

A winter landscape with snow-covered evergreen trees and a small stream. The scene is set in a forest with tall, dark evergreens and a ground covered in a thick layer of white snow. A small stream flows through the center of the image, reflecting the sky and trees. The sky is a pale, overcast blue with soft white clouds. The overall atmosphere is serene and quiet.

RIVER OF GOLDEN DREAMS WATERSHED MANAGEMENT PLAN

WHISTLER, BRITISH COLUMBIA

**PREPARED BY
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**PREPARED FOR
RESORT MUNICIPALITY OF WHISTLER PARKS & RECREATION
DEPARTMENT**

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River of Golden Dreams Watershed Management Plan Mapping Series 2001

Map 3 River of Golden Dreams Watershed Overview



Legend

	Subsidiary Boundary		Service Corridor
	Watershed Boundary		Trailway
	Water Course		Forest Road
	Hydrology		Highway
	Seasonal Stream		Municipal Boundary
	Lake		
	Wetland		

Scale 1:20000



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River of Golden Dreams Watershed Management Plan

Cover photo by Jillian Moule

ABBREVIATIONS

AWARE	Association of Whistler Area Residents for the Environment
BCAL	British Columbia Assets and Land Corporation
BMP	Best Management Practices
FWAC	Forest and Wildlands Advisory Committee
HIT	Habitat Improvement Team
LRUP	Local Resource Use Plan
PAH	Polycyclic aromatic hydrocarbons
PAN	Protected Areas Network
RMOW	Resort Municipality of Whistler
WFSG	Whistler Fisheries Stewardship Group
WORCA	Whistler Off Road Cycling Association

GLOSSARY

Adaptive Management The rigorous combination of management, research and monitoring so that credible information is gained and management activities can be modified by experience.

Aquatic Growing, living in or pertaining to water.

Best Management Practices Tools, including structures, policies and procedures, that are designed to reduce impacts on the watershed.

Carrying Capacity Number of organisms which a habitat can support without damaging organisms or habitat.

Ecosystem A functional unit consisting of all the living organisms (plants, animals and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size (a log, pond, field, forest, or the earth's biosphere) but it always functions as a whole unit.

Ecosystem Management A holistic approach to managing our environment and making land use decisions. It recognizes that our living environment is a complex, living system that must be protected as an interconnected system rather than simply a collection of separate parts.

Erosion Movement of soil by water and wind.

Flood Stream flow greater than the channel can contain.

Floodplain Area along a stream or river subject to flooding.

Habitat An area that provides the necessary food, water and shelter for an organism.

Impervious Area Impervious surfaces, such as paved roads, rooftops and highly compacted soils, reduce infiltration into underlying soils, increasing both the rate and amount of surface runoff entering stream channels.

Naturescaping Landscaping and gardening to create green spaces for wildlife and to preserve or restore damaged or lost habitat.

Riparian Area The land adjacent to the normal high water line in a stream, river, lake or pond and extending to the portion of land that is influenced by the presence of the adjacent ponded or channeled water. Riparian areas typically exemplify a rich and diverse mosaic reflecting the influence of available surface water.

Subwatershed Smaller watersheds within the larger watershed of focus.

Total Impervious Area: the total percent area of a watershed where water does not infiltrate the soil. Total impervious area is becoming more commonly utilized as a key indicator of watershed health and in developing appropriate management strategies.

Watershed A watershed, or a drainage basin, is an area of land defined by its highest elevations from which water, such as rainfall and snowmelt, drains towards a single point. A watershed drains water into a stream, which drains into a larger stream, river, lake or ocean. Watersheds represent a defined area of land in which ecological structure, functions and processes are tightly intertwined and inextricably connected to human activities and land use.

Wetland Land that is saturated with water long enough to promote wetland or aquatic processes; indicated by poorly drained soils and biological activity that is adapted to a wet environment.

INTRODUCTION

The development of a watershed management plan for the River of Golden Dreams is aimed at helping to protect and restore where possible the ecological health of this central Whistler Valley system. The implementation of the *River of Golden Dreams Watershed Management Plan* will further help to maintain the long-term social and economic viability of the Whistler community which is largely connected to the health and beauty of its natural environment. As part of Whistler's comprehensive movement towards environmental sustainability, this plan lays out Goals, Objectives, and recommended Actions for maintaining and improving watershed health, with a focus on stream, wetland and riparian areas.

The development of the *River of Golden Dreams Watershed Management Plan* was initiated by the Resort Municipality of Whistler (RMOW) Parks & Recreation Department, in partial fulfilment of the *Whistler Environmental Strategy*. Several important Tasks outlined in Chapter 5 of the *Whistler Environmental Strategy* include developing watershed management plans for 5 stream systems that lie within the River of Golden Dreams watershed. The development of a comprehensive watershed management plan for the River of Golden Dreams watershed will accomplish this Task. The *River of Golden Dreams Watershed Management Plan* will also help to accomplish further Tasks outlined in the *Whistler Environmental Strategy*, including conservation area tasks, stream and lake stewardship tasks, water supply and distribution tasks, and water conservation tasks.

The *River of Golden Dreams Watershed Management Plan* is also intrinsically connected to the Whistler Sustainability Project, which is utilizing The Natural Step as its fundamental framework. The Natural Step framework is based on science and serves as a compass for businesses, communities, academia, government agencies and individuals working to redesign their activities to become more sustainable. The Natural Step framework recognizes that what happens in one part of a natural system affects every other part of that system, similar to the way that everything occurring in a watershed has downstream effects. The Natural Step framework outlines 4 system conditions that must be fulfilled in order for any society to be sustainable. The four system conditions are as follows:

1. nature's functions and diversity are not systematically subject to increasing concentrations of substances extracted from the earth's crust;
2. nature's functions and diversity are not systematically subject to increasing concentrations of substances produced by society;
3. nature's functions and diversity are not systematically impoverished by physical displacement, overharvesting, or other forms of ecosystem manipulation; and
4. resources are used fairly and efficiently in order to meet basic human needs globally.

The *River of Golden Dreams Watershed Management Plan* aims to meet the spirit of these system conditions, specifically the third condition. Recognizing that development and land use activities have already impacted the functions and conditions of the watershed, the development of this plan strives to ensure that the functions and diversity of the River of Golden Dreams watershed will not be further degraded.

The *River of Golden Dreams Watershed Management Plan* emphasises the importance of a watershed approach to the protection and restoration of our local streams and habitat. Just as the protection of headwater tributaries helps preserve the valuable fish habitat of the watershed's lower reaches, the protection of the River of Golden Dreams watershed helps to preserve the ecological integrity of the systems into which it flows, like the Green River, the Lillooet River, and so on. The River of Golden Dreams Watershed Management Plan, just like the River of Golden Dreams itself, is simply a sub-component of a larger framework. The positive effects of stewardship in the River of Golden Dreams watershed, guided in part by the River of Golden Dreams Watershed Management Plan, become part of the larger river continuum and will continue to flow downstream from system to system. In this way, the *River of Golden Dreams Watershed Management Plan* is a notable step towards protecting other water resources in the Whistler Valley and beyond. As the River of Golden Dreams flows into Green Lake and the Green, Lillooet, Harrison and Fraser river systems, it is critical to minimize our impacts which affect not only our local systems but also the quality of water resources far downstream.

The *River of Golden Dreams Watershed Management Plan* is intended for use by all watershed stakeholders. RMOW Council approved the plan in December 2001 as a guiding policy document within the River of Golden Dreams watershed. It is hoped that other participating stakeholders will support the plan as an agreement in principle and will help fulfil the recommended Actions.

Protecting the ecological health of the River of Golden Dreams watershed will require concerted action by local government, residents and other stakeholders. The development of this watershed management plan has already entailed the commitment and cooperation of various community organizations and individuals, but the challenge has only just begun. As community and local government leaders uphold the directives of this plan, the values and inherent rewards of a healthy local watershed will become more and more apparent. Through responsible stewardship – which is the underlying basis of all recommended Actions in this plan – we will achieve the vision of a healthy watershed, protected and restored from the pressures of land use and human activities.

WATERSHED MANAGEMENT PLANNING

The health of water resources across the continent has long been deteriorating in response to growth, urban development, and natural resource extraction. Watersheds of every scale are being impacted by our actions, and the toll is revealing itself in numerous ways including the degradation of waterways and the decline of habitat and important fish populations. Partially in response to these negative effects, and more generally as the result of a greater holistic understanding of the environment, resource managers have begun to take a different approach to the management of our natural resources. This *ecosystem management* approach recognises that our environment is a complex, living system that must be managed as an interconnected system rather than simply a collection of separate parts (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995).

Watersheds are areas that lend themselves as natural and logical candidates for ecosystem management (Center for Watershed Protection 1998a; Charlton and Tufgar 1991; Ontario Ministry of Environment and Energy and Ontario Ministry of Natural Resources 1993a, 1993b, 1994; Riley 1998; Royal Commission on the Future of the Toronto Waterfront 1990; Schueler 1994b; UMA Environmental 1998). A watershed, or a drainage area, is an area of land defined by its highest elevations from which water, such as rainfall and snowmelt, drains towards a single point. A watershed can be as small as a basin that drains into a tiny creek or as large as the Fraser River basin which drains more than 25% of British Columbia's area (Fraser Basin Council 1997). Watersheds represent a defined area of land in which ecological structure, functions and processes are tightly intertwined and inextricably connected to human activities and land use. In other words, watersheds are bounded regions that may be broadly considered as ecological systems. Watersheds are integrated systems, meaning that effects in one part of the system are not isolated. What happens upstream in a watershed will have effects downstream and surrounding land use can significantly impact the quality of water resources (Center for Watershed Protection 1998a).

Watershed management may be defined as the process of managing human activities in an area defined by watershed boundaries in order to protect and restore land and water resources (Center for Watershed Protection 1998a; Ontario Ministry of Environment and Energy and Ontario Ministry of Natural Resources 1994 and 1993a; UMA Environmental 1998). The concept of watershed management encompasses the ecosystem approach by establishing ecological goals while recognising the benefits of planned growth and development to the social and economic well being of an area (Ontario Ministry of Environment and Energy and Ontario Ministry of Natural Resources 1994 and 1993a).

As a tool for assisting land and water use decision makers in making better decisions, watershed management planning can contribute to the environmental, social and economic health and sustainability of an area. Watershed management involves making decisions about the amount and location of development and choices about appropriate land use management techniques. By recognising the hydrologic cycle as the “pathway” integrating physical, chemical and biological processes, it is an ecosystem-based strategy aimed at achieving sustainability (Center for Watershed Protection 1998a; Ontario Ministry of Environment and Energy and Ontario Ministry of Natural Resources 1994 and 1993a; Still Creek-Brunette Basin Work Group 1996; UMA Environmental 1998).

THE RIVER OF GOLDEN DREAMS WATERSHED: A BRIEF OVERVIEW

The River of Golden Dreams watershed drains an area of 48km² and hosts a variety of land uses including commercial, residential and recreational (e.g. golf courses and ski area) development. A large, undeveloped portion of the watershed lies on Crown Land within the Soo Timber Supply Area, which has previously undergone extensive timber harvesting throughout the 1930s – 1970s. Water quality is a key issue as two tributaries to the River of Golden Dreams, Twenty One Mile Creek and Agnew Creek, provide approximately 85% of Whistler's community water supply. The River of Golden Dreams watershed also accommodates multiple recreation uses, including Whistler Mountain ski area, two world class golf courses, and numerous backcountry activities. The River of Golden

Dreams itself accommodates thousands of canoes and kayaks every year as recreationists follow the river's meandering passage from Alta Lake to Green Lake through the heart of the Whistler valley.

For further details on the conditions and uses of the River of Golden Dreams watershed, please refer to the *River of Golden Dreams Background and State of the Watershed Report*.

RIVER OF GOLDEN DREAMS WATERSHED MANAGEMENT PLANNING PROCESS

The *River of Golden Dreams Watershed Management Plan* initiative began in June 2000. The plan has been developed by the project Coordinator in conjunction with the Working Group and Tier 2 stakeholders. This section briefly outlines the various stages and activities involved in the development of the management plan.

Project Coordinator

In June 2000, a Coordinator was hired to develop a watershed management plan for the River of Golden Dreams. This position has involved extensive research on various topics relating to watershed management, in addition to research concerning watershed conditions and key issues of concern.

Stakeholder Identification and Assembly

The Coordinator identified current key landowners, decision makers and other stakeholders with a strong interest or involvement in River of Golden Dreams watershed issues. Stakeholders were contacted and invited to participate in the development of the watershed management plan. Stakeholders were then divided into two main groups, the Working Group consisting of key community stakeholders (see **Table 1.0**), and a broader group of Tier 2 stakeholders (see **Table 2.0**).

Working Group Meetings

The Working Group has been meeting monthly since July 2000 to assist the Coordinator in developing the directions and components of the watershed management plan. In the early stages, key issues within the watershed were identified by the Working Group, and from there a Vision, Goals, Objectives and recommended Actions for the watershed were collectively developed.

Stakeholder Dialogue

The Coordinator continually communicated the progress of the Working Group to the Tier 2 stakeholders, requesting feedback on the directions and content of the management plan. This feedback was then communicated to the Working Group, and amendments were continually made to the draft plan according to Tier 2 input. In addition to the participation of the Working Group and Tier 2 stakeholders, other interested stakeholders have also reviewed the plan and their input has been incorporated.

Research and Assessment

The Coordinator was responsible for compiling the *River of Golden Dreams Background and State of the Watershed Report*, which outlines the currently known basic land use and biophysical conditions of the watershed.

Mapping

At the initiation of this project, existing maps of the River of Golden Dreams watershed were found to be incomplete or inadequate. A compilation from various sources has led to the development of a more comprehensive base mapping inventory for the watershed, which will continue to be expanded as resources allow. Base maps for the watershed have been developed in tandem with the watershed management plan, and mapping content has been guided in part by the Working Group.

Public Information

The Coordinator has provided local newspapers with interviews regarding the development of the *River of Golden Dreams Watershed Management Plan*. Several presentations have been made throughout the community to interested groups, such as AWARE and the WFSG. BC Rivers Day festivities (September 2001) provided an opportunity for unveiling the draft plan to the community through an Open House event. The Open House was widely publicized in local papers, radio and television. More than 50 people attended the Open House to learn about the draft plan and provide feedback. A summary of the project was also developed and, along with copies of the draft plan, distributed at various locations throughout the community to raise public awareness about this initiative.

Approval by RMOW Council

In November 2000, an information report was presented to RMOW Council regarding the development of the *River of Golden Dreams Watershed Management Plan*. At this time, Council vocalized their support of the initiative.

On December 17, 2001, the RMOW Parks and Recreation Department presented the *River of Golden Dreams Watershed Management Plan* to RMOW Council (in the form of an Administrative Report) for approval as a guiding policy document. RMOW Council approved the plan and will implement the recommended Actions subject to available funding.

Table 1.0 Working Group members

Representative	Organization
Christina Symko, Consultant	Project Coordinator
Channa Pelpola, Stewardship Supervisor Heather Beresford, Parks Supervisor (resigned)	RMOW Parks & Recreation
Jan Jansen, Manager Parks Planning Tom Awram, Parks Planner (resigned)	RMOW Parks & Recreation
Steve Black, Manager Transportation & Drainage (resigned)	RMOW Public Works
Kim Needham, Senior Planner	RMOW Planning & Development
Chris Laing, Planning Technician (resigned)	RMOW Planning & Development
Chris Bishop, Planning Analyst (RMOW), Member (WORCA)	RMOW Planning & Development Whistler Off Road Cycling Association (WORCA)
Jennifer James, Utilities Labourer Nelson Bastien, Utilities Supervisor	RMOW Public Works
Don MacLaurin, Advisor	RMOW Forest & Wildlands Advisory Committee (FWAC)
Steve Patterson, Natural Resource Scientist Dave Williamson, Principal	Cascade Environmental Resource Group Ltd.
Bob Brett, Ecologist	Snowline Ecological Consulting Author, Emerald Forest Management Plan
Eric Crowe	Whistler Angling Club/ Whistler Fisheries Stewardship Group (WFSG)
Inge Flanagan, 1 st Vice President Stephane Perron (resigned) Max Gotz (resigned)	Association of Whistler Area Residents for the Environment (AWARE)
Grant Lamont Tim Malone	Whistler Outdoor Experience
Keenan Moses	X-plore International
Arthur DeJong, Mountain Planning & Environmental Resource Manager	Whistler/Blackcomb
Tom Eddie	Watershed resident
Scott Fennell	Watershed resident

Table 2.0 Tier 2 stakeholders

Representative	Organization
Joe Paul, Manager Development Services	RMOW Public Works
Mike Purcell, General Manager	RMOW Planning & Development
Bill Barratt, General Manager	RMOW Community Services
Bob MacPherson, Senior Planner	RMOW Planning & Development
Brian Barnett, General Manager	RMOW Public Works
Keith Bennett, Manager Park Operations	RMOW Parks & Recreation
Randy Symons, Maintenance Supervisor	RMOW Parks & Recreation
Ken Melamed, Councillor	RMOW Council
Rob Bell-Irving, Community Advisor	Department of Fisheries and Oceans
Mike Engelsjord, Habitat Auxiliary	Department of Fisheries and Oceans
Pamela Zevit, Aquatic/Terrestrial Habitat	BC Ministry of Water, Land & Air Protection

Specialist	
Rob Knight, Stewardship Advisor	BC Ministry of Water, Land & Air Protection
Valerie Cameron, Head of Wshd. Mgmt.	BC Ministry of Water, Land & Air Protection
Mike Willcox, Environmental Assessment Officer	BC Ministry of Water, Land & Air Protection
Norbert Greinacher, Planning Officer Paula Griffin, Planning Technician	BC Ministry of Forests, Squamish District
John Crooks, Resource Officer Recreation/Range	BC Ministry of Forests, Squamish District
Elizabeth Eldridge, Commercial Recreation Coordinator	BC Assets & Land Corporation
Steve Olmstead, Manager, Planning & Development	Squamish-Lillooet Regional District
Randy Lewis	Squamish Nation
Liz Jones	Lil'wat Fisheries Commission, Mount Currie Indian Band
Barry Wilkinson, Community Relations Coordinator	BC Hydro
John Brodie, Corporate Environmental Services	BC Rail Ltd.
Jim Hegan, Acting Area Manager Brian Lee, Area Manager (resigned)	BC Ministry of Transportation & Highways
Steve Drummond, General Manager	Capilano Highway Services Company
Tamsin Baker	The Land Conservancy of British Columbia
Dave Gottselig, Superintendent	Whistler Golf Course
Tim Wake	Whistler Housing Authority
Jay Symons, Manager	Edgewater Lodge
Don Gamache	Powder Mountain snowmobilers
Todd Bush	Alpine Club of Canada
Darren Burns, Superintendent	Nicklaus North Golf Course

Other stakeholders who have reviewed the plan include:

- Veronica Sommerville (Fish Technician, RMOW);
- Dave Waldron (Coordinator, Whistler Sustainability Project);
- John Clarke (Administrative Forester, Terminal Forest Products Ltd.); and
- Mike Wallace (Soo Coalition for Sustainable Forests Society).

