Sensitive Habitat

Inventory Mapping

On the Cover

The background image consists of an aerial photo of Port Alberni, Vancouver Island overlaid by cadastral, BC Terrain Resource Information Mapping (TRIM) streams, and Sensitive Habitat Inventory Mapping (SHIM) GPS stream course. Photographs reflect aspects of the SHIM process, including GPS and fish surveys and mapping watercourse features.

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Foreword

The Sensitive Habitat Inventory Mapping (SHIM) method was developed with the interest, cooperation and participation of many individuals and groups within British Columbia. SHIM method development is ongoing and integrates at least seven years of experience and consultation with specialists, local community groups and agencies within the Georgia Basin and West Coast of British Columbia. SHIM methods are intended for distribution and use as a watercourse mapping standard. The manual presented here is comprised of a series of modules describing tools to inventory, precisely map and compile data for BC urban and rural watercourses.

Many urban and smaller rural watercourses remain unknown, poorly understood, and suffer from many impacts of human development. SHIM methods reflect a novel set of tools to explore and promote awareness of these watercourses by mapping their location and inventorying their attributes. The awareness and commitment to local watercourses is an important process created through cooperation of local communities, First Nations, municipalities, planners, and managers. SHIM methods comprise a set of tools and methods which can be used to help protect and contribute to sustainable development of fisheries, wildlife and aquatic habitat resources around British Columbia. SHIM mapping and data systems developed to date reflect the use and interests of many of these agencies and community groups.

SHIM was initiated through the Fish Habitat Inventory and Information Program (FHIIP) through cooperation between Fisheries and Oceans Canada, the British Columbia Ministry of Water, Lands and Air Protection along with many municipalities and non government groups as partners in fisheries inventory and information systems in BC. The use of SHIM or other standardised mapping methods to locate, map and inventory watercourses will ● greatly improve information about watercourses to strengthen rationale for better protection and restoration of streams and riparian habitats in the face of continued land development; ● assist managers, planners and communities alike in the successful resource inventory, land use planning, freshwater restoration, enhancement and assessment of BC's urban/rural watercourses; ● improve the confidence of government agents in the information that nongovernment groups collect and compile; and ● ultimately improve the health of British Columbia's salmonid stocks and habitats.

M. Johannes, editor

Acknowledgements

We recognize contributions from many local government planners and engineers, volunteers, community groups, fishers, First Nations, fisheries and environmental biologists including: Don Chamberlain, Project Watershed in the Comox Valley, Langley Environmental Partners (LEPS), Nanaimo Community Fisheries Development Centre (CFDC), Alberni Clayoquot Regional District (ACRD), Regional Aquatic Management Society (RAMS), Regional District of Nanaimo (RDN), Northwest Ecosystem Institute (NEI) and many other groups (see below) that piloted methods and promoted use of the SHIM method and information products.

- *ARMS*
- *Bowen Forest & Water Mgt. Society*
- *BCCF – BC Conservation Foundation*
- *Burns Bog Society*
- *CORD – Central Okanagan Regional District*
- *CRD – Capital Regional District*
- *City of Abbotsford*
- *City of Chilliwack*
- *City Maple Ridge*
- *City of Mission*
- *City of Port Alberni*
- *City of Port Moody*
- *City of Squamish*
- *City of Surrey*
- *Comox Strathcona Regional District*
- *Coquitlam*
- *Cowichan Tribes*
- *CVRD – Cowichan Valley Regional District*
- *District of Saanich*
- *District of Ucluelet*
- *FVRD – Fraser Valley Regional*
- *FVRWC – Fraser Valley Regional Watershed Coalition*
- *Gambier Island Conservancy*
- *GVRD – Greater Vancouver Regional District*
- *ICNRC – Inner Coast Natural Resource Center*
- *Langley Environmental Partners Society*
- *Mt. Currie First Nations*
- *Mt. Waddington Regional District*
- *Powell River Healthy Community*
- *Sto Lo First Nations*
- *SCRD – Sunshine Coast Regional District*
- *Township and City of Langley*
- *Veins of Life*
- *Many Landowners*
- *Many Local Streamkeepers*

Direction for the development of this manual was provided by the Sensitive Habitat Inventory and Mapping (SHIM) steering committee including Brad Mason of Fisheries and Oceans Canada, Rob Knight of the Urban Salmon Habitat Program, Ministry of Water, Land and Air Protection; and Kathleen Moore of the Canadian Wildlife Service. Further guidance and support was provided by Dave Tredger, Fisheries Inventory Section in the Ministry of Sustainable Resources Management and Mark Johannes, Northwest Ecosystem Institute.

