⁷ For additional information, please contact the Watershed Planning Biologist in the Habitat Management Section of FLNRO.

2. While the watershed in the WET-derived list watersheds are considered of high provincial priority, their priority is subject to a regional GAP analysis and prioritization-setting process following the GAR Implementation Plan guidelines (see Anon. 2011) and the current Provincial “FSW Default-objectives and Designation Procedure”.
3. The WET database, forwarded with the GAR priority implementation schedule, has been password-protected to maintain the integrity of links and formulas.
4. Some high scoring watersheds will undoubtedly be missed by the WET. This is due to one of several factors:
 - a. Inaccurate data available to generate a representative score.
 - b. The watershed is between 250km² and 2500km² in size (see Method 2.3 Filter by... above).
 - c. The watershed is less than a 3rd order (1:50,000 Watershed Atlas) stream and drains directly into the marine environment or 4th order or larger watershed (face units). Regional staff will need to pay close attention to potential missed smaller marine and face-unit watersheds in their GAP analysis.

Appendix 4. Spatial Data Standards

A. Spatial Delineation of Alluvial Fans for an FSW Order

Many streams in B.C., especially at their lower reaches, are considered to be alluvial and therefore sediment-dependant. Spatial information (e.g., Fresh Water Atlas) typically represents the boundary of a watershed in a “teardrop” fashion (e.g., a solid red line in Figure 2a) where the lowest point in the watershed (i.e., the point where water flows out and away from the watershed, into a downstream location of a similar sized or larger stream, a lake, or into the marine environment) is represented as the “point” of the teardrop. While necessary from a spatial analysis perspective when characterizing a watershed in a nested (GIS) stream-network model, in alluvial systems this depiction often excludes the watershed’s lower-most alluvial fan, a feature often hosting very high fish habitat values and very sensitive to disturbance. All legal line-work submitted with the FSW order should be modified (i.e., redrawn) so that the extent of the alluvial fan is captured as part of the spatial boundary of the FSW Order.

The two images below illustrate how the watershed boundary should be drawn to include its alluvial fan. In Figure 2a, the watershed is configured in a standard teardrop fashion using spatial geodata from sources such as the Freshwater Atlas. In Figure 2b, the point has been reshaped to encompass the entire alluvial fan. The delineation of the modified shape should begin by using the fan’s apex and include the channel or waterbody (stream, lake, ocean, etc.) that shares its confluence. The fan’s boundary can often be easily interpolated in a GIS using air/satellite imagery, elevational contour lines, and in some cases, DEM models.