STRUCTURE OF THE RIVER OF GOLDEN DREAMS WATERSHED MANAGEMENT PLAN

The *River of Golden Dreams Watershed Management Plan* includes a **Vision** for the watershed, six fundamental **Goals** and a series of **Objectives** and recommended **Actions**.

Vision

The *River of Golden Dreams Watershed Management Plan Vision* represents the overall picture of the desired state of the watershed into the future. This **Vision** is, by nature, expansive and meant to portray the holistic desire for an ecologically healthy watershed.

Goals

There are 6 fundamental **Goals** outlined in the *River of Golden Dreams Watershed Management Plan*. The **Goals** are more focused than the **Vision**, and simply outline the general goals of the watershed management plan.

Objectives

A series of **Objectives** accompanies each **Goal**. These **Objectives** are more detailed than the **Goals** and outline the more specific aims of the plan.

Actions

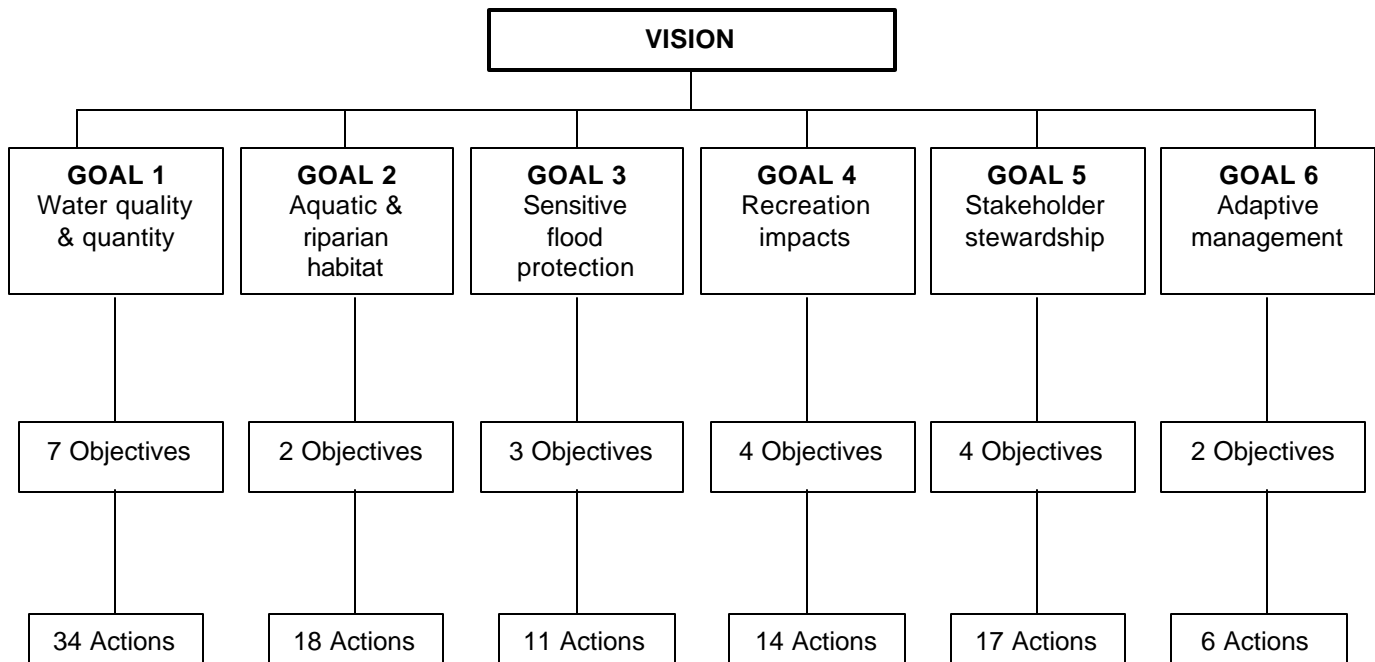
Finally, a series of recommended **Actions** accompanies each **Objective**. These **Actions** outline the various tasks meant to achieve each specific **Objective**. Suggested lead stakeholders and priority status accompany each

recommended **Action**. Combined, the fulfilment of these **Actions** will work towards achieving the **Objectives, Goals and Vision** of the *River of Golden Dreams Watershed Management Plan*.

Related Actions

A set of **Related Actions** is listed at the end of the **Actions** for each **Objective**. As watershed management planning involves many issues that are intrinsically interconnected, the completion of one **Action** can often help to achieve multiple **Objectives**. The **Related Actions** describe any of those listed beneath other **Objectives** that will help fulfil the **Objective** being discussed.

Figure 1.0 Structure of the River of Golden Dreams Watershed Management Plan



The following **Vision** was developed for the River of Golden Dreams watershed:

The River of Golden Dreams watershed will support the sustainable ecological integrity of its representative aquatic and terrestrial ecosystems. Through effective management, these ecosystems will be protected and restored from the pressures of land use and human activities.

The six fundamental **Goals** developed for the *River of Golden Dreams Watershed Management Plan* are as follows:

1. *Water quality and quantity are protected and restored in all streams, lakes and wetlands within the River of Golden Dreams watershed.*
2. *The River of Golden Dreams watershed supports healthy, protected networks of riparian and aquatic habitat.*
3. *Potential flooding risks to life and property within the River of Golden Dreams watershed are minimized through ecologically sensitive means.*
4. *The River of Golden Dreams watershed experiences minimal ecological impacts of diverse recreation opportunities.*
5. *River of Golden Dreams watershed stakeholders demonstrate cooperative stewardship.*
6. *Watershed management initiatives within the River of Golden Dreams watershed reflect the principle of adaptive management.*

The following pages contain the Goals, Objectives, and recommended Actions of the *River of Golden Dreams Watershed Management Plan*.

1.0 GOAL

WATER QUALITY AND QUANTITY ARE PROTECTED AND RESTORED IN ALL STREAMS, LAKES, AND WETLANDS WITHIN THE RIVER OF GOLDEN DREAMS WATERSHED.

1.1 OBJECTIVE

Sustain the raw surface water provided by Twenty One Mile Creek and Agnew Creek watersheds for Whistler's community water supply at a high quality so as to require minimal treatment in order to meet or exceed drinking water quality guidelines.

This Objective emphasizes the importance of maintaining a high quality of raw surface water to minimize potential health risks (e.g. waterborne disease) to the RMOW community water supply provided by Twenty One Mile and Agnew Creek. Historic timber harvesting and its associated road networks within these watersheds have contributed to erosion and unstable soil conditions. Erosion results in elevated water turbidity, which is known to act as a vehicle for bacterial transport. Forest integrity in upland and riparian areas is important in maintaining high surface water quality in Twenty One Mile Creek and Agnew Creek which comprise a major portion of Whistler's drinking water supply.

High motorized and non-motorized recreation use also occurs within these two watersheds. Recreational use of watersheds has been found to result in elevated levels of fecal coliforms and *Cryptosporidium* oocysts in water sources. Motorized recreation activities also result in the emission of polycyclic aromatic hydrocarbons (PAHs), which are deposited into snowpack and can degrade the chemical water quality of streams.

Minimizing risks to drinking water quality at the source is critical. Protection of the RMOW surface water supply can be achieved in part by proper management of land use activities within the Twenty One Mile Creek and Agnew Creek watersheds. Currently much of the area of these two watersheds lies on Crown Land outside of the RMOW boundary, hence land use activities occur under the jurisdiction of provincial government agencies. Public education is also critical in achieving effective protection of water supply resources.

1.1.1 Action

Finalize a formal agreement between RMOW and BC Ministry of Forests and/or the Ministry of Sustainable Resource Management (now responsible for strategic planning on Crown Lands) ensuring that there will be no future commercial timber harvesting within the Twenty One Mile Creek and Agnew Creek watersheds above the municipal water intakes to help maintain and protect raw surface water quality.

This Action entails two parallel initiatives:

- a) expand RMOW jurisdictional boundaries to include the entire Twenty One Mile Creek watershed area so as to gain local control over this significant water supply resource. The fulfilment of this initiative would give the RMOW critical legal control over activities within these water supply watersheds, allowing the municipality to prohibit activities which may serve to degrade water supply sources.
- b) establish these 2 watersheds as Special Management Zones (BC Ministry of Forests designation) or other similar designation through the Sea to Sky Local Resource Management Plan process.

Lead Stakeholders: RMOW Planning & Development (initiative a), RMOW Parks & Recreation and FWAC (initiative b)

Priority: High

1.1.2 Action

Utilizing ecologically sound techniques (e.g. state of the art bioengineering), stabilize existing slide locations in the Twenty One Mile Creek watershed above the municipal water intake to reduce potential erosion into water supply sources. All affected streams should be restored to natural drainage patterns.

This Action targets the major known slide on the access road near the municipal water intake, as well as other known slides within the watershed (for more detailed information on slides, see *International Proper Functioning Condition Symposium Final Report*, various geotechnical reports prepared for RMOW Public Works Department, and JCH maps).

Lead Stakeholders: RMOW Public Works, RMOW Parks & Recreation

Priority: High

1.1.3 Action

Initiate the deactivation and rehabilitation of historic logging roads, utilizing ecologically sound and up to date techniques, in the Twenty One Mile Creek and Agnew Creek watersheds which are not heavily used as recreation trails to help maintain and protect raw surface water quality. Ensure that all other remaining access and recreation roads are restored and maintained to BC Forest Practice Code standards.

Road locations to be targeted should be designated using BC Ministry of Forests forest cover maps. Prioritize roads for deactivation according to risk to water supply quality (e.g. sediment contribution, slide potential). Deactivation work should be accomplished from top to bottom, as access roads will be required for deactivation. Deactivation should include effective restoration of affected stream channels to natural drainage patterns.

Twenty One Mile Creek and Agnew Creek are currently not high priority watersheds with regards to Forest Renewal BC's Watershed Restoration Program project list. Twenty One Mile Creek is listed as a "key" watershed, due to its status as community water supply provider, but is not currently in line for Forest Renewal BC funding. One option for funding includes RMOW (or other) performing an assessment, following Forest Renewal BC guidelines, of existing/potential problem areas, highlighting risk to water supply quality, showing partnership potential, and submitting application for Forest Renewal BC "leftover" funds which may be utilized for high priority or high public interest projects. Other parties may also independently fund and perform road deactivation, but must go through Forest Renewal BC's Watershed Restoration Program approval process.

Lead Stakeholders: RMOW Parks & Recreation, FWAC, RMOW Public Works

Priority: Medium

1.1.4 Action

Prohibit motorized and commercial recreation activities within the Twenty One Mile Creek and Agnew Creek watersheds above the municipal water intakes (e.g. snowmobiles, ATVs, dirt bikes, helicopters) to protect and maintain the quality of raw surface water, and pursue mechanisms which will allow enforcement.

Currently, the Whistler Local Resource Use Plan (LRUP) Forest Recreation Plan prohibits motorized activities within the Twenty One Mile Creek watershed area above the municipal water intake. However, the guidelines provided by this document are not legally enforceable. Through the fulfilment of Action 1.1.1 (initiative b), the LRUP area (or the Twenty One Mile Creek watershed area) could be designated as a Ministry of Forests Special Management Zone which would incur legal jurisdiction to enforce this policy.

This Action may also be accomplished in part through the BC Assets & Land Corporation (BCAL) tenure application process. The RMOW responds to BCAL regarding tenure applications, and should advise rejection of all applications for motorized and commercial recreation ventures. The RMOW should also request that BCAL communicate with relevant user groups to communicate the policy.

Enforcement options include better management of access routes, increased education on potential negative impacts of these activities, removal of relevant trail routes currently provided in snowmobile, ATV, etc. terrain maps and guidebooks, and better communication with user groups. Managers might also consider the creation of a full time "watershed information/stewardship officer" position (see Action 1.1.7) to enforce prohibition and/or limitations on motorized recreation activities and to assist in public education regarding drinking water supply watershed protection issues.

If Action 1.1.1 is accomplished through an extension of RMOW boundaries (initiative a), then this Action could be supplemented with municipal bylaws and subsequent enforcement.

Lead Stakeholders: RMOW Parks & Recreation, FWAC

Priority: High

1.1.5 Action

Assess non-motorized recreation (e.g. hiking, biking, camping, backcountry skiing) activities within the Twenty One Mile Creek and Agnew Creek watersheds above the municipal water intakes to determine use numbers, patterns, impacts and potential risks to water supply. Subsequently, take steps to manage activities in order to minimize impacts and potential risks to raw surface water quality. A study on recreational use, patterns and risk to the water supply is currently being undertaken by the RMOW Public Works Department as a component of the *Long Term Water Supply Study Update*.

Management decisions should be made according to risk factors. For instance, if Twenty One Mile Creek is to remain a major water supply source for the RMOW and current types and levels of use present a significant risk to water quality, then non-motorized access to the watershed will be controlled. If limiting access is required, managers should consider implementing a user-pay system to help manage use numbers and patterns.

If non-motorized recreation is to continue within the Twenty One Mile Creek watershed, monitor the effectiveness of existing pit toilets with regards to maintaining high water quality and, if necessary, replace with alternative low impact sanitation facilities.

Lead Stakeholders: RMOW Public Works, RMOW Parks & Recreation

Priority: High

1.1.6 Action

As non-motorized recreation continues pending the fulfilment of Action 1.1.5, increase community and visitor awareness and education initiatives regarding human-posed risks to water quality when recreating in a water supply watershed to help minimize behaviour that could prove detrimental to raw surface water quality.

This Action could be accomplished by increased signage at main access points to community water supply watersheds (e.g. trailheads), and through the development and/or revision of relevant RMOW brochures and other relevant printed information (e.g. Rainbow Madely Trail brochure, phone book trail summaries). Signage and brochures should emphasize the importance of adhering to recommended behaviour, such as using provided sanitation facilities, and state possible consequences of doing otherwise. Clarify the connections between human use of the watershed and risks to the quality of the community water supply.

Participation of other recreation stakeholder groups (e.g. Alpine Club of Canada) should be initiated to assist in watershed education and protection initiatives.

Lead Stakeholders: RMOW Parks & Recreation

Priority: High

1.1.7 Action

If non-motorized recreation is to continue in the Twenty One Mile Creek watershed area, pending the outcome of Action 1.1.5, create a "Watershed Protection Officer" type of position to traverse the watershed.

This position could be responsible for performing a critical role in public education regarding appropriate behaviour in drinking water supply watersheds. The position could also be responsible for assisting in maintenance of trails, maintaining sanitation facilities, and monitoring and/or enforcing prohibition and/or limitations on motorized and non-motorized recreation activities (depending on jurisdictional issues outlined in Action 1.1.1). This position could also be assigned the role of monitoring activities and providing relevant information regarding recreation activities and habitat protection in other sensitive areas throughout the watershed (e.g. this position could perform the ranger function recommended for the Emerald Forest (Brett 2001) and other RMOW Protected Areas Network (PAN) 1

conservation areas). The work schedule of this position should reflect both seasonal and weekly use patterns of recreation activities throughout the watershed (e.g. high summer weekend use of Twenty One Mile Creek area).

Lead Stakeholders: RMOW Parks & Recreation
Priority: High (pending fulfilment of Action 1.1.5)

1.1.8 Action

Add a clause to the draft RMOW *Animal Control Bylaw*, prohibiting dogs within the Twenty One Mile Creek and Agnew Creek community watersheds above the municipal water intakes to protect raw surface water quality.

This Action may be enforced by the presence of a RMOW bylaw officer during heavy use periods at strategic access locations (e.g. Rainbow Trailhead) and might also be monitored by the new position suggested in Action 1.1.7.

In conjunction with this initiative, increase community and visitor education regarding the prohibition of dogs within these water supply watersheds. Signage at trail access points should be amended to include a basic but thorough explanation of potential health risks to the community water supply as a result of high numbers of dogs in the watersheds. Signage should also include the RMOW bylaw citation (if passed) and a map of alternate routes where dogs are permitted. The Rainbow-Madely trail brochure and the Whistler animal control brochure should also be adapted to include this information. Authors/publishers of relevant hiking guidebooks and maps should also be contacted and asked to include mention of the 'no dogs' policy for Whistler drinking water supply area trails.

Lead Stakeholders: RMOW Parks & Recreation, RMOW Bylaw
Priority: Medium

1.1.9 Action

Pending the fulfilment of Action 1.1.1, prohibit the application of pesticides related to timber harvesting objectives within the Twenty One Mile Creek and Agnew Creek community watersheds above the municipal water intakes to help protect raw surface water quality.

This Action should be accomplished through a formal agreement between Terminal Forest Products Ltd. (current forestry license holder) and the RMOW, recognizing the importance of these watersheds to Whistler's water supply.

Lead Stakeholders: FWAC
Priority: High

1.1.10 Action

Develop and implement innovative programs to provide consumers with information about drinking water, as well as provide individuals and the community with ways to get involved with protecting the quality of community drinking water sources. Community water supply protection efforts may be enhanced as citizens become actively involved in the assessment and protection of drinking water sources. Public education initiatives might include elementary and secondary schools.

Such programs might include a forum for providing relevant and appropriate information to the public regarding water source protection efforts and management strategies. Such programs might also include the development of a process for public input, and education.

Models of such programs can be found in the United States, where each state is required to develop a *Source Water Assessment and Protection Program* (SWAP). Colorado's SWAP, for example, encourages community-based protection and preventative strategies to help ensure the safe quality of all public drinking water sources.

The initiatives recommended by this Action have potential to be linked with the Whistler Sustainability Project.

Lead Stakeholders: RMOW Public Works
Priority: Medium

Objective 1.1 – Related Actions

- Action 1.2.1
- Action 2.2.3
- Action 2.2.6
- Actions 4.2.1 – 4.2.2
- Actions 4.3.1 – 4.3.3

1.2 OBJECTIVE

Improve community water supply testing and treatment methods.