Contributing authors and reviewers during the early development of this manual include: Coast River Environmental Services Ltd. in association with Northwest Hydraulic Consultants Ltd. and Quadra Planning Consultants Ltd., Louise Porto of Fisheries and Oceans Canada, Paul McElligott, Triton Environmental Consultants, and Julian Dunster. Early methods for riparian area mapping were developed by Annette DeHault and Maria Grau. Final riparian and photo-interpretive methods were written by Larianna Brown, University of British Columbia. The imperviousness module was written by Paul Zandbergen, University of British Columbia. The Global Positioning Systems module had contributions from Steve Robertson with assistance from Laurie Smith. Hydraulic cross sections were developed by Peter O'byrne of the District of Chilliwack engineering department and Murray Manson, Marc Porter, Katrina Roger and Tanya Bettles. Geographic Information System tools were developed by Johnny Y. Voong, Canadian Coast Guard. Review and editing, graphics and layout were undertaken by Mark Johannes, Leila Hanslit, Josie Cleland and Kari-Lyn Owen of Northwest Ecosystem Institute.

Local user input was contributed through ongoing consultation, extensive field trials, user need assessments, focus groups, working sessions and two workshops titled "Mapping a Course For Our Watersheds," held in Nanaimo and Abbotsford, 2000. The participation of numerous individuals from the municipal, provincial and federal governments, as well as stewardship groups and First Nations is appreciated. The diversity of groups participating in SHIM is essential for the creation of management strategies for protecting watercourses and planning sustainable communities.

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Introduction

The Sensitive Habitat Inventory Mapping (SHIM) method is intended as a standard for fish and aquatic habitat mapping in urban and rural watersheds in British Columbia. This method attempts to ensure the collection and mapping of reliable, high quality, current and spatially accurate information about local freshwater habitats and watercourses. Watercourses in residential, commercial, agricultural, industrial and recreational land use areas in coastal British Columbia are the primary focus of this standard, but these methods can be applied for use across all areas of British Columbia.

The principal objective of this method is to identify, inventory, and map all watercourses, their associated riparian habitats and important fisheries habitat features. These methods are also intended to inventory and map watercourses not currently identified or acknowledged in local/regional plans and maps. The Sensitive Habitat Inventory Mapping (SHIM) method is designed to provide the basis for accurately mapping baseline data that can be integrated into local mapping and planning initiatives. The mapping information collected is intended to augment and potentially enhance local land use planning maps and/or specific site or detailed planning surveys.

We acknowledge that other standards will be written to help guide detailed assessments for freshwater watercourse restoration and enhancement opportunities, fish production, productive capacity, water quality, impacts assessments and monitoring programs. The mapping methods and tools presented here include field surveying and mapping techniques that will allow information to be incorporated into geographical information systems (GIS) using global positioning systems (GPS) for field collection. The mapping information collected will include survey data on sensitive habitats, features and attributes, riparian areas, fish presence and watershed imperviousness. SHIM information can be applied to:

- *Identify sensitive habitats for fish and wildlife along watercourses;*
- *Assist in determining setbacks and fish/wildlife-sensitive zones;*
- *Help guide management decisions and priorities with respect to habitat restoration and enhancement projects;*
- *Assist in the design of stormwater/runoff management plans;*
- *Monitor for changes in habitat resulting from known disturbance;*
- *Provide a means of highlighting areas that may have problems with channel stability or water quality, and require more detailed study;*
- *Identify and map point and non-point sources of pollution;*
- *Provide current information, not previously available to urban planners, to allow more informed planning decisions and provide inventory information for Official Community Plans;*
- *Provide baseline mapping data for future monitoring activities;*
- *Map and identify the extent of riparian vegetation available and used by wildlife and fisheries resources;*
- *Provide preliminary data for analyses which can be used to indicate potential trends in resources that may require further study;*