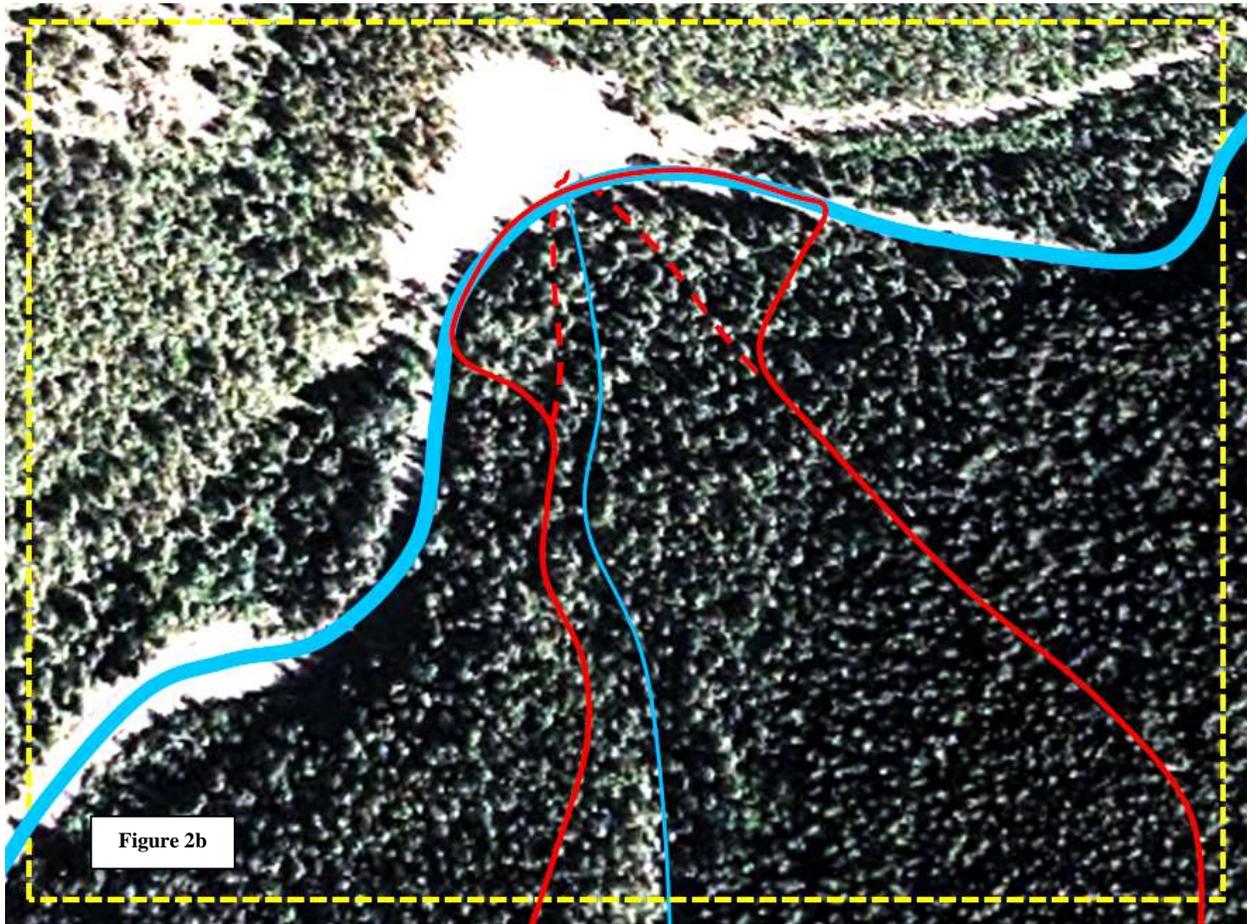
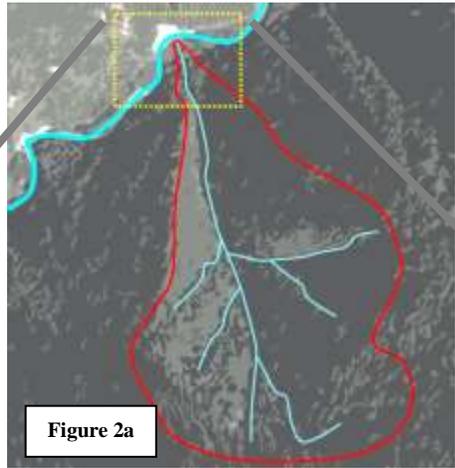


Figure 2. Spatial Delineation of Alluvial Fans for an FSW Order

B. Summary of Spatial Data Standards for submission of Fisheries Sensitive Watersheds

(Version -- March 2014)

Submission

The digital format for the submission of Fishery Sensitive Watershed (FSW) polygon(s) to support schedule A mapping is an ArcGIS shape file. Shape file projection must be BC Albers, Datum NAD 83.

Geometry XY tolerance should be 0.001 meter. Geometry must be clean, i.e., no slivers, intersecting arcs or unclosed intersections. Use “Check Geometry” and/or “Repair Geometry” tool in ArcGIS to confirm work before submission.

Attribute Data

The attribute data must contain the following attributes:

Column Name	Output Width	Type
FSW_TAG	14	Text
FEAT_NOTES	254	Text
FCODE	10	Text
WS_CODE	143	Text
GAZE_NAME	30	Text
LOCAL_NAME	30	Text
EVAL_UNIT	30	Text
UNIT_NO	14	Text
LEGAL	50	Text

FSW_TAG – Alphanumeric tag identifying the Fisheries Sensitive Watershed.