This Objective recognizes the importance of effective water supply testing and treatment methods in distributing safe, high quality water to the public. Surface water quality testing by the RMOW on Twenty One Mile Creek and Agnew Creek sources currently includes weekly testing for bacteriological contaminants (total and fecal coliforms) on raw surface water and finished water. The RMOW also performs biannual testing of raw surface water chemistry for metals, sulphates, nitrogen (nitrates and nitrites), chloride, fluoride, total and fecal coliforms, general inorganics, and physical parameters including pH, turbidity, colour true, conductants, total suspended solids and hardness. Turbidity testing is performed constantly on the raw surface water entering the Twenty One Mile Creek and Agnew Creek water intakes (i.e. second by second).

Currently the RMOW treats surface water from Twenty One Mile Creek and Agnew Creek with chlorine gas, which eliminates some, but not all, potentially harmful bacteria in the raw surface water. An increase in chlorination is not preferred for improving water treatment methods, as recent studies indicate that that prolonged drinking of chlorinated water is linked to increased incidence of health problems. It has recently been recommended that the RMOW implement screening for the protozoan pathogens *Giardia lamblia* and *Cryptosporidium parvum* to reduce health risks (Cascade Environmental Resource Group 2001).

1.2.1 Action

Evaluate the effectiveness of the current RMOW water quality testing and treatment methods and make improvements where appropriate.

The RMOW surface water quality testing and treatment regime should be revised to reflect current best practices, as demonstrated by the US Environmental Protection Agency's "Surface Water Treatment Rule" and the most current Canadian and provincial reviews of drinking water quality standards. This will involve setting up a protocol for determining the effectiveness of the treatment system. This might also involve establishing additional water quality parameters (e.g. testing for cryptosporidium twice annually, at appropriate and constant seasonal times).

As stated in the *Whistler Environmental Strategy*, the RMOW should continue to not only meet but exceed drinking water quality requirements (currently the Guidelines for Canadian Drinking Water Quality, 6th Edition). This should include maintaining excellent raw water quality, through proactive watershed protection and/or restoration measures, to minimize the amount of chlorine treatment needed.

The RMOW might also explore the potential of installing a more comprehensive water quality monitoring array at municipal intake structures, as recommended in the *International Proper Functioning Condition Symposium Final Report*.

The RMOW could produce a quarterly water quality analysis in the form of a public report (for distribution at RMOW Municipal Hall or on RMOW internet site). This could be completed in conjunction with other public learning initiatives (see Action 1.1.10).

Lead Stakeholders: RMOW Public Works

Priority: High

Objective 1.2 – Related Actions

- Actions 1.1.1 – 1.1.10

1.3 OBJECTIVE

Minimize non-point source pollution to restore and maintain water quality capable of supporting healthy, diverse populations of appropriate aquatic vegetation, fish and aquatic invertebrates in all streams, lakes and wetlands within the River of Golden Dreams watershed.

This Objective recognizes the importance of minimizing non-point source pollution for maintaining healthy local waterways. Water pollution policy has historically been focused on control of “point” sources – sewer pipes or industrial waste outlets – where a single discharge point could be identified and corrective action taken to reduce the pollutant load to surface and ground water. In recent years, however, attention is shifting to include “non-point” sources of pollution – sources that are diverse and often difficult to identify and control that may combine to threaten water quality (e.g. agricultural or road runoff containing toxic chemicals entering into local waterways).

Since all land within a watershed drains to a common outlet, every activity on the land has the potential to affect the entire watershed. Non-point source pollution can easily be carried from the land into a watershed’s ground water, lakes, streams and wetlands, degrading water quality for vegetation and wildlife species. For example, Whistler’s stormwater network is connected to our waterways. This means that everything draining into storm drains and ditches, such as road and lawn runoff – often containing motor oil, antifreeze, soaps and pesticides – flows directly into the community’s fishbearing streams. Non-point source pollution is cumulative; it results from many actions by many different people, animals or businesses. Effective control of non-point source pollution will largely be gained through ongoing efforts to change public understanding and behaviour.

1.3.1 Action

Develop and conduct a water quality monitoring program for streams, lakes and wetlands within the watershed to increase information on baseline conditions, to help detect areas of concern, and to provide a foundation for effective mitigation. Identify poor water quality “hot spots” and seek to reduce/eliminate sources of contamination.

This program should be developed with consideration of the recommended monitoring program outlined in Action 6.1.2.

With a thorough program outline and effective training, this Action could be successful as a volunteer program and could easily be tied in with the Streamkeepers and Wetlandkeepers programs.

Lead Stakeholders: WFSG, RMOW Parks & Recreation

Priority: High

1.3.2 Action

Encourage and facilitate a significant reduction of the use of pesticides by industrial and recreational facilities within the River of Golden Dreams watershed to help minimize non-point source pollution in waterways.

This Action has the potential to be connected to The Natural Step framework in relation to the Whistler Golf Course, the Nicklaus North Golf Course, and other local facilities. Cooperative initiatives between the RMOW, the golf courses, local businesses, BC Rail, and BC Hydro should focus on advancing alternative vegetation management practices. This could be accomplished by providing information on alternative best management practices, by celebrating facilities which significantly reduce their levels of pesticide use, or if necessary through the development of a municipal bylaw establishing maximum permitted levels and appropriate seasonal conditions for pesticide use.

Lead Stakeholders: RMOW Planning & Development, Nicklaus North Golf Course, Whistler Golf Course

Priority: High

1.3.3 Action

Develop a bylaw prohibiting the cosmetic use of pesticides within the watershed (e.g. residential and commercial landscaping purposes).

This initiative should be coupled with distribution of education regarding ecologically sound lawn and garden care (e.g. brochures, newspaper advertisements) to residents, property owners, landscaping companies, and small businesses. Education initiatives could be combined with The Natural Step “toolkits” anticipated as part of the Whistler Sustainability Project. A community workshop for local landscaping companies might serve as a useful forum for education and sharing alternative techniques.

Lead Stakeholders: RMOW Parks & Recreation
Priority: High

1.3.4 Action

Prepare and distribute an information brochure for residents, property owners and small businesses about stormwater issues, non-point source pollution and relations to the quality of stream corridor habitat. This brochure should provide tips for disposal of hazardous wastes (e.g. paint, motor oil, antifreeze), tips for washing vehicles, and draining pools and hot tubs.

This Action could be combined with The Natural Step household “toolkits” anticipated as part of the Whistler Sustainability Project.

Lead Stakeholders: WFSG, AWARE, RMOW Public Works
Priority: Medium

1.3.5 Action

Install storm drains stamped with the image of a fish on them for all new developments and wherever additional opportunities arise (e.g. re-development).

Lead Stakeholders: RMOW Public Works
Priority: High

1.3.6 Action

Conduct an annual storm drain marking program with elementary schools to educate residents and visitors about urban runoff, water quality and habitat issues to help minimize non-point source pollution in waterways.

This program should be carried out in the village and all other areas with storm drain systems. In cases where storm drains are those with fish stamped on the metal grates, children can use non-toxic coloured paint to highlight the engraved fish.

Lead Stakeholders: WFSG
Priority: Medium

1.3.7 Action

Implement a RMOW water quality response program designed to attend to spills, leaching, dumping, fish kills, and similar water quality emergencies to help minimize non-point source pollution in waterways.

The water quality response program should include a direct “hot line” phone number, to be clearly advertised in local phone books and relevant municipal brochures. This phone line could potentially be connected to other RMOW hazard response lines currently in use.

Lead Stakeholders: RMOW Public Works

Priority: Medium

1.3.8 Action

Facilitate and enforce proper storage and disposal of chemicals, fuels, and other hazardous substances by commercial and industrial operations (e.g. Whistler/Blackcomb, golf courses, BC Rail, RMOW) within the watershed to help minimize non-point source pollution in waterways.

The RMOW should ensure that existing provincial guidelines and regulations related to storage and disposal of hazardous materials are being met. This could be accomplished in part by providing effective reporting, inquiry and communication opportunities for community members and businesses.

Lead Stakeholders: RMOW Bylaw

Priority: Medium

1.3.9 Action

Keep all livestock manure piles a significant distance away from streams and riparian areas to minimize potential leaching into waterways. This Action should be consistent with existing relevant provincial legislation.

Lead Stakeholders: Whistler Outdoor Experience, Edgewater Lodge

Priority: High

1.3.10 Action

Ensure adequate measures are in place to help prevent spills/derailments along transportation corridors. High standards for maintenance practices along transportation corridors should be enforced, and practices should be as ecologically sensitive as possible.

Lead Stakeholders: RMOW Public Works, BC Rail, BC Ministry of Transportation and Highways

Priority: High

Objective 1.3 – Related Actions

- Actions 1.1.4 – 1.1.9
- Action 1.4.1
- Action 1.4.3
- Action 1.5.1
- Actions 1.6.1 – 1.6.2
- Action 2.2.1
- Action 2.2.3
- Actions 2.2.6 – 2.2.8
- Action 2.2.11
- Action 2.2.14
- Action 3.2.1
- Action 4.1.8
- Action 4.4.1
- Action 6.1.2

1.4 OBJECTIVE

Minimize sources of excessive human activity related sedimentation and resulting impacts on waterways within the River of Golden Dreams watershed.

This Objective recognizes the potential negative impacts to aquatic habitat that can result from excessive sediment loading in River of Golden Dreams watershed waterways. Mountain streams are high energy systems which

commonly carry large sediment loads. However, human activities and impacts on the land can lead to excessive sedimentation beyond natural levels which negatively effects the quality of aquatic and riparian habitat. Excessive sediment loading – significant sedimentation resulting from human activities – in waterways limits the availability of clean spawning gravel in the lower reaches of streams such as Crabapple Creek and the River of Golden Dreams. Excessive turbidity caused by sedimentation can result in significant habitat degradation for fish and aquatic life, as suspended particles restrict light penetration in the water, affecting temperature, algal growth and oxygen production.

Examples of excessive sedimentation sources in the River of Golden Dreams watershed include sand and gravel from winter road runoff, erosion from historic forestry roads, erosion from multiple recreation trails, and common construction site practices.

1.4.1 Action

Select and utilize winter snow dumping sites that are located away from watercourses and riparian areas to minimize the amount of road sand and gravel entering waterways.

A training course in environmentally sensitive operations should be considered for all snow clearing employees (e.g. RMOW, local contractors, Ministry of Transportation and Highways). This training could also be incorporated as part of a more comprehensive training program (see Action 2.2.12).

The RMOW should also continue to investigate alternative means of winter road safety maintenance that will reduce the need for sand and gravel application.

Lead Stakeholders: RMOW Public Works (Roads)

Priority: High

1.4.2 Action

Implement draft RMOW construction site guidelines to minimize potential erosion and sedimentation impacts to waterways.

These guidelines should be available in brochure format at the RMOW Building Department, and distributed with relevant documents. The RMOW should also consider implementing the guidelines through inclusion in zoning bylaws.

Lead Stakeholders: RMOW Planning & Development

Priority: High

1.4.3 Action

Develop and implement a ditch and storm drain maintenance schedule aimed at minimizing potential sedimentation in waterways.

This Action could be completed as part of Action 3.2.1, the development of a RMOW stormwater management plan.

Maintenance practices could be based in part on the WFSG stream classification map for fish habitat. The maintenance schedule should recommend minimal trimming of ditch vegetation and should outline procedures for ecologically sensitive ditch re-cutting (e.g. seasonal considerations, mitigation measures such as hay bale and silt fence placement).

Lead Stakeholders: RMOW Public Works (Roads), RMOW Parks & Recreation

Priority: High

1.4.4 Action

Rehabilitate roads with known erosion problems and ensure that all remaining logging and access roads within the Crabapple Creek, Garbonzo Creek and Gonzales Creek watersheds on Whistler Mountain meet or exceed BC

Forest Practices Code standards, where appropriate and possible. These standards are more stringent for designated Community Watersheds.

Perform rehabilitation wherever necessary, using ecologically sound techniques (e.g. state of the art bioengineering), and utilize all opportunities for replacing culverts with bridges. Restoration of disturbed riparian areas should be a priority, and stream channels should be restored to natural drainage patterns wherever possible. A useful source providing examples of recent bioengineering techniques can be found at <http://www.bioengineering.com/>.

This Action could be tied in with Whistler/Blackcomb's "Operation Green-Up" program.

Lead Stakeholders: Whistler/Blackcomb

Priority: Medium-High

1.4.5 Action

Utilizing ecologically sound techniques, stabilise and rehabilitate existing slide locations in the Twenty One Mile Creek watershed below the municipal water intake to minimise potential sedimentation into waterways.

Lead Stakeholders: RMOW Parks & Recreation, WFSG

Priority: Medium-Low

Objective 1.4 – Related Actions

- Actions 1.1.1 – 1.1.3
- Actions 2.2.1 – 2.2.7
- Action 2.2.12
- Actions 2.2.14 – 2.2.15
- Action 3.2.1
- Actions 3.3.1 – 3.3.4
- Action 4.1.5 – 4.1.6
- Action 4.3.3
- Action 6.1.2

1.5 OBJECTIVE

Maintain and restore water quality in Alta Lake to a quality capable of supporting healthy, diverse populations of appropriate aquatic vegetation, fish and aquatic invertebrates.

This Objective recognizes the importance of healthy, productive lakes to maintaining the overall integrity of the River of Golden Dreams watershed. Recent research has revealed that Alta Lake, although shallow and abundant in submergent and emergent vegetation, is oligotrophic (i.e. not very productive). The limiting nutrient was found to be phosphorous, while nitrogen was also found only in small concentrations (Cascade Environmental Resource Group 1999). Anecdotal evidence attributes the unproductive state of Alta Lake to an insufficient supply of fresh water sources entering the lake, but as of yet this claim is unfounded.

1.5.1 Action

Clearly inform property owners of their responsibility to remove and clean up septic systems when municipal wastewater collection system is extended to Alta Lake Road to help protect and maintain water quality in Alta Lake.

Lead Stakeholders: RMOW Public Works

Priority: High

1.5.2 Action

Consider a re-introduction of partial flows from Twenty One Mile Creek into Alta Lake and Alta Lake/Rainbow wetlands, within the context of a comprehensive study of historic flow patterns and potential effects of any alterations on Alta Lake, Twenty One Mile Creek, the River of Golden Dreams and the wetland corridor.

Alta Lake has been determined to be oligotrophic, or unproductive and lacking in various nutrients. This condition could potentially be mitigated through the reintroduction of freshwater flows from Twenty One Mile Creek. The Proper Functioning Condition framework could be used as the basis for this analysis.

Lead Stakeholders: RMOW Parks & Recreation, RMOW Public Works

Priority: Medium

Objective 1.5 – Related Actions

- Actions 1.3.1 – 1.3.4
- Actions 1.3.7 – 1.3.8
- Action 1.3.10
- Actions 1.6.1 – 1.6.2
- Action 3.2.1
- Action 6.1.2

1.6 OBJECTIVE

Protect water quality in groundwater aquifers within the River of Golden Dreams watershed so as to require minimal treatment to meet or exceed provincial drinking water quality guidelines.

This Objective recognizes the importance of groundwater quality in maintaining the overall health of the River of Golden Dreams watershed. Within the hydrologic system, water travels through different routes. Some water initially flows overland into channels and eventually into streams before ultimately discharging out to the ocean. Some water will infiltrate into the ground and travel as groundwater back to the land surface into lakes and streams. Water commonly travels both surface and subsurface routes through the system. Groundwater is important in maintaining base stream flows during periods of low precipitation and snowmelt and can be critical to fisheries habitat.

Groundwater reserves, or aquifers, within the River of Golden Dreams watershed are also a potential, but not current, source of water supply for the RMOW. Protecting the quality of these potential groundwater sources is critical as they may one day be used for public drinking water. Several homes and businesses within the watershed already rely on private wells for their water, making protection efforts an even more immediate priority.

Groundwater is generally less susceptible pollution than surface water, but contamination can still occur. Groundwater contamination generally results from misuse and improper disposal of liquid and solid wastes, illegal dumping or abandonment of household, industrial or commercial chemicals, accidental spilling of chemicals from trucks, railways, etc., improper siting, design, construction, operation or maintenance of facilities, and use of pesticides and herbicides.

1.6.1 Action

Develop a groundwater protection program for all aquifers that are potential sources of community water supply.

This groundwater protection program should follow the prescriptions of the BC Ministry of Environment, Lands and Parks/BC Ministry of Water, Land and Air Protection, such as the *Well Protection Toolkit*, which includes some of the following tasks:

- identify potential contaminants within area of capture for each aquifer (e.g. non-point pollution sources such as pesticides, fertilizers, storm drain outfalls carrying urban runoff, winter road salt stockpiles, and line sources such as sewer, gas lines, highways, railways);
- identify how close the sources of potential contamination are from the aquifer (based on 1 year travel time);
- identify how great the potential is for contamination per source; and

- develop appropriate management strategies to reduce/eliminate risks to aquifer (focus on prevention).

Lead Stakeholders: RMOW Public Works

Priority: High

1.6.2 Action

Develop municipal groundwater protection legislation.

This legislation would include consideration of zoning and land use activities to be permitted above potential community water supply aquifers and their areas of capture and would be connected to the groundwater protection program outlined in Action 1.6.1.

Lead Stakeholders: RMOW Public Works, RMOW Planning and Development

Priority: High

Objective 1.6 – Related Actions

- Action 1.1.4
- Actions 1.1.9 – 1.1.10
- Actions 1.3.1 – 1.3.4
- Actions 1.3.7 – 1.3.8
- Action 1.3.10
- Action 1.5.1
- Actions 3.1.1 – 3.1.4
- Action 3.2.1
- Actions 3.3.3 – 3.3.4
- Action 4.1.8
- Action 4.4.1
- Action 6.1.2

1.7 OBJECTIVE

Improve community water conservation and efficiency to maintain base stream and groundwater flows and a dependable quantity of water supply from surface and groundwater sources within the River of Golden Dreams watershed.