- *Integrate new map information with existing TRIM and municipal planning maps;*
- *Contribute information towards an inventory of fish distribution and limiting factors to watershed based fish production;*
- *Assist in understanding urban water runoff patterns and help determine areas of impervious surfaces in urban watersheds.*

Streams and other freshwater watercourses are a critical component to the health, vitality and economies of the urban and rural landscapes of British Columbia. They not only contain the runoff for water downhill, but also provide critical habitats and corridors for fish and wildlife. In coastal BC, small streams and watercourses provide critical spawning, rearing, overwintering and feeding habitats for both adult and juvenile salmonids. These environments are also home to many other species of fish, aquatic invertebrates, benthic organisms, wildlife and plants, all of which function as a part of the freshwater community and the entire ecosystem.

Conditions in and adjacent to streams are easily disturbed, and changes in land use can adversely affect the overall health and state of the streams and watercourses and the plants and animals within them. Human disturbance to freshwater watercourses often results from housing, industry and road development, and leads to the decline and alteration of: surface water runoff; stream channel stability; watershed based nutrient cycles; other organic/ inorganic constituents; riparian vegetation; in-stream vegetation; water temperature and flow regimes. These forms of disturbance can cause dramatic changes in the ecosystem biodiversity, population status and the form and function of watersheds and ecosystems. For example, in British Columbia's Georgia Basin, numerous coastal salmonid stocks (Slaney et al. 1996) and populations of 29 wildlife taxa are at risk of extinction (red or blue listed) and are rapidly declining in abundance due to loss of sensitive habitats which are vital to sustaining populations (Anon. 1997).

Recent studies (i.e. Brown 1997), reveal that at least 30% of small urban streams and watercourses in the Georgia Basin of British Columbia are not delineated on provincial or federal topographic maps and databases. This appears to be typical in many regions and local municipalities. Local cadastral and planning information can often be dated and not capture recent land use changes, while recent large-scale inventory maps of streams and adjacent habitats are often not available as a means to identify sensitive habitats for fish and wildlife. As a result, many planning and development decisions continue to be made in the absence of critical information about fish and stream habitats and associated sensitive areas. Good land use planning and decision making requires accurate, precise and recent spatial habitat information. Accurately inventoried and delineated small urban streams, wetlands, watercourses, and riparian areas will help improve current land use planning processes and promote decisions made through greater understanding, improved planning practices, heightened protection and clearer priorities for fish and wildlife habitat restoration and enhancement.

Population growth within the Georgia Basin of British Columbia is expected to double in the next 20 years. For this reason, ecologically sensitive areas such as floodplains, riparian corridors, small stream channels and wetlands may be severely influenced by development unless there is strong community stewardship, awareness and effective land use planning. Mapping of stream and

riparian habitat is a critical first step towards protecting and managing sensitive freshwater habitats. The SHIM methods are intended to provide community, stewardship groups, individuals, regional districts and municipalities with an effective low cost approach to map and inventory local watercourses.

Some communities are presently using SHIM methods to collect critical freshwater habitat data. SHIM is being used to help support land use planning in these communities being challenged by pressures of local development. We encourage SHIM data to be collected, compiled and integrated into local government geographic information systems and incorporated to assist in local municipal and regional planning and recognised in Official Community Plans. SHIM mapped watercourses should also be used to address land use development referrals, the Fish Protection Act Stream Side Directives, ditch maintenance in urban and agricultural areas, freshwater habitat enhancement and restoration opportunities, Greenway and Ecologically Sensitive Areas (ESA) planning and wildlife habitat conservation.

During the past five years local communities have performed trials and reviews of SHIM methods to collect and integrate accurate and precise watercourse information. At least 30 separate community SHIM based mapping projects have been completed throughout the Georgia Basin and west coast Vancouver Island.