Tag numbers must be lower case with dashes, e.g., f-6-003, where ‘f’ is constant and ‘6’ is the Ministry of Environment (MOE) region number. Note: MOE region numbers, rather than MFLNRO region numbers, must be used for all spatial data until further notice.

FEAT_NOTES – An optional description or notation associated with the FSW polygon.

FCODE – Ministry of Environment database code identifying the feature category

- The FSW code value is FF33515300

WS_CODE – Watershed code derived from the BC Fresh Watershed Atlas, 1:20,000 scale; identifies a watershed polygon at the lowest down stream point in its relationship to associated polygons within the Fisheries Sensitive Watershed. The WS_Code should be recorded using the BC Fresh Water Atlas attribute data format (i.e., using hyphens to separate sets of integers; 001-000001-000001...).

GAZE_NAME – Name of watercourse legally recognized in the BC Gazette, at the lowest down stream point in the Fisheries Sensitive Watershed.

LOCAL_NAME – Local name of watercourse at the lowest down stream point in the Fisheries Sensitive Watershed. This will be recorded as the Gazetted name where a different local name does not exist.

EVAL_UNIT – Evaluation Unit – Arbitrary field (held for possible future use – do not populate).

UNIT_NO – Unique alphanumeric string assigned to each polygon unit within a group of polygons that have the same FSW tag. Where watershed evaluation documentation is produced that references watershed sub-units (polygons), the unique alphanumeric string should match that used in the report.

LEGAL – Acronym of the applicable Provincial legislation for the FSW polygon.

Enter one of the following options:

FRPA (Forest and Range Practices Act)

OGAA (Oil and Gas Activities Act)

FRPA;OGAA (Both Acts apply)

Appendix 5. FSW Designation Types

There are four different ways in which a watershed can become an FSW. These are called FSW “Types”. The Type I FSW involves the evaluation and final designation of a number of FSWs named in Schedule 2 of the Forest Planning and Practices Regulation (FPPR). Type II is a designation that is largely supported by the direction laid out in Higher Level Plans (HLPs) or Land and Resource Management Plans (LRMPs). Type III is the most common and involves evaluation of watersheds in a given area (e.g., TSA) to determine which ones are suitable to propose as FSWs. Type IV includes those watersheds that are community watersheds (CW), and are in the process of being rescinded because they no longer meet regulatory CW criteria, but meet FSW suitability criteria. Once designated, the difference between FSW Types lies in the process used to evaluate and determine their suitability. Each of these is discussed in more detail below.

Type I. ‘Sunset(ed)’ FPPR Fisheries Sensitive Watersheds

In the transition from the *Forest Practices Code Act*, 44 of the existing FSWs were embedded in the FPPR. At the end of 2005, all qualifying Type I FSWs were designated under the GAR. This process involved the review of the 44 watersheds listed in schedule 2 of the FPPR, and of that list, 17 were carried over and designated as FSWs under GAR. The remaining watersheds either did not qualify based on the available information or were deferred because they were named in HLP or LRMP documents and thus seen to have received interim FSW status from government-approved land use planning documents (and would be advanced as Type II FSWs at a later date). Therefore, in some cases watersheds not receiving Type I designation in 2005 may be subject to re-evaluation as Type II or III FSWs in the future. The legal Orders and related spatial information for Type I watersheds can be found on the GAR FSW Website.⁸

Type II. Higher Level Plan Fisheries Sensitive Watersheds

The evaluation of Type II watersheds for FSW suitability is ongoing and involves watersheds named or described as FSWs in HLPs and LRMPs. For example, watersheds named or described in the Okanagan-Shuswap LRMP and Cariboo-Chilcotin HLP underwent a review for their suitability as FSWs and 14 were designated. The procedure for evaluating their technical suitability and designation draws on the land use direction provided in the plans, regional rankings provided by a prototype version of the WET, and local knowledge bases. Management objectives used in the FSW order are informed by the HLP or LRMP and rely on using default-objectives (and the refinement process) described in the steps of the FSW procedure. Not all qualifying watersheds within an area of interest (i.e., planning unit or TSA) will be necessarily designated as Type II FSWs using this approach; however, these may not be omitted altogether as they can be reconsidered, subject to new or improved information, as a Type III watershed.