This Objective recognizes the importance of water conservation efforts in sustaining the overall health of the River of Golden Dreams watershed. However plentiful it may seem, water is not an unlimited resource. Here in Whistler, we have not yet experienced a scenario of extreme water scarcity but this does not mean it cannot happen. The Whistler community uses about 4,400,000 cubic meters of water every year, all of it coming from the local mountain streams that surround us. Water conservation measures will prove critical in ensuring a sustainable water supply from our community's sources, which include Twenty One Mile Creek and Agnew Creek within the River of Golden Dreams watershed. Water conservation can also help reduce energy use – and costs – both in homes and businesses as well as within municipal water supply infrastructure. In addition to human consumption needs, local vegetation, fish and wildlife are also dependent on reliable water sources – maintaining base stream flows for aquatic habitat is critical and provides further motivation for water conservation within the community.

In order to achieve water planning and management that is sustainable over the long-term, a shift from the traditional, supply-side management approach is necessary. Water conservation strategies emphasize demand-side management, which means addressing the amount of water people consume (i.e. reducing the demand) rather than continually seeking out additional sources to meet growing needs (i.e. increasing the supply). One example of an incentive used to increase consumer awareness about the value and importance of reducing water waste is metering. Public education will play a critical role in effecting water conservation in Whistler.

1.7.1 Action

Implement a municipal volume-based water pricing system to provide an economic incentive for community water conservation, coupled with water conservation education strategies. Water metering will apply to all users of the community water supply.

The RMOW Public Works Department is now implementing Phase 1 of this Action, which focuses on community flow reduction initiatives.

Lead Stakeholders: RMOW Public Works

Priority: High

1.7.2 Action

Develop and implement water efficiency standards for municipal infrastructure.

This Action includes various measures for increasing water efficiency, such as landscaping standards (e.g. native plants and ground covers for non-turf areas), fixture and appliance standards, wastewater recovery and re-use standards, and pressure reduction mechanisms. Water efficiency standards should emphasize demand management conservation measures relating to hardware/technology (e.g. leak detection and repair, low flow appliances, hand watering vegetation or automatic shutoff valves for irrigation systems) as well as behaviour management (e.g. shutting off unused valves).

This Action could be linked to The Natural Step program and the new Public Works water conservation program currently underway. This Action could also be complemented with the introduction of a comprehensive wastewater bylaw.

Lead Stakeholders: RMOW Public Works, RMOW Parks & Recreation

Priority: High

1.7.3 Action

Develop and implement water efficiency standards for large-scale commercial and recreational infrastructure.

This Action applies to all major hotels, golf courses, Whistler/Blackcomb facilities, and other large scale facilities within the watershed. Water efficiency standards should be encouraged and implemented where possible through development permit areas and should include consideration of landscaping (e.g. require native plants and ground covers for non-turf areas) and irrigation practices, fixture and appliance standards, wastewater recovery and re-use, and pressure reduction mechanisms. Water efficiency standards should emphasize demand management conservation measures relating to hardware/technology (e.g. leak detection and repair, low flow appliances, hand watering vegetation or automatic shutoff valves for irrigation systems) as well as behaviour management (e.g. shutting off unused valves, servicing and adjusting equipment, washing full loads only). This Action should be accompanied by public education measures towards water conservation.

Another example of a potential water conservation measure is the installation of computerized irrigation systems that automatically adapt watering schedules in relation to existing weather conditions. RMOW Parks & Recreation, the Nicklaus North Golf Course and the Whistler Golf Course have implemented these systems for landscaping and irrigation.

This Action could be incorporated with the Whistler Sustainability Project, using The Natural Step framework. This Action could also be complemented with the introduction of a comprehensive wastewater bylaw.

Lead Stakeholders: RMOW Public Works, RMOW Planning & Development

Priority: Medium

1.7.4 Action

Develop and implement water efficiency standards for residential developments, accompanied by public education measures to promote water conservation among residents.

Water efficiency standards should address landscaping practices (e.g. native plants and ground covers), fixtures and appliances, wastewater recovery and re-use, and pressure reduction mechanisms. Water efficiency standards should emphasize demand management conservation measures relating to hardware/technology (e.g. leak detection and repair, low flow appliances, hand watering vegetation) as well as behaviour management (e.g. shutting off unused valves, servicing and adjusting equipment, washing full loads only).

The RMOW could provide incentive programs for retro-fitting (e.g. low flow toilet exchange). The RMOW (Public Works) should also consider providing a free home water audit in conjunction with meter installation.

These residential water efficiency standards could be implemented through the introduction of a comprehensive wastewater bylaw.

Tips for water efficiency and conservation in homes could be included in the household “toolkits” anticipated as part of the Whistler Sustainability Project.

Lead Stakeholders: RMOW Public Works, RMOW Planning and Development

Priority: Medium

Objective 1.7 – Related Actions

- Action 1.1.10
- Action 3.2.1
- Action 5.1.1

2.0 GOAL

THE RIVER OF GOLDEN DREAMS WATERSHED SUPPORTS HEALTHY, PROTECTED NETWORKS OF RIPARIAN AND AQUATIC HABITAT.

2.1 OBJECTIVE

Increase knowledge and inventory of watershed conditions and critical aquatic and riparian habitat requirements for fish and wildlife within the River of Golden Dreams watershed in order to implement effective management strategies.

This Objective recognizes the importance of understanding watershed conditions to achieving effective management efforts. Adequate information is necessary for developing and implementing effective management strategies. The *River of Golden Dreams Background and State of the Watershed Report* has helped to identify various information gaps regarding watershed conditions. Throughout the implementation of this plan, in addition to other related initiatives, further information will be gathered that will help identify and address further concerns, as well as providing more direction in addressing already identified concerns. Over time, the Objectives of this plan will become more specific and will be refined as new information becomes available, allowing managers to more effectively monitor progress and assess the success of management decisions.

2.1.1 Action

Develop an inventory of key, indicator, rare and endangered/at risk species and their habitat requirements. Monitor these species and critical habitat conditions to help identify priority areas for protection and restoration. A clear understanding of the complexity and functions of wildlife and habitat needs is necessary to manage for the conservation of biological diversity.

This Action could be fulfilled in part in connection with the RMOW PAN initiative. The fulfilment of additional Tasks recommended in the *Whistler Environmental Strategy* will also contribute to accomplishing components of this Action.

Identified critical habitat areas should be protected through the various means available to municipal and provincial jurisdictions, such as the inclusion of areas in the RMOW PAN or the creation of RMOW Development Permit Areas or BC Ministry of Forests Special Management Zones.

This initiative should include a consideration of potential human use related risks to species' activities and habitat in different areas and seasonal periods (e.g. bird nesting times, fish spawning times, bird and wildlife migration periods and routes). Consideration of natural disturbance patterns should also be included. This information should be used to assist in developing appropriate protection and management strategies for both upland and low-lying valley areas.

Instream fish habitat throughout much of the River of Golden Dreams watershed has already been identified and categorized according to habitat value (e.g. fish bearing streams, nutrient contributing streams) and presented in the form of a stream classification map.

Lead Stakeholders: RMOW Planning & Development, RMOW Parks & Recreation
Priority: High

2.1.2 Action

Continue to build upon the current mapping inventory for the watershed.

Additional mapping parameters can assist in targeting key habitat areas, sites for restoration, and other baseline information (e.g. impervious area analysis). A good example of habitat mapping is the stream classification map produced by the WFSG, which can be used to assist in various elements of watershed management strategies (e.g. ditch maintenance schedules and stormwater management).

Mapping initiatives should be coordinated and linked across the RMOW. Mapping technology should be able to accommodate the gradual evolution of maps, as conditions change and new information is gathered.

Lead Stakeholders: RMOW Parks & Recreation, RMOW Planning and Development, WFSG
Priority: Medium

2.1.3 Action

Complete information gaps regarding watershed conditions as identified by the *River of Golden Dreams Background and State of the Watershed Report*.

Lead Stakeholders: RMOW Parks, WFSG
Priority: High

Objective 2.1 – Related Actions

- Action 1.3.1
- Action 1.5.2
- Action 2.2.4
- Action 2.2.8
- Actions 2.2.10 – 2.2.11
- Action 2.2.14
- Action 3.1.5
- Action 4.1.1

2.2 OBJECTIVE

Protect and restore the productivity of instream, wetland, and riparian habitat for fish and wildlife populations within the River of Golden Dreams watershed.

This Objective recognizes the critical importance of protected and restored riparian and aquatic habitat in maintaining the overall integrity of the River of Golden Dreams watershed. Managers should embrace a policy of *no net habitat loss* of streams, lakes, wetland complexes, old growth forests, critical habitat or wildlife corridors within the River of Golden Dreams watershed. *No net habitat loss* can be accomplished through various means, including protection (e.g. protected areas network (PAN) zoning, conservation covenants, limiting access) and ecological restoration initiatives.

The RMOW PAN initiative will undoubtedly prove a significant tool in helping to protect contiguous sensitive areas on a landscape scale, which is critical to preserving ecosystem integrity. It is expected that several key areas within the River of Golden Dreams watershed, in addition to the Emerald Forest, (e.g. Whistler Wildlife Refuge, Golden Dreams Conservation Area, and Rainbow Wetlands) will be identified and protected through the PAN initiative. The Emerald Forest, the first area to be designated as part of the RMOW's PAN strategy, is located within the central valley corridor of the River of Golden Dreams watershed. The *Emerald Forest Management Plan* (Brett 2001) focuses on management strategies for the conservation of upland habitat within this particular area, whereas the *River of Golden Dreams Watershed Management Plan* addresses issues related to the central corridor wetlands and stream and riparian corridors. The legal protection of this central valley wetland corridor in its entirety would contribute to the conservation of critical fish and wildlife habitat within the River of Golden watershed and would assist in achieving *no net habitat loss*.

Going beyond the concept of *no net habitat loss*, managers within the River of Golden Dreams watershed should strive to work towards a *net gain* of habitat. *Net gain* of habitat can be accomplished through various means, such as the protection of critical habitat areas coupled with floodplain reclamation and instream, wetland and riparian habitat restoration.

The *River of Golden Dreams Watershed Management Plan* focuses on maintaining the integrity of aquatic and riparian ecosystems. The conditions of upland areas also play a critical role in maintaining healthy lowland aquatic habitat. While this plan suggests various recommended Actions pertaining specifically to upland areas, it is presumed that other related initiatives, such as *The Whistler Environmental Strategy* and the PAN strategy, will also contribute to providing a broader context for comprehensive upland habitat assessment, protection and restoration.

Instream Habitat

Streams provide a variety of habitat types and requirements, depending on the flow of the water, swift to slow, and the slope of the land, steep to shallow. The quality of the water, the condition of stream banks and the stream bed material also determine what types of species will inhabit the stream. Whistler's fish species require cool, clean, clear water free of sediment and pollution, as well as loose gravel for laying eggs during spawning time. Steep headwater streams provide cool fresh water and nutrients, while gentler valley bottom channels like the lower reaches of Crabapple Creek provide spawning and rearing habitat for fish. Other requirements for good instream habitat include large woody debris such as logs and branches which provide cover, hiding and resting places for fish. Woody debris also creates instream complexity such as pools and riffles – other necessities for good fish habitat. Water flowing over and around obstacles creates oxygen in the water which enables fish to breathe. Good instream conditions provide habitat not only for fish but for insects, amphibians and other birds and wildlife that live in and near the water.

Wetlands

Wetlands are critical to the health of the River of Golden Dreams watershed. Wetlands absorb floodwaters during periods of heavy precipitation and runoff, reducing flood risks along streams and rivers, and slowly release water to stream systems in drier periods, which helps to maintain base flows. Wetlands recharge groundwater aquifers and wetland vegetation works to filter out pollutants in the water. Wetlands within the River of Golden Dreams watershed also provide critical habitat for fish and wildlife, such as rearing areas for salmonids and nesting and breeding grounds for migratory birds.

Riparian Areas

The integrity of riparian areas is essential to maintaining ecological health within the River of Golden Dreams watershed. The protection and restoration of riparian areas is a critical biophysical issue that should be significantly represented in any integrated watershed management plan.

Riparian areas perform numerous functions that are vital to the properly functioning condition of channel hydrology and aquatic habitat. Some of the essential functions that natural riparian vegetation performs for streams include:

- providing stream bank stability and preventing erosion/sedimentation;
- providing large organic debris (mature growth) needed to sustain stream morphology, complexity and oxygenation;
- helping to control sediment movement within streams;
- maintaining floodplain processes;
- providing small organic debris and terrestrial insects (nutrition for fish and invertebrates);
- filtering pollutants from runoff and groundwater flows;
- providing microclimate modification (shade);
- providing cover for fish to hide from predators;
- maintaining better water depth and annual flow cycle; and
- providing more biodiversity and productivity (Millar et al. 1997; Schreier et al. 1997; Taccogna and Munro 1995; Yates 1988; and Zandbergen 1998).

The Importance of a Watershed Approach to Stream Restoration

Stream restoration will have a greater chance of being effective in the long term if planned, implemented and monitored at a watershed scale (Brouha and Chappell 1997; Reeves et al. 1991; Roper, Dose and Williams 1997). Taking a watershed approach to restoration implies recovering the fundamental natural channel hydrology to improve local habitat conditions. To do this, stream restoration projects must be expanded beyond isolated instream projects to include rehabilitation of upslope, riparian and other watershed conditions that cause downstream fish bearing stream habitats to decline (Brouha and Chappell 1997; Roper, Dose and Williams 1997).

Various habitat restoration projects have been completed to date within the River of Golden Dreams watershed, such as riparian planting and instream complexing along many of the valley bottom streams. In the interest of effective long term habitat improvements, future restoration projects should be planned within the context of overall watershed (or subwatershed) conditions, rather than on a site-specific or issue-specific basis.

2.2.1 Action

Revise relevant RMOW bylaws (i.e. *Official Community Plan*, zoning bylaws) to implement protective riparian setbacks that meet or exceed those outlined in the *Streamside Protection Regulations* under the *Fish Protection Act*. This legislation should be enacted as soon as possible in order to prevent further negative impacts to currently intact riparian areas. Minimum setbacks on all non-ephemeral streams should be 15-30m. These riparian guidelines should be applied to lakeshore areas.

Mapping of streamside and lakeside setbacks should be done in conjunction with the RMOW PAN mapping initiative currently underway. Mapping of setbacks should include consideration of compensation (e.g. already developed riparian areas within the setback zone could be compensated with larger than required setbacks where riparian areas remain intact).

Protective riparian setbacks should be implemented where possible when rezoning or redevelopment occurs. In such cases, emphasis should be on recovery and restoration of maximum riparian areas.

Lead Stakeholders: RMOW Planning & Development

Priority: High

2.2.2 Action

Wherever possible, apply the protective riparian setbacks outlined in Action 2.2.1 to RMOW municipal infrastructure.

This Action could be accomplished by the inclusion of this policy within the proposed municipal riparian area protection legislation detailed in Action 2.2.1.

Lead Stakeholders: RMOW Planning & Development

Priority: High

2.2.3 Action

Identify public and private areas requiring riparian revegetation and replant with native tree and shrub species. Monitoring should be performed on planting sites to determine success rates.

On private lands, landowner contact should be initiated to identify potential sites for riparian planting. Riparian revegetation on private property could be tied in with the naturescaping program initiatives outlined in Action 2.2.9.

On municipal property, as recommended in the *Whistler Environmental Strategy*, the RMOW should adopt and implement naturescaping principles for landscaping practices, helping to re-establish habitat.

Several priority sites for riparian restoration which have already been identified through various initiatives include:

- along the River of Golden Dreams main channel at Meadow Park near the Valley Trail;
- at Rainbow Park along Rainbow Creek from the wetlands into Alta Lake; and
- in the riparian-wetland zone along the River of Golden Dreams main channel between 21 Mile Creek confluence and the BC Rail bridge crossing the River of Golden Dreams.

Lead Stakeholders: WFSG, RMOW Parks & Recreation

Priority: Medium-High

2.2.4 Action

Develop and implement a WFSG strategic fish habitat restoration and stewardship plan to follow the nearly completed original 5 year plan. Design and complete watershed habitat restoration projects based on this plan.

The plan should focus on a watershed approach to restoration initiatives. As recommended in the *International Proper Functioning Condition Symposium Final Report*, instream restoration should be completed without cables, anchors and other artificial means. The Proper Functioning Condition framework could be used as a basis for designing and monitoring stream corridor restoration projects.

Photo point monitoring and other appropriate monitoring initiatives should be performed at all restoration project sites to help determine changes over time. Records of past and future restoration projects should be archived to increase baseline information and learning potential.

Lead Stakeholders: WFSG

Priority: High

2.2.5 Action

Construct protective fencing, where appropriate and possible, around critical stream, wetland and riparian areas at risk from pedestrian, pet, or bike traffic.

This Action could be accomplished in conjunction with the PAN initiative, but should be performed in areas both within and beyond RMOW PAN designated areas. This Action could be accomplished in conjunction with Action 4.2.1.

Lead Stakeholders: RMOW Parks & Recreation, WFSG

Priority: High

2.2.6 Action

Improve educational signage in parks and other areas calling for pet owners to keep dogs out of streams to help minimize erosion, sedimentation and other damage to instream and riparian areas. Signage should focus on the

potential negative impacts to instream and riparian habitat that arise from dogs in and around streams, and encourage compliance as a form of stewardship.

This Action is related to the proposed Animal Control Bylaw (Action 1.1.8) and the proposed Parks Bylaw, which prohibit dogs from disturbing streams.

The Whistler animal control brochure should be amended to include information about potential impacts of dogs in and around streams, and to reflect legislative changes in the case of these bylaws being passed by RMOW Council. WAG should be contacted to assist with related education initiatives.

Lead Stakeholders: RMOW Parks & Recreation, WFSG

Priority: Medium

2.2.7 Action

Maintain adequate fencing around the River of Golden Dreams main channel to minimize horse access to the stream. Replant riparian areas with native vegetation species. Minimal stream crossings should be made during horse trail rides.

Lead Stakeholders: Whistler Outdoor Experience/ Edgewater Lodge

Priority: Medium-High

2.2.8 Action

Encourage and facilitate the initiatives of neighbourhood habitat stewardship groups.

The RMOW should include mention of groups such as WFSG, Whistler/Blackcomb's Habitat Improvement Team (HIT), AWARE, Whistler Naturalists, etc. in relevant municipal publications and web sites, and provide a medium for residents and landowners to suggest areas for restoration or other stewardship initiatives.

Lead Stakeholders: RMOW Parks & Recreation

Priority: High

2.2.9 Action

Encourage landowners and residents to engage in naturescaping on their properties. Naturescaping is a way of inviting wildlife into backyards by using native plants that help provide shelter, food, and clean water for fish and wildlife. Naturescaping can help protect, restore and maintain critical habitat components in and around developed areas.