Two workshops have also been held in Nanaimo and Abbotsford to review the status of all SHIM mapping projects, potential data gaps, to review and improve methods and provide recommendation for future method development. Method and project recommendations derived from the workshops include:

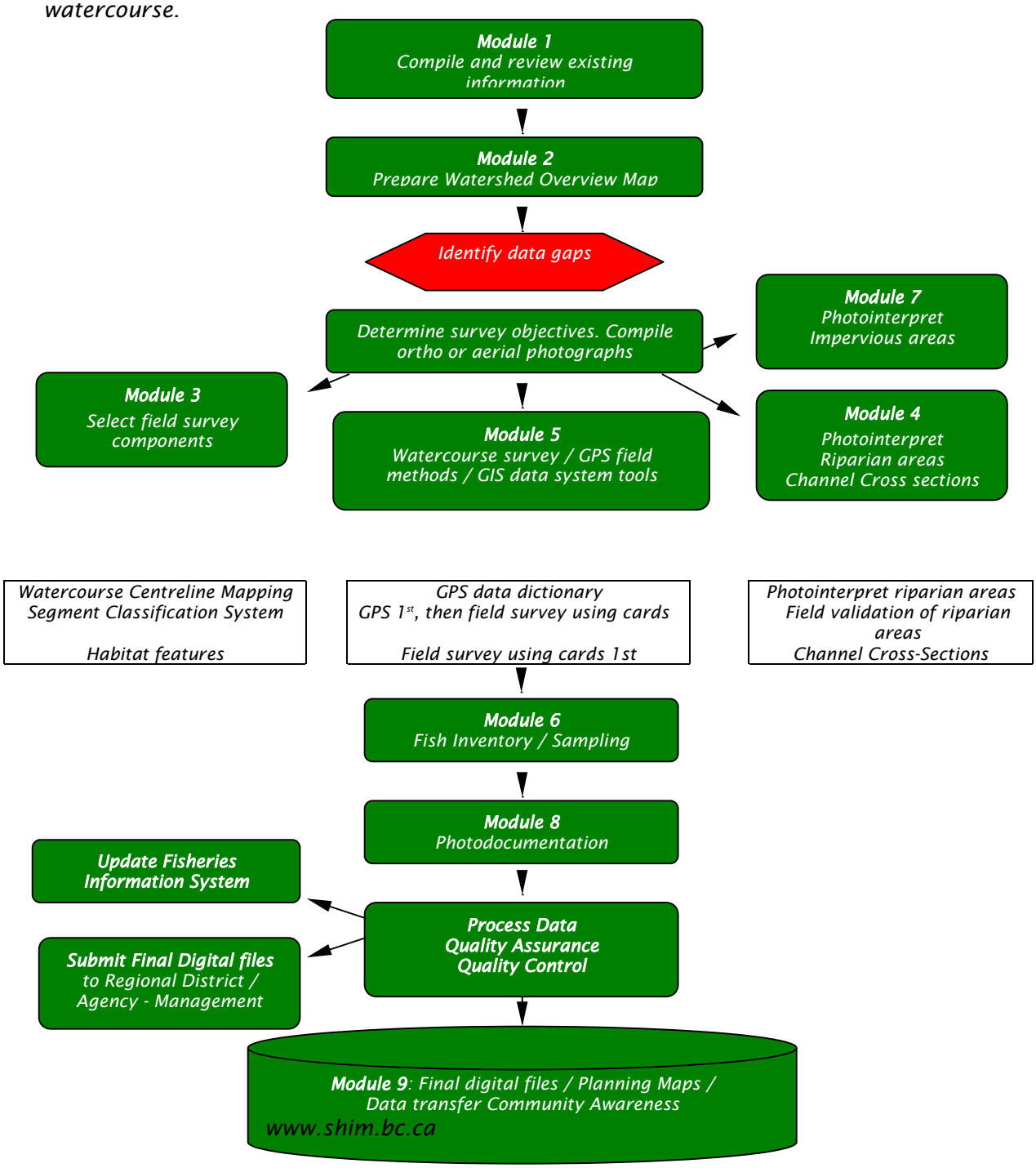
- *Maintenance of adequate funding for SHIM mapping project support;*
- *Development of resource centres for compiling data, disseminating information, training and planning stewardship activities;*
- *Completion of a data collection standard so information will be accurate and can be shared and interpreted for a variety of management applications;*
- *Formation of 2 steering committees (Vancouver Island, Lower Mainland) consisting of local and senior resource and planning managers, and key community groups to assist in coordination of local projects, improvement standards and inventory systems;*
- *Integration of mapping information into local GIS for use by communities;*
- *Development of Sensitive Habitat Atlases for all communities in the Georgia Basin.*