Type III. Regular GAR/EPMR Fisheries Sensitive Watersheds

Of the more than 17,000 third order and larger watersheds in B.C. (calculated using the 1:50,000 scale Watershed Atlas), the majority meeting the FSW criteria will be designated as Type III FSWs. Using the FSW default-objectives approach, the procedure described in this document utilizes the WET, existing information (where it already exists), and expert review to evaluate the suitability of a watershed as a FSW and assign default, or modified default-objectives.

⁸ GAR FSW website URL: <http://www.env.gov.bc.ca/wld/frpa/fsw/index.html>

Type IV. Community Watershed to Fisheries Sensitive Watershed

Historically, watersheds designated as community watersheds (CW) were also seen to meet the FSW criteria under GAR. As management requirements for a CW are similar to that of a FSW, where a watershed designated as a CW that also meets the FSW criteria, government chose not to pursue an additional designation because it was assumed that a similar level of special management would take place. However, under certain circumstances, CW Orders can be rescinded when, for example, a community no longer requires a specific CW as a water supply (MOE 2008). This situation put FSW values at risk leaving the watershed without the special management requirements necessary to conserve fisheries values. In these situations a rescinded CW can be rolled over as per the provisions in the (updated) CW designation procedure (see also 2010 Deputy Minister Direction) and established as a FSW if it can be shown to have significant fisheries values. The underlying reasoning supporting this approach is that the need to show “significant sensitivity” has already been demonstrated by the need for “special management” to protect water quality under the original CW designation, and therefore this test has already been met. Further details of this procedure can be found in the CW procedures document (MOE 2011 [FSW Update]).

Appendix 6. FSW Effectiveness Monitoring

A watershed-based protocol designed to monitor FSWs and other watersheds with high fish values is currently under development. The methodology is titled the Watershed Status Evaluation Protocol (WSEP). More information on this protocol can be found at the B.C. Forest and Range Evaluation Program website.

Appendix 7. FSW Default-objectives

See next page containing list of FSW default-objectives.