This Action could be accomplished through the preparation and distribution of a brochure. The contents of this brochure might also be printed in local newspapers at appropriate seasonal times.

Brochures should provide mention of further information resources such as relevant government programs and agencies, internet web sites, etc. Brochures should also include mention of long term opportunities for habitat conservation on private land, such as Conservation Covenants and the federal Ecological Gifts Program.

The RMOW should also encourage naturescaping practices by private landscaping companies.

Lead Stakeholders: RMOW Parks & Recreation, WFSG, AWARE (with Whistler Naturalists?)

Priority: Medium

2.2.10 Action

Perform a study of the historic and current impacts of beaver dams on the stability and proper functioning condition of the River of Golden Dreams main corridor and develop and implement a protocol for appropriate management strategies.

This study should investigate the relation of beaver dams to hydrologic flow, stream morphology, bank stability, instream habitat, and floodplain functions. Beaver dam management strategies should consider flood protection objectives and appropriate tactics during sensitive periods of fish activity. Management strategies must also consider subsequent impacts to recreational boating activities on the River of Golden Dreams, should they be permitted to continue as per management strategies resulting from recommended Action 4.1.1.

Lead Stakeholders: RMOW Parks & Recreation, WFSG, AWARE

Priority: High

2.2.11 Action

Implement components of the *Crabapple Creek Watershed Management Plan* (Symko 2000).

As Crabapple Creek is a tributary to the River of Golden Dreams, implementation of this management plan will contribute to protecting and restoring critical habitat within the River of Golden Dreams watershed.

Lead Stakeholders: RMOW Parks & Recreation, other relevant stakeholders

Priority: Medium

2.2.12 Action

Incorporate sensitive machine operation techniques around habitat areas into standard training for relevant RMOW employees and, where possible, contractors.

Lead Stakeholders: RMOW Public Works, RMOW Parks & Recreation

Priority: Medium-High

2.2.13 Action

Perform municipal operations and maintenance in and around waterways within the River of Golden Dreams watershed with recognition of instream and riparian habitat values. Necessary sediment removal from stream channels should be timed to minimize impacts to fish and should be accompanied by restoration of riparian vegetation and instream complexity.

Lead Stakeholders: RMOW Public Works

Priority: High

2.2.14 Action

Identify potential areas for wetland restoration. Design and complete wetland restoration projects.

Wetland restoration projects could be developed through the Whistler Wetlandkeepers program. As recommended in the *International Proper Functioning Condition Symposium Final Report* (Lucey et al 1999), wetland restoration projects could also be developed according to the results arising from Action 1.5.2, the comprehensive assessment of the Twenty One Mile Creek, Alta Lake, River of Golden Dreams and wetland corridor. Wetland restoration projects could also be developed in accordance with input from AWARE and the Whistler Naturalists Club.

Lead Stakeholders: WFSG, AWARE, RMOW Parks

Priority: Medium

2.2.15 Action

Additional ski area development (e.g. runs, service roads) on Whistler Mountain within the River of Golden Dreams watershed should be designed and constructed in an ecologically sensitive manner.

Any new ski trails should be glade trails, and should not be located in or around critical wildlife habitat areas. Whistler/Blackcomb should continue with the principles and initiatives of the “Operation Green-Up” program.

Lead Stakeholders: Whistler/Blackcomb

Priority: High

Objective 2.2 – Related Actions

- Actions 1.1.1 – 1.1.9
- Actions 1.3.1 – 1.3.10
- Actions 1.4.1 – 1.4.5
- Actions 1.5.1 – 1.5.2
- Actions 1.6.1 – 1.6.2
- Actions 2.1.1 – 2.1.2
- Actions 3.1.1 – 3.1.4
- Actions 3.2.1 – 3.2.2
- Actions 3.3.1 – 3.3.4
- Actions 4.1.1 – 4.1.8
- Actions 4.2.1 – 4.2.2
- Actions 4.3.1 – 4.3.3
- Action 4.4.1
- Actions 5.2.1 – 5.2.2
- Action 5.2.7
- Action 6.1.2

3.0 GOAL

POTENTIAL FLOODING RISKS TO LIFE AND PROPERTY WITHIN THE RIVER OF GOLDEN DREAMS WATERSHED ARE MINIMIZED THROUGH ECOLOGICALLY SENSITIVE MEANS.

3.1 OBJECTIVE

Minimize increase in the impervious areas of the River of Golden Dreams watershed and its subwatersheds.

This Objective recognizes the measure of impervious area as an important biophysical indicator of health for the River of Golden Dreams watershed. The amount of land transformed by development into impervious surface is widely recognized as having significant impacts on stream flows, water quality and channel hydrology. Impervious surfaces, such as paved roads, rooftops and highly compacted soils, reduce infiltration into underlying soils, increasing both the rate and amount of surface runoff entering stream channels (Harbor 1994; Leopold 1968; Schueler 1995a). An increase in the impervious area of a watershed amplifies the relative extremity of peak and low flows, frequently resulting in elevated flooding and habitat concerns (Booth 1990; Richter and Schultz 1988; Weiss 1990).

Research has consistently shown declines in the integrity of streams with increasing levels of imperviousness (Harbor 1994; Leopold 1968; Schueler 1994a, 1995a; Zandbergen 1998). Results depict a fairly rapid decline occurring between 10% and 25% imperviousness as recognized stream health indicators decline from good to poor. Several studies report a threshold of around 10% imperviousness below which the detrimental effects are small or absent. At higher levels of imperviousness (i.e.: above 25%), the decline slows as impacts are already significant (Zandbergen 1998).

While the impact of impervious areas on stream health has been recognized for several decades, recent years have seen a much stronger recognition of imperviousness as an indicator of overall watershed health. A measurement of “total impervious area”, the total percent area of a basin where water does not infiltrate the soil, is becoming more commonly utilized as a key indicator of watershed health and in developing appropriate management strategies (Arnold and Gibbons 1996; Claytor and Brown 1996; Schueler 1995b). “Effective impervious area” is another

important indicator that relates to maintaining the natural hydrologic conditions of a stream system. The effective impervious area of a watershed is generally lower than the total impervious area, as runoff enters the channel at a slower rate (e.g. through ditches rather than storm sewers).

The total percent imperviousness for the entire River of Golden Dreams watershed is currently calculated to be approximately 2.5%. To more accurately reflect the watershed's drainage patterns and the potential impacts of impervious areas on stream channels, a measure of total impervious area was calculated according to subwatershed drainage boundaries. The subwatershed drainage areas with relatively high impervious areas include: Crabapple Creek (~9.9%); ROGD sub-basin (~13.8%); and Unnamed E sub-basin (~20.2%). The ROGD and Unnamed E sub-basins, however, do not have a single main channel into which runoff flows; this lowers the concern in terms of impacts to stream and riparian corridors from elevated total impervious areas. The remaining total impervious area calculations for the River of Golden Dreams subwatershed drainage areas are summarized in the *River of Golden Dreams Background and State of the Watershed Report*.

3.1.1 Action

Develop and implement, through zoning bylaws, maximum site coverage requirements allowing no more than a set percentage of impervious area per lot to be developed.

The allowable percentage of impervious area coverage should be established in part according to zoning classification. This would be done on a parcel by parcel basis, where a ratio would be established for each lot, calculated to total. Maximum site coverage should be developed in relation to the calculated total impervious areas for each of the subwatershed drainage areas.

The provincial SMART Growth program might be used as a source for information on low impact development.

This Action has potential to be tied in with The Natural Step program.

Lead Stakeholders: RMOW Planning & Development, RMOW Public Works

Priority: Medium-High

3.1.2 Action

Where possible, reduce impervious surfaces in subwatersheds that have relatively high total impervious areas.

In instances of rezoning or redevelopment, identify potential sites to reclaim, in part or entirely. Replace impervious surfaces with more porous materials or restore to natural state.

Lead Stakeholders: RMOW Planning & Development, RMOW Public Works

Priority: Low

3.1.3 Action

Encourage application of best management practices for site design in new developments to minimize impervious areas and impacts to natural hydrologic functions and features.

Up to date best management practices may be found on government agency web sites (e.g. US EPA, Center for Watershed Protection, etc.) as well as in use by federal and provincial government agencies and other municipalities.

Lead Stakeholders: RMOW Planning & Development, RMOW Public Works

Priority: High

3.1.4 Action

Implement the following guidelines for minimizing total impervious areas within the watershed and incorporate them into zoning bylaws and/or the RMOW *Official Community Plan*. It is recognized that many of these guidelines are currently practised by the RMOW.

- cluster development and aim for maximum density per area, thereby reducing urban sprawl
- avoid further use of underground storm drainage systems
- use grassy swales and open ditches rather than curb and gutter systems
- minimize stream crossings (e.g. roads, trails)
- bridges, not culverts, are preferred where stream crossings are necessary
- bridges should cross streams at right angles
- bridge spans will equal 1.5 times the bank full width or as required for flood passage as determined by a professional engineer, whichever is wider (bridges over fish bearing/nutrient contributing streams must adhere to BC Ministry of Water, Land and Air Protection guidelines (or former guidelines from Ministry of Environment, Lands and Parks)
- culverts, where necessary, will provide access for fish passage and minimize impacts to hydrology (e.g. bottomless culverts, oversized culverts, baffles within culverts)
- retrofit existing culverts to provide fish passage where necessary
- minimize and/or reduce paved areas where opportunities exist:
 - reduce residential road lengths and widths where possible
 - reduce parking lot sizes
 - utilize cul-de-sac donuts (vegetation island in centre)
 - encourage pervious surface residential driveways
 - install pervious spillover parking areas

Lead Stakeholders: RMOW Planning & Development, RMOW Public Works

Priority: High

3.1.5 Action

When the RMOW begins utilising a complete GIS mapping system, consider including a measure of total impervious area for municipal watersheds as an indicator in the annual RMOW monitoring program.

Lead Stakeholders: RMOW Public Works

Priority: Low

Objective 3.1 – Related Actions

- Action 1.1.3
- Actions 1.6.2 – 1.6.2
- Actions 2.2.1 – 2.2.2
- Action 2.2.15
- Actions 3.2.1 – 3.2.2
- Actions 3.3.3 – 3.3.4

3.2 OBJECTIVE

Improve stormwater management initiatives within the River of Golden Dreams watershed.

This Objective recognizes the importance of effective stormwater management efforts in maintaining the health of waterways within the River of Golden Dreams watershed. Upland and valley development has potential to alter natural peak and low flows for stream systems. While changes in peak and low flows may result from development related activities such as storm drains and ditch systems, the natural drainage capacity of the channel remains unaltered, potentially raising flood hazards significantly. Such alterations can also reduce the channel's capacity to disperse naturally occurring sedimentation (i.e. by preventing natural channel meandering). This can lead to excessive sediment deposits in lower reaches, degrading spawning and rearing habitat for fish.

Historically, the common approach to urban drainage management and design was to simply collect stormwater runoff in an underground pipe system and remove it from the drainage basin as quickly as possible. Recently, however, the focus in drainage planning has shifted towards stormwater drainage that performs the historic function

of protecting property and allowing developed land use while at the same time sustaining natural riparian and aquatic systems (Stephens 1999; Stoney Creek Stormwater Steering Committee 1998). This recent approach to drainage planning, often called “integrated stormwater and stream corridor management”, represents a shift towards ecosystem-based management. This approach views ecosystem components and functions in a broader context integrating environmental, economic and social concerns and aims to develop strategies for creek systems that are hydrologically and technically sound and environmentally sensitive (Stephens 1999; Stoney Creek Stormwater Steering Committee 1998).

Integrated stormwater and stream corridor management addresses four main factors limiting the ecological values of urban streams. These factors are changes in hydrology, disturbance of the riparian corridor, disturbance of aquatic habitat, and deterioration of water quality (Emery, Derry, Stephens and Baisley 1998; Stephens 1999; Stoney Creek Stormwater Steering Committee 1998). The broad objectives of an ecosystem-based integrated stormwater management strategy approach are to: protect property from flooding; control stream erosion and sedimentation; protect the ecosystems within the stream corridors; reduce post development drainage impact on the receiving environment; enhance storm runoff quality for aquatic life; and increase public awareness of the role of stewardship (Stephens 1999; Stoney Creek Stormwater Steering Committee 1998).

In shifting towards more integrated stormwater management practices, the RMOW could more effectively maintain pre-development flow levels within the River of Golden Dreams watershed, minimizing increased rates of flow and sudden flushes and droughts which negatively affect instream and riparian habitat.

3.2.1 Action

Develop a comprehensive municipal stormwater management plan to address urban runoff quality, quantity and additional related issues from the perspective of integrated stormwater and stream corridor management.

Recent legislation gives municipalities the power to implement stormwater management bylaws and policies to protect the natural environment. The *Official Community Plan* should be amended to include minimum development standards outlined in the municipal stormwater management plan.

The stormwater management plan should emphasize application of structural and non-structural best management practices. This plan might also consider infrastructural solutions to road sand and gravel deposits, such as the construction of engineered wetlands within road network designs to serve as settling ponds for sediments.

Lead Stakeholders: RMOW Public Works

Priority: High

3.2.2 Action

For large-scale developments, require a zero net increase in peak stormwater runoff from sites after development (based on 1:1 year or 1:6 month storm events).

This requirement should be included as a guideline in the *Official Community Plan*. This Action could be accomplished in part by requiring the submission of a stormwater management strategy for each new development.

Lead Stakeholders: RMOW Planning & Development, RMOW Public Works

Priority: High

Objective 3.2 – Related Actions

- Action 1.3.1
- Actions 1.3.4 – 1.3.6
- Action 1.4.1
- Action 1.4.3
- Action 1.5.2
- Actions 1.6.1 – 1.6.2
- Actions 2.2.10 – 2.2.11
- Actions 2.2.14 – 2.2.15

- Actions 3.1.1 – 3.1.5
- Actions 3.3.1 – 3.3.4
- Action 5.4.2 – 5.4.3

3.3 OBJECTIVE

Preserve and restore natural floodplain functions within the River of Golden Dreams watershed where appropriate and possible.

This Objective recognizes the importance of preserving floodplain functions to maintain the overall health of the River of Golden Dreams watershed. Floodplains are relatively flat landforms adjacent to a stream that are composed of primarily unconsolidated depositional material (i.e. sediments) derived from the stream and that are subject to periodic flooding. The floodplain is an integral part of the stream system, allowing for channel adjustments according to changes in flows and sediment loads. Frequent flood flows should be capable of spreading out on a low-lying area adjacent to the stream to provide for water storage and release, energy dissipation, sediment deposition, and periodic flooding of riparian vegetation (Prichard et al 1998).

Stream systems within the River of Golden Dreams watershed have varying floodplain conditions. The River of Golden Dreams main channel and Twenty One Mile Creek likely present the most significant flood risks in terms of property damage. Within the River of Golden Dreams watershed, human developments have, in certain places, altered natural stream channel and floodplain functions (e.g. railway). In the future, development, flood protection and floodplain management initiatives should be performed within the context of maintaining proper functioning stream and floodplain conditions.

3.3.1 Action

Accomplish flood protection measures in high risk areas throughout the River of Golden Dreams watershed, where appropriate and possible, in conjunction with instream and riparian habitat protection and restoration initiatives.

For example, consider flooding issues around the Tapley's Farm area in relation to the broader context of the Alta Lake/River of Golden Dreams/Twenty One Mile Creek wetland corridor area (see Action 1.5.2.).

Lead Stakeholders: RMOW Public Works

Priority: High

3.3.2 Action

Where the construction of training berms is deemed necessary for flood protection, leave full riparian area between berm and stream and re-establish vegetation upon the berms. Incorporate this practice into relevant municipal policy.

Lead Stakeholders: RMOW Public Works

Priority: Medium-High

3.3.3 Action

Restrict further development on floodplains (1:200 year) within the watershed and incorporate this policy into relevant RMOW legislation.

This Action might be accomplished in part through the inclusion of floodplain areas within the watershed the RMOW PAN zoning designation. Undeveloped floodplain areas not included in the PAN should be rezoned as parks or other protective designations.

Lead Stakeholders: RMOW Planning & Development, RMOW Public Works

Priority: High

3.3.4 Action

Where possible, reclaim and restore floodplain area functions.

This Action could be accomplished in part by obtaining floodplain lands not already owned by the RMOW and subsequent rezoning to park or PAN status, and restoring lands where necessary.

Lead Stakeholders: RMOW Public Works, RMOW Planning & Development

Priority: Medium-Low

Objective 3.3 – Related Actions

- Action 1.5.2
- Action 2.2.10
- Action 2.2.14
- Actions 3.1.1 – 3.1.5
- Actions 3.2.1 – 3.2.2

4.0 GOAL

THE RIVER OF GOLDEN DREAMS WATERSHED EXPERIENCES MINIMAL ECOLOGICAL IMPACTS OF DIVERSE RECREATION OPPORTUNITIES.

4.1 OBJECTIVE

Manage recreational boat and flotation device traffic within the River of Golden Dreams watershed to minimize ecological impacts.

This Objective recognizes the importance of managing water-based recreation activities within the River of Golden Dreams watershed to protect the ecological integrity of aquatic and riparian habitat. With increasing public and commercial recreational use of the River of Golden Dreams main channel and estuary at Green Lake, it is critical to gain an understanding of use patterns and numbers, as well as real and potential impacts to habitat so that effective management options may be identified and implemented. The challenge of balancing ecological integrity and water-based recreation within the River of Golden Dreams watershed presents many opportunities for community learning and stewardship. Managing activities in an ecologically sensitive manner on the River of Golden Dreams represents a shift towards sustainable recreation initiatives, helping to achieve the broader goals of the resort community.

4.1.1 Action

Perform a study of recreational carrying capacity and related issues for boating activities on the River of Golden Dreams and manage use accordingly.

The recreational carrying capacity study should outline the potential goals and objectives of recreation management (i.e. to protect natural features and processes, to enhance opportunities for quality recreation experiences) and the inherent complex jurisdictional issues (e.g. access point, riparian and river channel ownership). The study and subsequent recreation management strategies should be based on current and projected use types, numbers, timing patterns and intensities of use. These use patterns and impacts should be considered along with known relevant seasonal fish and wildlife habitat requirements (e.g. waterfowl requiring no disturbance during nesting times or fish spawning in streambed). The study should also consider the consequent effects (benefits and challenges) of potential management strategies for stakeholder groups, as well as potential options for effective implementation.