It is important to realize that while communities may receive a limited amount of funding for data collection, there is little or no funding available to provide support to compile and integrate data into a common database and generate final products such as Sensitive Habitat Atlases. As in previous years, there are many new funding applications from communities for SHIM projects through federal, provincial, regional government and other sources.

Note: *new and ongoing projects need to recognize the importance of proper field and office staff training, use of quality field survey tools, effective data quality assurance and control, and maintenance of local computing centres for compiling, integrating and distributing final mapping products.*

SHIM Method Schematic

The SHIM method comprises "eight" component modules and three appendices. The following flow chart illustrates the sequence and connectivity between tools and methods used to complete Sensitive Habitat Inventory Mapping on a given watercourse.



Limitations of SHIM Methods

The SHIM methods outlined here are intended to collect information on fish species distribution, watercourse location and characteristics, watercourse reach descriptions, the location and nature of fish habitat features, riparian zone conditions and impervious area.

These methods are not intended to assess fish population abundance or determine the productive capacity of watercourses. More detailed, site specific assessments should be coordinated for collection of this information. SHIM methods can augment fish and habitat assessments by providing spatial details of habitats. SHIM collected information can be displayed on digital/hardcopy maps and tables and provides the details of location for inventoried watercourses.

It is important to emphasize that SHIM and this manual address methods to inventory fish and fish habitats exclusively. It does not address methods used to assess fish stock structure and abundance, or habitat related restoration and enhancement potential. However, data collected using SHIM methods can be used to augment these resource assessments. SHIM should be viewed as one component tool used to inventory and assess the health, state, productive capacity of freshwater resources and habitats.

Who can or should use this manual?

A basic understanding of freshwater ecology and general fishery and ecological principles is needed as a starting point for users of SHIM methods and this manual. The goal of developing a SHIM standard is to make the methods versatile and usable by both professionals and trained community groups. ***All users*** *need Resource Inventory Committee certified operator training in global positioning system (GPS), fish habitat field procedures and data compilation.*

Local Fisheries and Oceans Canada, BC Ministry of Water, Land and Air Protection, municipal and regional environmental planners, should be contacted prior to conducting surveys using SHIM in local watercourses. They are interested in helping and may be able to provide equipment and/or helpful background information.

As one final note, we have developed the SHIM methods to ensure information is collected and mapped using a standard procedure to allow this information to be effectively used and integrated with existing local and regional data and maps (e.g., local cadastral, Terrain Resource Information Maps - TRIM, Fisheries Information Summary System - FISS, and regional/municipal planning and mapping systems).

Terms and Definitions

For the purposes of this manual, urban areas have been broadly interpreted to include urban and rural ***settlement*** *areas. For example, the entire Fraser Valley may be considered as a settlement area. Generally, there are four broad categories of land use to which this manual applies:*

Urban *- Aquatic features (watercourses, lakes, wetlands, streams, aquifers ditches etc.) that fall within regional/municipal boundaries and are typically affected by urban development pressures such as culverting, channelization, riparian clearing, flow diversion and enclosure, and hydrological and water quality changes associated with impervious surfaces.*

Rural *- Aquatic features that are located within agricultural/forest land and are affected by riparian clearing, livestock access, irrigation withdrawal, channelization, impoundment and point source water quality impacts.*