Suite of default objectives for fisheries sensitive watersheds (v.2.4.2)⁹

Characteristics of a healthy watershed	Item #	Indicators	Metrics	Benchmark(s) for FSW objectives setting and monitoring	Draft Legal Objective	Alternative Draft (Measurable) Legal Objective	Supporting References
Sediment <ul style="list-style-type: none"> • Sediment production and transport at natural levels <ul style="list-style-type: none"> ○ Landslide rates similar to natural rate ○ Minimal stream crossings ○ Low road densities 	1.1	Landslides	Number of landslides	Landslides connected to stream channels not to exceed the natural rate	(Primary forest and industrial activities) in the FSW will not result in landslides that increase sediment and debris delivery to: <ol style="list-style-type: none"> 1. fish-bearing streams and, 2. non-fish-bearing streams which flow directly into fish-bearing streams. 	(Same)	<ul style="list-style-type: none"> • Smith 2005 • Guthrie and Millard (unpublished)
	1.2	Sediment	Sediment rating	<ul style="list-style-type: none"> • Maintain a low rating (per FREP criteria) for all sediment delivery points on fish bearing streams and direct tributaries to fish bearing streams • Maintain on average a low rating (based on FREP criteria) for sediment delivery points across the entire watershed (derived from subsample) 	Manage sediment production and delivery from roads along all: <ol style="list-style-type: none"> 1. Fish streams, and 2. Non-fish-bearing streams that flow directly into fish-bearing streams such that low sediment delivery ratings are achieved. 	(Same)	<ul style="list-style-type: none"> • Carson <i>et al.</i> 2009
	1.3	Roads	Number of stream crossings	Density of stream crossings across the watershed to remain below the WAP-based moderate risk criteria of 0.32/km ² (interior watersheds) and 0.8/km ² (coastal watersheds).	Minimize the number of stream crossings in the FSW on fish-bearing streams. (Note: use of “fish-bearing” here is inappropriate as all crossings contribute to sediment within wsd.)	Minimize the number of stream crossings in the FSW by maintaining stream crossing densities such that a sediment generation risk rating ≤ low is achieved.	<ul style="list-style-type: none"> • MOF 1995a & 1995b • Carson <i>et al.</i> 2009
	1.4	Roads	Road density	Road density on unstable slopes (e.g., slopes greater than 60%) to maintain the low WAP-based risk criterion (0.12 km/km ²) Definition: “Access structures”, whether temporary or permanent, and active or deactivated, include (but are not necessarily limited to): roads, the road prism, and stream crossings as defined or described under the FRPA.	<ul style="list-style-type: none"> • Minimize road densities in unstable terrain directly connected to fish-bearing streams and their non-fish-bearing tributaries. • Ensure forest practices (including roads and trails, drainage structures, and forest harvest) in gentle-over-steep terrain do not cause landslides or other mass wasting events. • Maintain natural water drainage patterns. 	Permitted access structures in the FSW must: <ol style="list-style-type: none"> 1. Minimize road densities in unstable terrain directly connected to fish-bearing streams and their non-fish-bearing tributaries such that they achieve ≤ low risk rating, 2. Ensure industrial management or primary forest activities in gentle-over-steep terrain do not cause landslides or other mass wasting events, and 	<ul style="list-style-type: none"> • MOF 1995a & 1995b • Jordan 2001 • Geertsema <i>et al.</i> 2010 • Jordan <i>et al.</i> 2010

⁹ Note that the default-objectives will be updated from time to time as new information and improved science becomes available. (Created: 11/02/22) Updated: 15/11/06