Confluence Environmental Consulting has provided some introductory material related to this Action (see **Appendix A**).

Lead Stakeholders: RMOW Parks & Recreation

Priority: High

4.1.2 Action

Foster stream corridor stewardship initiatives and learning among commercial boating operators/renters and clients.

The operators should continue to strengthen their partnership efforts with the WFSG in developing stewardship and learning initiatives. The WFSG and operators could cooperatively develop an educational interpretive brochure for distribution to clients.

Lead Stakeholders: ROGD commercial boat operators, WFSG

Priority: Medium-High

4.1.3 Action

Recommend that all commercial operators on the River of Golden Dreams become members of the WFSG, pending the outcome and resulting recreation management strategies of Action 4.1.1.

This Action could be accomplished through the RMOW Licensing Department (e.g. incorporate into policy) as operators apply for and are granted business licenses.

Lead Stakeholders: RMOW Parks & Recreation, WFSG

Priority: Medium-High

4.1.4 Action

Develop and implement a Code of Ethics for commercial boating operators regarding appropriate behaviour on the River of Golden Dreams. This should be a cooperative effort by the WFSG and relevant commercial operators.

The Code of Ethics should determine standards for “Low Flow/High Flow No Go” periods, during which operators should be prepared to offer alternative tour routes to clients). The Code of Ethics should include parameters for river corridor maintenance with respect to minimizing impacts on riparian and instream habitat. The Code of Ethics should also include guidelines for refraining from boating operations on the river during sensitive fisheries periods (e.g. during spawning and after while eggs remain in gravel).

Some of these voluntary recreation management initiatives have the potential to be implemented as RMOW policy, pending the outcome of Action 4.1.1 and resulting management strategies.

Lead Stakeholders: commercial boat operators, WFSG, RMOW Parks & Recreation

Priority: Medium-High

4.1.5 Action

As recommended in the *International Proper Functioning Condition Symposium Final Report*, cable anchor large trees along the River of Golden Dreams main channel between the 21 Mile Creek confluence and the BC Rail bridge crossing the River of Golden Dreams to prevent risks to boaters.

Attach the cable to ensure that when the trees fall, they fall onto the stream bank and help to preserve the river's functional condition. The root masses should be left untouched, as they are critical in armouring the river banks.

Lead Stakeholders: WFSG, commercial boat operators, RMOW Parks & Recreation

Priority: Medium-Low

4.1.6 Action

Improve construction of existing boat access points along the River of Golden Dreams to minimize impacts to riparian and instream habitat.

This Action includes bank stabilisation (e.g. revegetation) adjacent to the portage location at the weir. This could be coordinated with additional improvements to the current boardwalk structure and could include managing access with chilcotin fencing. Improvements to other access points should also be made (e.g. pull-out on the downstream side of Highway 99).

Lead Stakeholders: RMOW Parks & Recreation, commercial boat operators, WFSG

Priority: Medium-High

4.1.7 Action

Provide educational interpretive signage on the subjects of riparian and instream habitat values and how to minimize impacts during river recreation at main access points to the River of Golden Dreams.

Lead Stakeholders: commercial boat operators in conjunction with WFSG, RMOW Parks & Recreation

Priority: Medium-High

4.1.8 Action

Prohibit motorized boats and jet skis from operating on the River of Golden Dreams main channel and in the River of Golden Dreams estuary on Green Lake.

This Action could be accomplished through appropriate legislative means, and possibly enforced by RCMP and/or RMOW Bylaw. Signage should be placed in appropriate locations (e.g. boat launches and rental operators' facilities) to promote compliance. Signage should include educational content.

Lead Stakeholders: RMOW Parks & Recreation, RMOW Planning & Development

Priority: High

Objective 4.1 – Related Actions

- Action 2.2.1 – 2.2.5
- Action 2.2.10
- Action 4.2.1
- Action 4.3.1 – 4.3.3
- Action 5.2.1 – 5.2.2

4.2 OBJECTIVE

Manage non-motorized land-based recreation activities within the River of Golden Dreams watershed to minimize ecological impacts.

This Objective recognizes the potential for non-motorized land-based recreation activities within the River of Golden Dreams watershed to impact the integrity of aquatic and riparian habitats. As all-season trail recreation use increases within the community, it is critical to identify and protect these sensitive habitat areas. Public education and involvement, including interpretive signage and stewardship opportunities, will play a significant role in effectively restoring and protecting habitat from potential impacts of non-motorized recreation activities.

4.2.1 Action

In conjunction with the RMOW PAN rezoning initiative, identify hiking and mountain biking trails currently traversing sensitive habitat areas (e.g. wetlands and riparian areas) and either close off access, re-route, and restore or construct boardwalk trails.

New trails should be constructed with minimal ecological impact. Mountain bike trails may in part be identified and restored in conjunction with WORCA's trail building and maintenance efforts. Trail locations and types should correspond with the PAN guidelines outlined in the *Whistler Environmental Strategy*. These guidelines could also be applied to recreation trails beyond RMOW boundaries (e.g. Rainbow Trail).

Lead Stakeholders: RMOW Parks & Recreation, WORCA, WFSG

Priority: High

4.2.2 Action

Encourage and facilitate ecologically sensitive mountain bike trail construction and maintenance.

WORCA should develop and encourage basic standards for sensitive trail construction and maintenance to help minimize erosion and other negative impacts to habitat (e.g. encourage bikers to avoid sensitive habitat areas such as streams and riparian areas). RMOW Parks & Recreation could help facilitate trail construction and maintenance through informal dialogue or seasonal workshops with trail crews.

Lead Stakeholders: WORCA, RMOW Parks & Recreation

Priority: Medium

Objective 4.2 – Related Actions

- Actions 1.1.4 – 1.1.8
- Action 1.3.2
- Action 1.3.9
- Action 2.1.1
- Actions 2.2.5 – 2.2.7
- Actions 4.3.1 – 4.3.3
- Action 4.4.1
- Actions 5.2.1 – 5.2.2
- Action 5.2.7

4.3 OBJECTIVE

Increase resident and visitor learning about watershed health and potential impacts of recreational uses.

This Objective emphasizes the critical role of an informed public in protecting the overall health of the River of Golden Dreams watershed from the potential impacts of outdoor recreation activities. Increasing learning and stewardship opportunities for community businesses, groups and individuals with regards to recreation and habitat issues is essential for encouraging ecologically sensitive activities within the watershed.

4.3.1 Action

Increase quality interpretive signage throughout the watershed regarding sensitive instream, wetland and riparian habitat areas.

Signage should be consistent throughout the watershed (for example, see Crabapple Creek Interpretive Strategy). All relevant stakeholders should work together regarding themes and messages they wish to portray.

Educational signage should be placed at all points where trail access becomes restricted to critical habitat. Connections between human activities and potential impacts to habitat and wildlife populations should be made clear.

Signage in watershed within the Whistler Mountain ski area, as well as other areas, have great potential in all seasons for increasing resident and visitor learning about Whistler's sensitive natural areas.

Lead Stakeholders: RMOW Parks & Recreation, WFSG, Whistler/Blackcomb
Priority: High

4.3.2 Action

Improve educational and interpretive information regarding sensitive habitat areas and appropriate activities on RMOW and WORCA trail maps, brochures and other relevant information distributed to the public.

Lead Stakeholders: RMOW Parks & Recreation, WORCA
Priority: Medium

4.3.3 Action

Develop and conduct workshops for various recreation user groups and commercial operators regarding low impact activities and habitat stewardship.

This Action could be accomplished through the cooperation of the municipality with various community stewardship groups, such as the WFSG and AWARE. Potential recreation groups include WORCA, Wild Willies, the Alpine Club of Canada, snowmobile clubs, and boat tour operators, and other commercial operators/rental agencies.

Lead Stakeholders: RMOW Parks & Recreation, WFSG, AWARE
Priority: Medium

Objective 4.3 – Related Actions

- Actions 1.1.5 – 1.1.7
- Action 1.1.10
- Action 2.2.6
- Actions 4.1.2 – 4.1.4
- Action 4.1.7
- Action 4.2.1
- Actions 5.2.1 – 5.2.6

4.4 OBJECTIVE

Manage motorized recreational vehicle traffic within the River of Golden Dreams watershed to minimize ecological impacts.

This Objective acknowledges the growing popularity of motorized recreation within the River of Golden Dreams watershed and the subsequent increasing potential impacts to sensitive habitat and overall watershed health.

4.4.1 Action

Prohibit dirt bikes, snowmobiles, ATVs and other motorized recreational vehicles in sensitive habitat areas.

This Action has potential to be implemented through amendments to relevant municipal legislation in conjunction with the RMOW PAN initiative. This Action applies to sensitive habitat areas within the watershed such as the Emerald Forest, as well as other sensitive habitat and riparian areas. RMOW bylaw officers could monitor and enforce the prohibition of these activities within RMOW boundaries.

The “watershed protection officer” position proposed in Action 1.1.7 could be useful in monitoring and enforcing limitations to motorized recreation in sensitive areas throughout the watershed.

Whistler/Blackcomb should ensure that ATV tours on Whistler Mountain avoid sensitive habitat areas.

It is critical to develop education initiatives to accompany this recommended Action. This could be accomplished in part through communication with commercial operators and equipment rental agencies, as well as through including stewardship information in motorized recreation guidebooks and map publications.

Lead Stakeholders: RMOW Parks & Recreation, RMOW Planning & Development, Whistler/Blackcomb
Priority: High

Objective 4.4 – Related Actions

- Action 1.1.4

5.0 GOAL

RIVER OF GOLDEN DREAMS WATERSHED STAKEHOLDERS DEMONSTRATE COOPERATIVE STEWARDSHIP.

5.1 OBJECTIVE

Facilitate support and endorsement of the River of Golden Dreams Watershed Management Plan by the Whistler community, local government, and other active watershed stakeholders.

This Objective recognizes the importance of stakeholder involvement and commitment for effective watershed management and stewardship. For any resource management plan to be successful in achieving its goals, there must be resolution on the part of stakeholders to uphold and implement the directives of the plan, to monitor progress, and to adapt objectives and actions according to changes in conditions. The early and continued involvement of watershed stakeholders is one of the most significant tools for achieving the support and commitment needed to develop and implement the watershed management plan. As stated by Bowers (1999), “long-term, effective watershed management requires 25% science and technology, and 75% human psychology and sociology” (11).

5.1.1 Action

Meaningfully include a diverse group of watershed stakeholders in the development process of the management plan.

This Action has been fulfilled through the formation of the *River of Golden Dreams Watershed Management Plan* Working Group, which has been meeting monthly since July 2000 to cooperatively develop the components of the plan. The Coordinator has also engaged other watershed stakeholders (Tier 2 Stakeholders) in an ongoing dialogue regarding the components of the plan.

The success of this watershed management plan will be determined by its effective implementation. It is hoped that members of the Working Group and other participating stakeholders, having been directly involved in its development, maintain a sense of ownership of the plan and that they will remain committed to facilitating its implementation.

Lead Stakeholders: Coordinator
Priority: High

5.1.2 Action

Encourage all stakeholders participating in its development (i.e. *Working Group* and *Tier 2* stakeholders) to become signatories of the *River of Golden Dreams Watershed Management Plan*, as a means of acknowledging their commitment to support and/or help fulfil the various recommendations of the plan.

Lead Stakeholders: Coordinator, RMOW Parks & Recreation

Priority: High

5.1.3 Action

Hold an Open House to share the draft watershed management plan with the community and to provide a forum for public feedback.

Public input should be incorporated into the draft plan, where appropriate, before submission to RMOW Council. The Open House could be held in conjunction with BC Rivers Day activities in the community.

An annual Open House should be conducted on subsequent Rivers Days, to provide the community with an update on plan progress, monitoring results and further initiatives.

Lead Stakeholders: Coordinator

Priority: High

Objective 5.1 – Related Actions

- Actions 5.2.3 – 5.2.4
- Action 5.2.6
- Action 5.2.8
- Actions 5.3.1 – 5.3.3
- Action 5.4.1
- Action 6.1.1
- Actions 6.2.1 – 6.2.2

5.2 OBJECTIVE

Encourage and facilitate community learning and involvement in watershed management and stewardship initiatives.

This Objective recognizes that a critical aspect of achieving a healthy resort community watershed is public education and involvement. Raising community awareness about watershed management and stewardship initiatives is important for gaining stakeholder support and endorsement, without which implementation of the plan will be difficult. Interpretive initiatives should be maximized to foster community learning, while opportunities provided by local stewardship groups will play a critical role in engaging public interest and involvement.

5.2.1 Action

Develop and implement a River of Golden Dreams watershed interpretive network on the Valley Trail along the main channel's corridor from the weir by Lorimer Road to Meadow Park or to the river's mouth at Green Lake.

This interpretive network should communicate the multitude of stories of the River of Golden Dreams – past, present and future. The interpretive network could exist along the Valley Trail, provide spaces just off the trail (i.e. no intrusion into sensitive habitat areas) for people to step off and read signage while experiencing the natural environment around them. This interpretive network will add educational value to the Valley Trail by providing engaging learning opportunities. Residents and visitors will learn about the River of Golden Dreams while experiencing its natural features. The construction of this interpretive network is an inexpensive opportunity for enhancing the quality of the Valley Trail experience and for increasing community learning. As the Valley Trail is transformed into a conduit for communication and education, this is an ideal demonstration project for the River of Golden Dreams watershed.

The interpretive network should portray information in a clear, simple and entertaining manner. A recognisable logo and a set of themes and messages should be developed for the watershed interpretive network, to draw out continuity and connections.

The interpretive network could include information about various aspects of the River of Golden Dreams, including:

- historic uses of the river corridor;
- historic morphology (form);
- headwaters and tributary streams;
- human alterations to the river and reasons for changes (e.g. railway, flow diversion);
- impacts of development – consideration of past management actions, and things that would not be done in the same manner today (e.g. Valley Trail constructed in sensitive riparian areas);
- historic structures (e.g. sawmill);
- flow and flooding issues;
- beaver dams;
- wetlands and other sensitive habitat areas;
- history of conservation efforts (e.g. Emerald Forest, PAN);
- community stewardship and restoration initiatives (e.g. WFSG, River Life);
- fish and wildlife life cycles and habitat requirements;
- canoe touring;
- community water supply (e.g. Agnew Creek);
- role of dead trees and downed wood; and
- current management efforts.

This Action could incorporate and/or build upon the example of the Crabapple Creek Interpretive Strategy, outlined in the *Crabapple Creek Watershed Management Plan*.

Lead Stakeholders: RMOW Parks & Recreation

Priority: Medium

5.2.2 Action

Continue to foster community learning and stewardship initiatives through the activities of the Streamkeepers, Wetlandkeepers, River Life, HIT, and other programs.

Streamkeepers and Wetlandkeepers groups increase community knowledge about aquatic and riparian ecosystems. Elementary and secondary schools provide vast opportunities for engaging children and teenagers in community stewardship initiatives. Some examples of additional programs that could be implemented in schools include Project WET and Project WILD. A recent teacher's guide entitled *Water, Watersheds, and Stewardship*, as well as its companion guide for community groups, *Make a Splash: Including Schools in your Watershed Stewardship Project* might also serve as useful resources in fostering environmental learning initiatives.

This Action has potential to be linked with the Natural Step Toolkits for schools.

Lead Stakeholders: WFSG, AWARE, Whistler/Blackcomb (HIT), RMOW Parks & Recreation

Priority: High

5.2.3 Action

Continue to celebrate watershed initiatives at relevant annual environmental festivities (e.g. Rivers Day, Earth Day, Arbour Day, Fishing Derby).

Lead Stakeholders: WFSG, RMOW Parks & Recreation, AWARE

Priority: Medium-High

5.2.4 Action

Provide a continual stream of articles to local newspapers, radio stations and organisations regarding watershed health and management and stewardship initiatives.

This Action will complement other outreach Actions by keeping watershed issues in the public eye.

Lead Stakeholders: WFSG, RMOW Parks & Recreation
Priority: Medium

5.2.5 Action

Highlight watershed stewardship initiatives and opportunities for involvement at Whistler Spirit Day.

Lead Stakeholders: RMOW Parks & Recreation, WFSG
Priority: Medium

5.2.6 Action

Develop an internet web site regarding watershed management, stewardship and related initiatives in Whistler.

This web site could be coordinated with a WFSG site, or could be added to the current RMOW site. The web site could include WFSG news and projects, watershed management, restoration and stewardship initiatives, links to other information sites, and suggestions on how people can get involved. This Action might also be linked with programs recommended in Action 1.1.11 related to community education and involvement in the protection of water supply sources.

Lead Stakeholders: RMOW Parks & Recreation, WFSG
Priority: Medium

5.2.7 Action

Where possible, accomplish ecological restoration projects in conjunction with local schools and community groups.

The restoration of the Emerald Forest north and south gravel pits and the gravel road, as recommended by the *Emerald Forest Management Plan*, could be accomplished by elementary or high school students, with appropriate guidance by the RMOW. This potential initiative represents a suitable and inexpensive approach to revegetating the gravel pit, providing students with direct experience in ecological restoration, and raising community awareness and involvement in restoration and stewardship initiatives.

Lead Stakeholders: RMOW Parks & Recreation, WFSG, AWARE
Priority: High

5.2.8 Action

Develop and distribute a summary of the *River of Golden Dreams Watershed Management Plan* for public information and review.

The summary should include a brief introduction to the key components of the plan and its development process (e.g. stakeholders involved, reasons for plan development).

Lead Stakeholders: Coordinator
Priority: High

Objective 5.2 – Related Actions

- Actions 1.1.6 – 1.1.7
- Action 1.1.10
- Actions 1.3.4 – 1.3.6
- Action 2.2.4
- Action 2.2.6
- Action 2.2.11
- Action 4.1.2

- Action 4.1.7
- Actions 4.3.1 – 4.3.3
- Actions 5.1.1 – 5.1.2
- Actions 5.3.2 – 5.3.3
- Action 5.4.1
- Action 6.1.2
- Action 6.2.2

5.3 OBJECTIVE

Facilitate cooperation among stakeholders in addressing and resolving conflicts, multiple use and jurisdiction issues within the River of Golden Dreams watershed.

This Objective recognizes the importance of key stakeholder communication and cooperation, given the multiple use and jurisdiction issues within the River of Golden Dreams watershed. Maintaining a dialogue among stakeholders will help eliminate redundancy in management efforts and assist in working towards a shared set of goals and objectives that will help provide common ground when addressing conflicts. Fostering partnerships whenever opportunities arise will not only help achieve effective implementation of this plan but will also facilitate the growth and flourishing of even more ideas for watershed stewardship within the community.