Urban/Rural Interface *- Aquatic features located at the edge of expanding urban settlement, where there is growing pressure to convert land from rural to urban use which may affect freshwater habitat values.*

Less Disturbed *- While this manual does not apply to rural forested watersheds that are relatively undisturbed, many urban or rural watersheds remain undisturbed in their headwater areas. In these instances, this manual would apply to these less disturbed areas of watershed.*

The following definitions apply throughout this manual:

Watercourse *- a well defined channel containing flowing water for at least part of the year, which supports a community of plants and animals within the channel and its associated riparian zone. Watercourses can be* ***ephemeral*** *(watercourse that flows briefly in direct response to precipitation in the immediate locality and whose channel is at all times above the water table),* ***intermittent*** *(watercourse that flows in contact with the groundwater table only at certain times of the year when the groundwater table is high and/or when it receives water from springs or from some surface water source such as melting snow in mountainous areas), or* ***permanent*** *(watercourse that flows continuously throughout the year). Watercourses do not include features lacking a well defined channel i.e., lakes and some wetlands.*

Inventory *- the collection of information. In the context of natural resources, inventory requires measurement of objects and features, but no interpretation regarding their importance or value (see assessment below). Inventory data are typically derived from field surveys, and minimal professional judgement is required other than interpretation of inventory data descriptions and definitions.*

Assessment *- to determine the importance, value or condition of what has been inventoried. In the context of natural resources, assessment requires interpretation of data collected through an inventory method. Assessment can sometimes be derived during field surveys, although in these professional judgement and experience is applied.*

Fish Habitat *- spawning grounds and nursery, rearing, food supply and migration and holding areas on which fish depend directly or indirectly to continue their life history cycle.*

Relationship of this Manual to Other Inventory Methods

A variety of methods are currently used to inventory habitat and resource in urban areas. Many of these methods were reviewed and used to supplement SHIM methods. It is also important to recognize the specific program/project objective of each method or inventory procedure. The relationship of this manual to several other methods currently used in B.C. is presented below.

Streamkeepers

The Streamkeepers Manual: A Practical Guide to Stream and Wetland Care (Taccogna and Munro, 1995) was prepared as part of FOC's (DFO) Streamkeeper Program. The guide describes several fish and fish habitat inventory techniques, and is used primarily by volunteer stewardship groups for local fish and fish habitat monitoring and to understand specific restoration and enhancement potential.

Urban Salmon Habitat Program (USHP)

The USHP document Urban Salmon Habitat Program Assessment and Mapping Procedures for Vancouver Island (Michalski, Reid and Stewart 2000) provides a watercourse assessment method for volunteer stewardship groups. The document outlines a procedure for completing USHP inventory and mapping projects, and a process for identifying and prioritising future habitat restoration projects.

The SHIM manual is intended to complement, not replace, the Streamkeepers and USHP manuals. Determining which inventory method to use will depend on the project objectives, training and expertise, available equipment and survey tools, level of funding and computing. Generally, Streamkeepers and USHP information will be suitable when community based stewardship groups are collecting watercourse information, and for providing a general description of the watershed i.e., information at the reconnaissance level. The USHP manual is helpful for identifying enhancement and restoration opportunities in a watershed, and is generally considered to include a more intense level of assessment and data interpretation than Streamkeepers methods. SHIM methods can augment other methods, but should be used when the information is collected by professionals (biologists/fisheries technicians, or trained and certified community members), and when detailed spatial tied to technical information on an aquatic system is required.

RIC Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Manual

The Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Manual (RIC, 1997) is a Resources Inventory Committee manual, which replaces the Lake and Stream Inventory Standards and Procedures (RIC Draft, 1995). The manual describes a sample-based survey method intended to provide inventory information about watercourse and lake biophysical

characteristics as well as fish species presence/absence characteristics, distribution and relative abundance in forested watersheds. The intended audience of this manual is fisheries professionals (biologists/fisheries technicians). The SHIM method is intended to complement the Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Manual, and serve as its urban counterpart. However, if detailed mapping is essential or required, SHIM methods can be adopted for use in any watercourse across British Columbia.

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