Characteristics of a healthy watershed	Item #	Indicators	Metrics	Benchmark(s) for FSW objectives setting and monitoring	Draft Legal Objective	Alternative Draft (Measurable) Legal Objective	Supporting References
						3. Maintain natural water drainage patterns.	
Hydrology <ul style="list-style-type: none"> ECA sufficiently low such that peak flow characteristics and patterns are not altered relative to those in the watershed when free of human developments. 	2.1	Vegetation cover	Equivalent clear cut area (ECA)	ECA not to exceed 20%	Maintain ECA in the FSW at $\leq 20\%$ to preserve natural hydrological processes and streamflow characteristics and patterns.	(Same)	<ul style="list-style-type: none"> MOF 2001 Guthrie 2003
	2.2	Roads	Road density	Road density to remain within the range for the WAP-based low risk criterion ($< 0.4 \text{ km/km}^2$)	Limit the peak-flow hydrological impacts of roads in streamflow generation zones (H60) in the FSW such that natural streamflow characteristics and patterns remain unaltered for all flow types.	Limit the peak-flow hydrological impacts of roads in streamflow generation zones (H60) in the FSW such that: <ul style="list-style-type: none"> 1. natural streamflow characteristics and patterns remain unaltered for all flow types, and 2. a \leq low risk rating is achieved. 	<ul style="list-style-type: none"> MOF 1995b
Riparian <ul style="list-style-type: none"> Natural riparian and channel function <ol style="list-style-type: none"> Intact riparian structure & bank stability Consistent short and long term LWD contributions (Natural aquatic thermal conditions) 	3.1	Riparian condition	Percent riparian area logged	<ul style="list-style-type: none"> Ensure, at minimum, default approaches to riparian management are implemented for class S1, S2, and S3 streams. Establish windfirm no-harvest riparian buffers $\geq 10 \text{ m}$ wide on either side of class S4, S5, and S6 streams. 	<ul style="list-style-type: none"> Minimize disturbances to riparian areas in the FSW to maintain their: structural integrity; physical and biological characteristics and functions; and influences on adjacent and downstream aquatic ecosystems and fish habitats. Maintain riparian-stream function over time by accounting for hydro-geomorphic and watershed processes. 	Minimize disturbances to riparian areas in the FSW by ensuring that at a minimum: <ol style="list-style-type: none"> windfirm no-harvest riparian buffers are established on all streams, and $\geq 10 \text{ m}$ wide no-harvest buffer is established on either side of class S4, S5, and S6 streams. 	<ul style="list-style-type: none"> NOAA 1996 Snetsinger 2011 Tschaplinski 2010 Tschaplinski 2011
	3.2	Riparian condition	Density of roads adjacent to streams	Road densities within 100 m of a stream to remain at the WAP-based, low-risk criterion ($\leq 0.16 \text{ km/km}^2$)	Road densities within 100m of a fish-bearing stream or a non-fish-bearing stream which flows directly into a fish-bearing stream within the designated FSW are low.	Limit road densities in the FSW that are within 100m of a fish-bearing stream, or a non-fish-bearing stream which flows directly into a fish-bearing stream, such that a \leq low risk rating is achieved.	<ul style="list-style-type: none"> MOF 1995a, 1995b Valdal & Quinn 2010.
Fans	4.1	Alluvial and colluvial fan condition	Proportion of fan(s) destabilized	Management activities on and above fans, in both coastal and interior regions, must not amplify natural hydro-geomorphic processes on fans.	Management practices and activities on or above a fan in the FSW must not destabilize fan.	(Same)	<ul style="list-style-type: none"> Wilford <i>et al.</i> 2003 Wilford <i>et al.</i> 2005 Wilford <i>et al.</i> 2009
Subsurface Water	5.1	Summer temperature maxima and winter temperature minima	Percent channels/seeps to drainage structures	Maintain summer and winter temperature regimes and habitat suitability by minimizing interception of subsurface flows so that the thermal preferences and tolerances of fish species are not exceeded.	Maintain a cross drainage structure density in the FSW that preserves the natural seasonal water temperature regime, including summer maxima and winter minima.	Maintain a network of cross-drainage structures in the FSW such that they preserve the natural seasonal water temperature regime influencing fish-bearing stream reaches.	<ul style="list-style-type: none"> Herunter et al. 2003 (Hudson 2003)
Cumulative Effects	6.1	Roads	Road density	<ul style="list-style-type: none"> Road densities across entire watershed to remain within the WAP-based, low risk criterion ($< 1.2 \text{ km/km}^2$) 	Manage road densities in the FSW to minimize cumulative hydrological and associated adverse impacts to fish and fish habitat.	(Same)	<ul style="list-style-type: none"> MOF 1995a, 1995b

Characteristics of a healthy watershed	Item #	Indicators	Metrics	Benchmark(s) for FSW objectives setting and monitoring	Draft Legal Objective	Alternative Draft (Measurable) Legal Objective	Supporting References
<ul style="list-style-type: none"> Fish have access to habitats throughout the range of their historical (pre-development) aquatic network, and are able to move freely among habitats at appropriate times of the year 				<ul style="list-style-type: none"> Road densities in sensitive areas with erodible soil to remain within the WAP-based, low-risk criterion of < 0.20 km/km² 			
	6.2	Aquatic connectivity	Percent accessible habitat	<ul style="list-style-type: none"> Maintain full, unobstructed access to all fish habitats (rearing, spawning, holding, overwintering, etc.) 	<ul style="list-style-type: none"> Maintain full, unobstructed access to all fish habitats in the FSW. Ensure that stream crossings in the FSW do not impede fish passage at any time of the year by constructing, maintaining, and deactivating the crossings to preserve: <ol style="list-style-type: none"> the pre-crossing width of the stream channel channel gradient natural streamflow velocities at all times of the year, and the natural roughness of the stream channel bed. 	(Same)	<ul style="list-style-type: none"> MOE 2011

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