5.3.1 Action

Develop a conflict resolution protocol for potential disputes between watershed stakeholders.

Lead Stakeholders: RMOW Parks & Recreation

Priority: Medium

5.3.2 Action

Develop and foster effective partnerships among watershed stakeholders to facilitate the implementation of Actions and progress towards achieving Goals and Objectives.

Lead Stakeholders: all active stakeholders

Priority: Medium

5.3.3 Action

Ensure sufficient communication with downstream watershed stakeholders (e.g. Green River, Lillooet River, etc. watershed groups and relevant agencies) regarding watershed conditions and management initiatives within the River of Golden Dreams watershed.

Lead Stakeholders: RMOW Parks & Recreation, RMOW Public Works, RMOW Planning & Development

Priority: Medium

Objective 5.3 – Related Actions

- Actions 5.1.1 – 5.1.2
- Action 5.2.4 – 5.2.8
- Action 5.4.1
- Action 6.1.1
- Actions 6.2.1 – 6.2.2

5.4 OBJECTIVE

Encourage and facilitate stakeholder use of available legislative tools to their utmost capabilities to restore and protect the health of the River of Golden Dreams watershed.

This Objective emphasizes the availability of a growing number of legislative tools which the RMOW could use to assist in protecting the ecological integrity of the River of Golden Dreams watershed. Very few municipalities have to date utilized these tools to their full extent – it would be fitting for a community such as Whistler, with its vocal commitment to sustainability, to become a leader in this manner. Although the introduction of legislation does not bring about immediate solutions to ecological problems, it does provide a starting point and an avenue for publicly addressing these important issues. It should also be said that legislation alone will not bring about compliance – legislative mechanisms should always go hand in hand with public education initiatives. As people come to understand the underlying reasons for legislation – protection of the community’s natural resources – they are more likely to be receptive and respectful of the policies in question.

5.4.1 Action

Submit the *River of Golden Dreams Watershed Management Plan* to RMOW Council for approval as a guiding policy document within the watershed.

The process of introducing the various bylaws and other legislation suggested in this plan should begin after approval by Council (RMOW Planning & Development).

Lead Stakeholders: Coordinator, RMOW Parks & Recreation
Priority: High

5.4.2 Action

Review the RMOW *Official Community Plan* and other relevant municipal legislation to ensure consistency with the River of Golden Dreams Watershed Management Plan.

Lead Stakeholders: RMOW Parks & Recreation, RMOW Planning & Development
Priority: Medium

5.4.3 Action

Incorporate relevant higher level government policies related to environmental protection into the *Official Community Plan* and other municipal legislation.

This Action is geared towards increasing local control and independence at the municipal level. The *Stewardship Series* provides good examples of the various practices that can be legislated by local governments. The extended powers given to local governments via the Municipal Act should be utilized to their full extent in the aims of achieving effective environmental stewardship.

Lead Stakeholders: RMOW Planning & Development
Priority: Medium

Objective 5.4 – Related Actions

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6.0 GOAL

WATERSHED MANAGEMENT INITIATIVES WITHIN THE RIVER OF GOLDEN DREAMS WATERSHED REFLECT THE PRINCIPLE OF ADAPTIVE MANAGEMENT.

6.1 OBJECTIVE

Monitor progress towards fulfilling recommended Actions, Objectives and Goals.

This Objective recognizes the importance of monitoring, evaluation, and adaptive management to help achieve effective management within the River of Golden Dreams watershed. Monitoring progress towards completing the tasks outlined in the plan, as well as monitoring biophysical conditions of the watershed, will play fundamental roles in informing us about the effectiveness of our management initiatives and where improvements or modifications to the plan are necessary.

6.1.1 Action

Develop and update progress checklist of recommended Actions, Lead Stakeholders, Priority and Completion Status for tracking the implementation of the watershed management plan. This checklist should be updated twice annually, and the plan amended where necessary to include changes to Goals, Objectives and recommended Actions.

Updating the checklist, communicating progress to the Working Group and making subsequent changes to the management plan will be the responsibility of the position outlined in Action 6.2.1.

The progress checklist is provided in **Appendix B**.

Lead Stakeholders: Coordinator, RMOW Parks

Priority: High

6.1.2 Action

Develop a detailed watershed monitoring program linked to the *River of Golden Dreams Watershed Management Plan* and the *River of Golden Dreams Background and State of the Watershed Report*.

It should be the responsibility of the position outlined in Action 6.2.1 to update the monitoring program annually, as information is collected. Monitoring results should be utilized to help identify target conditions, which should be articulated in the re-writing of the plan's recommended Actions and Objectives to make them more specific and/or quantifiable.

The recommended watershed monitoring program is provided in **Appendix C**.

Lead Stakeholders: Coordinator, RMOW Parks & Recreation

Priority: High

6.1.3 Action

As recommended in the *International Proper Functioning Condition Symposium Final Report*, establish a long-term protocol for preserving monitoring data, photographs, and other historical and archival information.

This Action could be accomplished cooperatively by the RMOW and the WFSG, possibly in collaboration with the Whistler Library and the Whistler Museum and Archives.

Lead Stakeholders: RMOW Parks & Recreation, WFSG

Priority: Medium

Objective 6.1 – Related Actions

- Action 1.3.1
- Actions 2.1.1 – 2.1.2

6.2 OBJECTIVE

Treat the River of Golden Dreams Watershed Management Plan as a living document, open to change and reconsideration of initiatives according to new information and changing conditions and priorities.

This Objective emphasizes that ecological and social conditions are always changing and that we are constantly learning new things. It is important to recognise that effective integrated watershed management is an iterative process. The principle of adaptive management asserts that we monitor progress towards goals, carry out continual evaluations and, when appropriate, be open to adapting our course and reconsidering initiatives according to changing circumstances and priorities. The more we learn about the conditions of the River of Golden Dreams watershed, the more specific and direct we can be in our management efforts. Over time, we will learn what types of management actions are effective and what types are less so. Experience will guide us, and we will, to some extent, continually be learning – and improving – as we go. This plan is intended to encourage best management practices within the River of Golden Dreams watershed. Activities are expected to be consistent with this plan unless emergencies, new information or improved practices justify deviation.

6.2.1 Action

Ensure that a permanent RMOW position includes the responsibility of monitoring and fostering the implementation of the *River of Golden Dreams Watershed Management Plan*.

To monitor progress towards Objectives, this person will review and update the implementation checklist (see Action 6.1.1) twice annually. This checklist progress review will track recommended Actions that have been implemented and will identify Actions still to be completed. Such reporting may also be helpful in prioritising uncompleted Actions and in determining potential new recommended Actions required to move further towards achieving the plan's Objectives. Stakeholders should be prompted to complete Actions they have committed to. The process of reviewing the checklist should include a brief evaluation of the effectiveness of actions which have been carried out, and prioritising remaining or new actions.

This person will also be responsible for communicating successes and challenges to both the Working Group and the Tier 2 stakeholders. This person should also participate in the annual/semi-annual Working Group meetings recommended in Action 6.2.2.

Lead Stakeholders: RMOW Parks & Recreation

Priority: High

6.2.2. Action

Reassemble the Working Group once/twice annually to discuss progress and adaptations to be made to the plan.

The Goals, Objectives and recommended Actions of this plan should be evaluated and altered to reflect added information and/or changing conditions or priorities within the watershed. The Goals and Objectives stated in this watershed management plan, although defining desired future conditions, reflect current environmental, social and economic conditions. They may need modification to address new issues or to reflect recent changes in technology or watershed conditions.

Currently, many gaps also exist in our baseline information about the watershed – as these gaps are filled, this plan will change accordingly. Objectives will be altered to reflect known quantitative conditions, and will establish realistic targets of where we want to be in a given amount of time.

Supplemental communication with Working Group members should be performed as necessary, in relation to implementation of specific aspects of the watershed plan.

Lead Stakeholders: RMOW Parks & Recreation
Priority: High

6.2.3 Action

Ensure that the *River of Golden Dreams Watershed Management Plan* is updated when necessary or appropriate to reflect changes in relevant stakeholders and policies.

Lead Stakeholders: RMOW Parks
Priority: High

Objective 6.2 – Related Actions

- Actions 6.1.1 – 6.1.2

APPENDIX A

Exploring a “Carrying Capacity” Approach to Recreation Management

As submitted by Ethan Askey, Confluence Environmental Consulting, April 2001

The River of Golden Dreams flows generally north-northeast between Alta Lake and Green Lake within the RMOW, draining a wetland corridor fed by Twenty One Mile Creek and Alta Creek. The stream is regarded as a significant natural amenity with recreational opportunities including canoeing, bird watching, and fishing. It is the focus of a Watershed Management Plan now under development. Confluence Environmental Consulting was approached by the coordinator of the River of Golden Dreams (ROGD) Watershed Management Plan to assist in undertaking a “carrying capacity study” addressing expressed concerns with recreational use of the stream in the context of both social and ecological values.

The following synopsis of issues, opportunities, and constraints represents a first step in scoping out and better defining the parameters of this management initiative. More detailed information, analysis and consultation would be required to develop and implement a management regime that involves limiting or otherwise influencing recreational use of the study area. This synopsis is presented point-by-point under sub-headings that reflect the main issues requiring discussion by the Working Group of the ROGD Watershed Management Plan prior to moving onto future steps in this process.

Jurisdiction

The ROGD is located within the Resort Municipality of Whistler (RMOW), and the corridor land area is dedicated for the most part to the municipal protected areas network including the River of Golden Dreams Conservation Area and, downstream near the mouth, Dream River Park. A portion of the corridor is understood to be under private land ownership and conservation trust, and remaining portions of wetland area are believed to be Crown land. While the RMOW clearly has certain jurisdiction and a strong role to play in managing public and commercial use of recreation amenities within municipal boundaries, the Province retains title to all “aquatic lands”, which refers to the foreshore and beds of water bodies (i.e. lands below the upland natural boundary), regardless of upland ownership in most cases.

The Ministry of Environment, Lands and Parks administers aquatic lands under authority of the *Land Act* and *Land Titles Act* to provide for human use including recreational use, and in doing so it respects common law rights (vs. statutory rights) of waterfront property owners and recognizes the importance of providing public access to and along aquatic lands (editor’s note: it is BC Assets & Land Corp. is the agency responsible for administration of Crown Lands). However, public access to a waterway is a privilege, not a right. (For more on this issue, refer to “Riparian Rights and Public Foreshore Use in the Administration of Aquatic Crown Land”, Occasional paper No.5, Province of BC, 1990). Additionally, any construction of put-in/take-out facilities on the foreshore of ROGD ostensibly requires consent of the Crown as it is not a “right” of the upland owner.

On the other hand, the ROGD is a navigable waterway, and public navigation (excluding foreshore access unless in emergency, but including anchoring, mooring, and fishing over aquatic land) is a right. Navigation is a federal issue handled by Canadian Coast Guard under the authority of the *Navigable Waters Protection Act*.

Riparian land ownership (especially at river access/egress sites) and administrative authority or jurisdiction should be clearly understood (i.e. legally defined) prior to any management initiative aimed at controlling access or otherwise limiting recreation use of the ROGD. It is worth noting that heavy-handed efforts to limit use of recreation trails and waterways in the U.S. has resulted in legal action involving both public and commercial user groups.

Mandate

According to the RMOW “Park Visions” Recreation Master Plan for Whistler’s Park System (1996), the Park and Recreation Department’s mandate is “to preserve and enhance natural habitat and to increase the level of environmental consciousness by educating residents and visitors about Whistler’s flora and fauna...by establishing a system of interpretive parks and outdoor education programs”. Within certain (as yet unspecified) limits, recreation use and enjoyment of natural amenities is to be encouraged both as an end in itself, and also as a possible means of involving and educating recreationalists in environmental stewardship. The above referenced document discusses limits to development but it does not explicitly address limiting use: “The Recreation Masterplan shall limit the development of natural areas to passive low impact activities”. Further, regarding recreation use impacts (and also

relating back to the above discussion of the need for a hierarchical statement of objectives), the document states: “The RMOW considers environmental protection of all natural watercourses, water bodies, and wetlands to be of paramount importance, but will encourage outdoor recreation uses of these areas where such use can be shown to be compatible with preservation and enhancement objectives, on a site-by-site basis”.

The above selections of text quoted from the RMOW Parks vision document, and the general thrust of this document as well as the more recent Whistler Environmental Strategy, identify a mandate for RMOW Parks to develop and manage recreation amenities in a manner that encourages and facilitates recreation use where it is “appropriate to the setting”. No specific reference to limiting use *per se* has been found in these documents. (Note: the Whistler Local Resource Use Plan includes discussion of acceptable types and levels of recreation use, although it primarily addresses areas outside of the municipal boundaries on the surrounding Crown land). It follows that the development of a management regime involving “carrying capacity” determination and possible use limitations should be carefully considered by the Working Group in the context of the RMOW Parks mandate and any possible precedents (or possible precedent-setting) in this situation.

Approaches to “Carrying Capacity”

The concept of carrying capacity was borrowed from range management (i.e. how many grazing animals a unit of land can sustain) and applied to public lands and parks throughout the U.S. in the 1970’s. Often these “capacities” were little more than a statement of existing use levels at the time of determination, or they were seat-of-the-pants management estimates of the level of use an area could sustain without diminished aesthetics or “quality of recreation”. More recently, different public agencies in North America including the BC Forest Service have experimented with carrying capacity related management models. The earliest of these management models focused on identifying some critical use threshold or “magic number” beyond which recreation use was thought to be associated with deteriorated social or environmental values. More recent approaches (e.g. Limits of Acceptable Change) recognized that estimates of “maximum acceptable use” did not necessarily take into account how, when, and where particular recreation users react in a particular setting, and how these factors may be related to the quality of both the experience and the environment.

Determination of carrying capacity is a very difficult thing to do in a scientifically defensible or even a politically palatable manner. A decision by the Working Group to proceed with determination of a carrying capacity for the River of Golden Dreams should specify whether social values (i.e. the “river experience”) or environmental values (e.g. fisheries and wetland habitat values) are the primary focus of this initiative, or perhaps other values or considerations. If the former is deemed most important or germane in the case of ROGD, some form of recreation user survey would be warranted prior to or in the course of developing a management strategy (for example, see the RMOW Parks Masterplan policy statement: “Recreation participation rates and activity preferences of both community and visitor users shall be analyzed periodically”). If the latter focus is chosen, then consultation with the stewardship agencies would be warranted to identify possible species or habitats of management concern. These survey and consultation initiatives, and other related initiatives including the identification and monitoring of specific condition indicators, are recommended as a means of ensuring and demonstrating that any management control (i.e. use limitation) is directly related both to verifiable management concerns and to the recreation use in question, rather than being an almost arbitrary intervention based on untenable assumptions or value judgements.

Public and Private Interest

It is understood that “on the water” ROGD recreational user groups include both the self-guided public (normally Whistler area residents) and commercially guided or catered-to visitors. The above referenced RMOW Parks vision document states: “The interests and needs of the community and resort shall be considered top priority in the planning design, and implementation of all parks and facilities”. What if anything is known about the relative numbers of these two distinct user groups? What are their interests and needs? This piece of information is key to understanding whether there are issues relating broadly to “social carrying capacity”, and it also may provide an indication of how possible use limitations might be applied most effectively. For example, if it was determined that most of the canoeing use of ROGD is a commercial activity and use limitation is desirable, then any management actions would reasonably target the commercial service providers. Controlling the numbers of watercraft available for rent likely would be much easier than controlling individual public access to and use of the waterway. However, such non-market constraints on growth and self-determination for recreation businesses can significantly affect business viability.

Clearly, both the general public and private interests potentially would be affected by a “carrying capacity” determination and associated management regime. There is the potential for both positive and negative effects. The Working Group should explore which businesses might be affected by such an initiative, and how. The Working

Group also should explore which interest groups (i.e. “general public”, local residents, visitors, public/environmental interest groups, commercial interests, public agencies), if any beyond the RMOW and ROGD Working Group, would be most appropriately involved in setting management objectives and deciding on “appropriate use”. For the best chance of management success, common wisdom suggests it is best to build partnerships and involve as wide a public as possible in decision-making so as to build solid support for the decisions made.

Goals and Objectives

As with any goal-oriented activity, recreation management must be directed by clearly articulated objectives (i.e. the ends to be achieved by management actions). Multiple objectives can be stated, although future management actions may require that objectives are stated hierarchically so as to ensure such actions are directed most appropriately.

Specifically, it should be clarified whether (and in what relative priority) the management intention is:

- to protect or preserve natural features and processes;
- to maintain opportunities for a quality recreation experience appropriate to the setting;
- to enhance opportunities for a quality recreation experience appropriate to the setting;
- to provide continued recreational opportunities within existing facilities constraints;
- to enhance environmental stewardship of the recreational greenway and the network of protected areas (i.e. as per Whistler Environmental Strategy); and/or
- other objectives?

Once these objectives are agreed upon and articulated, then even more specific objectives and indicators can be developed which define appropriate use of the natural area over the short and/or long term. This is key to the Watershed Management Plan and to a potential “carrying capacity” element to the plan which provides direction with respect to types, timing, intensity and location of recreation uses within the study area. Careful consideration should be given to who should participate in these discussions and decisions, and how and when their participation is desirable.

Summary and Closing Remarks

In a nutshell, I think you will find that individual recreational users, users groups, and commercial interests may have widely varying ideas as to what social and environmental conditions are appropriate for the ROGD. The results of a preliminary “Proper Functioning Conditions Assessment” conducted for a portion of the ROGD by Lacas, Lucey and others in 1999 indicate that currently it is a relatively healthy, well functioning stream. Anecdotal accounts suggest that canoe and related watercraft traffic on the river at the height of summer season is crowded to point of “capacity”. The decision as to what if anything should be done to regulate recreation user numbers, timing, or behaviours is a difficult one and that is probably why such management approaches have been limited in their application and success to date elsewhere. Clearly, it would be easiest and most appropriate for management actions to address the factors which most directly link verifiable management concerns with recreation use of the ROGD.

My recommendation is for the Working Group to reflect on the above issues and document any agreements reached (e.g. strategic objectives) and any pertinent information (e.g. status of riparian land ownership) that can be verified. This first step will pave the way for the initial development of a growth management strategy. Such an approach (not elaborated on here) is proposed since it directs emphasis away from the question of “how much use is too much”, and emphasizes instead the involvement of community and agency stakeholders in a process that validates their value judgements concerning what they think the ROGD should “look like” over time.

Following the initial scoping exercise and a decision to move forward with management actions, subsequent steps recommended for managing recreation use of the ROGD are:

- specifying desired or “target” resource conditions and recreation experiences;
- comparing now and over time target conditions with current conditions;
- identifying what it is that most likely explains the difference between target and current conditions;
- developing and implementing appropriate management actions (strategies, tactics) to achieve target conditions; and
- monitoring the effectiveness of any management actions taken, and periodically re-evaluating management objectives.

APPENDIX B

River of Golden Dreams Watershed Management Plan Progress Checklist

Highest priority recommended Actions are shaded in the Priority column

Action	Lead Stakeholders	Priority	Completion Status
GOAL 1 Water quality and quantity are protected and restored in all streams, lakes and wetlands within the River of Golden Dreams watershed			
Objective 1.1 Maintain high surface water quality in drinking water supply watersheds			
1.1.1 Finalize no logging agreement for Twenty One Mile Creek and Agnew Creek watersheds	RMOW Planning (initiative a) RMOW Parks (initiative b) FWAC (initiative b)	H	
1.1.2 Stabilize slide locations in Twenty One Mile Creek watershed above intake	RMOW Public Works RMOW Parks	H	
1.1.3 Deactivate historic logging roads in Twenty One Mile Creek and Agnew Creek watersheds	RMOW Parks FWAC RMOW Public Works	M	
1.1.4 Prohibit motorized and commercial recreation in Twenty One Mile Creek and Agnew Creek watersheds above intakes	RMOW Parks FWAC	H	
1.1.5 Assess water quality impacts of non-motorized recreation activities in Twenty One Mile Creek and Agnew Creek watersheds and manage activities accordingly	RMOW Public Works RMOW Parks	H	
1.1.6 Pending fulfilment of Action 1.1.4, increase education initiatives regarding water supply protection	RMOW Parks	H	
1.1.7 If non-motorized recreation is to continue in Twenty One Mile Creek, create "Watershed Protection Officer" position	RMOW Parks	H	
1.1.8 Add clause to RMOW Animal Control Bylaw prohibiting dogs within water supply watersheds above intakes	RMOW Parks RMOW Bylaw	M	
1.1.9 Pending fulfilment of Action 1.1.1, prohibit pesticide application in Twenty One Mile Creek and Agnew Creek watersheds above intakes	FWAC	H	
1.1.10 Develop drinking water information and programs for consumers	RMOW Public Works	M	
Objective 1.2 Improve community water supply testing and treatment methods			
1.2.1 Evaluate and improve water supply testing and treatment methods	RMOW Public Works	H	
Objective 1.3 Minimize non-point source pollution in streams, lakes and wetlands			
1.3.1 Conduct water quality monitoring program for streams, lakes	WFSG	H	

Action	Lead Stakeholders	Priority	Completion Status
and wetlands	RMOW Parks		
1.3.2 Reduce pesticide use by industrial and recreational facilities	RMOW Planning Nicklaus North Golf Course Whistler Golf Course	H	
1.3.3 Develop bylaw prohibiting cosmetic use of pesticides	RMOW Parks	H	
1.3.4 Distribute public information brochure about stormwater and non-point source pollution issues	WFSG AWARE RMOW Public Works	M	
1.3.5 Install fish-stamped storm drains	RMOW Public Works	H	
1.3.6 Conduct storm drain marking program with schools	WFSG	M	
1.3.7 Implement RMOW water quality response program	RMOW Public Works	M	
1.3.8 Facilitate and enforce proper storage and disposal of hazardous substances	RMOW Bylaw	M	
1.3.9 Keep manure piles far away from streams and riparian areas	Whistler Outdoor Experience Edgewater Lodge	H	
1.3.10 Ensure adequate measures in place for spill prevention along transportation corridors	RMOW Public Works BC Rail BC Ministry of Transp/Hwy	H	
Objective 1.4 Minimize sources of excessive human activity related sedimentation and resulting impacts on waterways			
1.4.1 Dump snow away from watercourses and riparian areas	RMOW Public Works (Roads)	H	
1.4.2 Implement RMOW construction site guidelines	RMOW Planning	H	
1.4.3 Implement ditch and storm drain maintenance schedule	RMOW Public Works (Roads) RMOW Parks	H	
1.4.4 Rehabilitate roads with known erosion problems on Whistler Mountain	Whistler/Blackcomb	M-H	
1.4.5 Stabilise and rehabilitate slides in Twenty One Mile Creek watershed below intake	RMOW Parks WFSG	M-L	
Objective 1.5 Maintain and restore water quality in Alta Lake			
1.5.1 Remove and clean up septic systems when wastewater collection is extended to Alta Lake Road	RMOW Public Works	H	
1.5.2 Consider re-introducing partial flows from Twenty One Mile Creek into Alta Lake, within context of comprehensive study	RMOW Parks RMOW Public Works	M	
Objective 1.6 Protect water quality in groundwater aquifers			
1.6.1 Develop groundwater protection program for potential water supply aquifers	RMOW Public Works	H	
1.6.2 Develop municipal groundwater protection legislation	RMOW Public Works RMOW Planning	H	
Objective 1.7 Improve community water conservation and efficiency			
1.7.1 Implement volume-based water pricing system	RMOW Public Works	H	
1.7.2 Implement water efficiency standards for municipal infrastructure	RMOW Public Works	H	

Action	Lead Stakeholders	Priority	Completion Status
	RMOW Parks		
1.7.3 Implement water efficiency standards for large-scale commercial and recreational infrastructure	RMOW Public Works RMOW Planning	H	
1.7.4 Implement water efficiency standards for residential developments	RMOW Public Works RMOW Planning	M	
GOAL 2 The River of Golden Dreams watershed supports healthy, protected networks of aquatic and riparian habitat			
Objective 2.1 Increase knowledge and inventory of watershed conditions and critical habitat requirements			
2.1.1 Conduct species/habitat inventory	RMOW Planning RMOW Parks	H	
2.1.2 Build mapping inventory	RMOW Parks RMOW Planning WFSG	M	
2.1.3 Complete information gaps identified in <i>River of Golden Dreams Background and State of the Watershed Report</i>	RMOW Parks WFSG	H	
Objective 2.2 Protect and restore instream, wetland and riparian habitat			
2.2.1 Implement riparian setbacks	RMOW Planning	H	
2.2.2 Apply riparian setbacks to RMOW	RMOW Planning	H	
2.2.3 Conduct riparian replanting	WFSG RMOW Parks	M-H	
2.2.4 Develop WFSG strategic plan	WFSG	H	
2.2.5 Construct fencing for riparian areas	RMOW Parks WFSG	H	
2.2.6 Improve signage re: dogs	RMOW Parks WFSG	M	
2.2.7 Minimize horse access to stream and riparian areas	Whistler Outdoor Experience Edgewater Lodge	M-H	
2.2.8 Facilitate habitat stewardship group initiatives	RMOW Parks	H	
2.2.9 Encourage naturescaping	RMOW Parks WFSG AWARE	M	
2.2.10 Conduct beaver dam study	RMOW Parks WFSG AWARE	H	
2.2.11 Implement Crabapple Creek Watershed Management Plan	RMOW Parks Other relevant stakeholders	M	
2.2.12 Incorporate sensitive machine operation techniques	RMOW Public Works RMOW Parks	M-H	
2.2.13 Perform sensitive operations and maintenance in and around streams	RMOW Public Works	H	
2.2.14 Design and complete wetland restoration projects	WFSG	M	

Action	Lead Stakeholders	Priority	Completion Status
	AWARE RMOW Parks		
2.2.15 Incorporate ecological sensitivity into ski area development	Whistler/Blackcomb	H	
GOAL 3 Potential flooding risks to life and property within the River of Golden Dreams watershed are minimized through ecologically sensitive means			
Objective 3.1 Minimize increase in impervious area			
3.1.1 Implement maximum impervious site coverage requirements	RMOW Planning RMOW Public Works	M-H	
3.1.2 Reduce impervious surfaces	RMOW Planning RMOW Public Works	L	
3.1.3 Encourage BMPs to for site design to minimize impervious areas	RMOW Planning RMOW Public Works	H	
3.1.4 Implement guidelines for minimizing impervious areas	RMOW Planning RMOW Public Works	H	
3.1.5 Incorporate impervious area as indicator for RMOW monitoring program	RMOW Public Works	L	
Objective 3.2 Improve stormwater management initiatives			
3.2.1 Develop municipal stormwater management plan	RMOW Public Works	H	
3.2.2 Require zero net increase in peak runoff from development sites	RMOW Planning RMOW Public Works	H	
Objective 3.3 Preserve and restore natural floodplain functions			
3.3.1 Conduct flood protection in conjunction with habitat initiatives	RMOW Public Works	H	
3.3.2 Leave riparian area between training berm and stream	RMOW Public Works	M-H	
3.3.3 Restrict floodplain development	RMOW Planning RMOW Public Works	H	
3.3.4 Reclaim and restore floodplain areas	RMOW Public Works RMOW Planning	M-L	
GOAL 4 The River of Golden Dreams watershed experiences minimal ecological impacts of diverse recreation opportunities			
Objective 4.1 Manage recreational boat traffic to minimize ecological impacts			
4.1.1 Conduct recreational carrying capacity study on ROGD main channel	RMOW Parks	H	
4.1.2 Foster stewardship initiatives among commercial boating operators	Commercial boat operators WFSG	M-H	
4.1.3 Recommend that all commercial boating operators become WFSG members	RMOW Parks WFSG	M-H	
4.1.4 Implement Code of Ethics for commercial boating operators	Commercial boat operators WFSG RMOW Parks	M-H	
4.1.5 Anchor large trees on main channel	WFSG	M-L	

Action	Lead Stakeholders	Priority	Completion Status
	Commercial boat operators RMOW Parks		
4.1.6 Minimize impacts of boating access points	RMOW Parks Commercial boat operators WFSG	M-H	
4.1.7 Provide educational signage at boating access points	Commercial boat operators WFSG RMOW Parks	M-H	
4.1.8 Prohibit motorized boats/jet skis on ROGD main channel and estuary	RMOW Parks RMOW Planning	H	
Objective 4.2 Manage non-motorized land-based recreation to minimize ecological impacts			
4.2.1 Close or re-route and restore trails	RMOW Parks WORCA WFSG	H	
4.2.2 Facilitate sensitive mountain bike trail construction and maintenance	WORCA RMOW Parks	M	
Objective 4.3 Increase public learning about watershed health and potential impacts of recreation uses			
4.3.1 Increase interpretive signage	RMOW Parks WFSG Whistler/Blackcomb	H	
4.3.2 Improve educational component in RMOW publications	RMOW Parks WORCA	M	
4.3.3 Conduct workshops for recreation user groups on minimizing impacts	RMOW Parks WFSG AWARE	M	
Objective 4.4 Manage motorized recreational vehicle activities to minimize ecological impacts			
4.4.1 Prohibit motorized recreational vehicles in sensitive habitat areas	RMOW Parks RMOW Planning Whistler/Blackcomb	H	
GOAL 5 River of Golden Dreams watershed stakeholders demonstrate cooperative stewardship			
Objective 5.1 Facilitate community and stakeholder support and endorsement of the River of Golden Dreams Watershed Management Plan			
5.1.1 Include stakeholders in development of watershed management plan	Coordinator	H	
5.1.2 Encourage participating stakeholders to become signatories of management plan	Coordinator RMOW Parks	H	
5.1.3 Hold an Open House to share project with community and solicit feedback	Coordinator	H	
Objective 5.2 Encourage and facilitate community learning and involvement in watershed management and stewardship initiatives			

Action	Lead Stakeholders	Priority	Completion Status
5.2.1 Implement watershed interpretive network along Valley Trail	RMOW Parks	H	
5.2.2 Foster community learning and stewardship initiatives through local groups	WGSG AWARE Whistler/Blackcomb (HIT) RMOW Parks	H	
5.2.3 Celebrate watershed initiatives at relevant festivities (e.g. Rivers Day)	WFSG RMOW Parks AWARE	M-H	
5.2.4 Provide articles to newspapers etc. about watershed initiatives	WFSG RMOW Parks	M	
5.2.5 Highlight watershed initiatives at Spirit Day	RMOW Parks WFSG	M	
5.2.6 Develop internet site about watershed initiatives	RMOW Parks WFSG	M	
5.2.7 Accomplish restoration in conjunction with schools and community groups	RMOW Parks WFSG AWARE	H	
5.2.8 Distribute summary of watershed management plan to public	Coordinator	H	
Objective 5.3 Facilitate cooperation among stakeholders in addressing and resolving conflicts, multiple use and jurisdiction issues			
5.3.1 Develop conflict resolution protocol	RMOW Parks	M	
5.3.2 Foster stakeholder partnerships	All active stakeholders	M	
5.3.3 Communicate with downstream stakeholders about watershed issues	RMOW Parks RMOW Public Works RMOW Planning	M	
Objective 5.4 Encourage and facilitate stakeholder use of available legislative tools to their utmost capabilities for watershed protection			
5.4.1 Submit watershed management plan to RMOW Council for approval	Coordinator RMOW Parks	H	
5.4.2 Review RMOW OCP to ensure consistency with watershed plan	RMOW Parks RMOW Planning	M	
5.4.3 Incorporate higher level government environmental policies into local legislation	RMOW Planning	M	
GOAL 6 Watershed management initiatives within the River of Golden Dreams watershed reflect the principle of adaptive management			
Objective 6.1 Monitor progress towards fulfilling recommended Actions, Objectives and Goals			
6.1.1 Develop and update progress checklist	Coordinator RMOW Parks	H	
6.1.2 Develop watershed monitoring program	Coordinator RMOW Parks	H	

Action	Lead Stakeholders	Priority	Completion Status
6.1.3 Establish protocol for preserving data and other information	RMOW Parks WFSG	M	
Objective 6.2 Treat the River of Golden Dreams Watershed Management Plan as a living document, open to change			
6.2.1 Ensure RMOW permanent position includes implementation of watershed plan	RMOW Parks	H	
6.2.2 Hold annual/semi-annual Working Group meetings	RMOW Parks	H	
6.2.3 Update plan as necessary according to changes in stakeholders and relevant policies	RMOW Parks	H	

APPENDIX C

Monitoring Program for the River of Golden Dreams Watershed

The Vision, Goals and Objectives of the *River of Golden Dreams Watershed Management Plan* establish the desired conditions for the River of Golden Dreams watershed. The recommended Actions in this plan lay out the first of many steps which will help reach and maintain those goals. Beyond developing goals and the measures needed to achieve them, it is important that various key indicators be monitored in order to determine progress towards, or away from, these goals. In monitoring the effects of actions upon the watershed, approaches may be adjusted according to results in order to more effectively and efficiently restore and maintain the ecological health of the River of Golden Dreams watershed.

Monitoring can provide feedback on the performance of the tools used to achieve watershed Goals. It indicates how a stream, a watershed, or even a community is responding to the management practices outlined in the plan. Baseline or existing conditions for selected indicators must first be established to provide a context against which to measure changes in the system. Sampling of these indicators must then be conducted consistently and at appropriate time scales as per the nature of the indicators. Monitoring results should then be used to identify needs for modifying the Objectives and implementation of the watershed management plan.

Although some social indicators are suggested, this proposed monitoring program emphasizes biophysical indicators of watershed health, as the overarching Vision of this plan is to protect the ecological integrity of the watershed into the future. To date, relatively little is known about trends in the biophysical conditions of the River of Golden Dreams watershed. There are recent data regarding some of the primary indicators of watershed health, but good baseline information has only just begun to be collected. Many of the following suggested biophysical indicators might prove vital in evaluating and monitoring changes in watershed conditions. Knowledge of trends, effects, and changing conditions is necessary so that appropriate and effective planning, management, and restorative decisions can be made.

This monitoring program proposed here reflects the emphasis placed by the relevant literature on the fundamental importance of monitoring in integrated watershed management planning initiatives. Monitoring both biophysical indicators and progress of the plan towards achieving objectives is critical for effective watershed management. Most importantly, monitoring must be fully integrated with management efforts so that monitoring results affect management decisions. Monitoring results should be incorporated into the annual reviews and amendments of the plan outlined in Actions 6.1.1, 6.2.2 and 6.2.3. A brief monitoring report should be prepared annually, by the position outlined in Action 6.2.1. This report should be sent to all Working Group and Tier 2 stakeholders, reviewed in annual Working Group meetings and used to update the management plan as needed, as outlined in Action 6.2.3

The monitoring indicators suggested below are organised according to Goal.

Goal 1: Suggested Indicators

Water quality and quantity are protected and restored in all streams, lakes and wetlands within the River of Golden Dreams watershed.

Community Water Supply Sources

Various recommended Actions under this Goal aim to protect the quality of raw surface water in the Twenty One Mile Creek and Agnew Creek watersheds, which source a significant portion of Whistler's water supply.

The range of RMOW water quality monitoring variables for raw surface water from Twenty One Mile Creek and Agnew Creek should be expanded to include polycyclic aromatic hydrocarbons (PAHs) and the protozoan pathogens *Giardia lamblia* and *Cryptosporidium parvum*. Rigorous and consistent raw water testing by the municipality will help indicate changes in water quality according to the implementation of various recommended Actions. Water quality variables should be monitored both prior to and after treatment procedures to evaluate and monitor treatment efficacy.

Monitoring efforts with respect to raw water sources for the community water supply within the River of Golden Dreams watershed should include a brief analysis of RMOW Utilities water quality monitoring data to determine changes in the quality of raw surface water from Twenty One Mile Creek and Agnew Creek, and potential causes for

changing quality conditions (e.g. are positive water quality changes potentially resulting from implementation of recommended Actions?). Monitoring should also include mention of ongoing or proposed initiatives such as changes in legislation or relevant procedures.

Groundwater

Testing groundwater quality is clearly not as simple as testing surface water quality. Groundwater testing might be performed annually or biannually on potential water supply source aquifers by RMOW Public Works (Utilities), using appropriate indicators such as those listed in the provincial Well Head Protection Program. Monitoring should also include mention of ongoing or proposed initiatives such as changes in legislation or relevant procedures.

General Water Quality

Various recommended Actions under this Goal aim to minimize non-point source pollution, to minimize excessive human activity-related sedimentation and to maintain high water quality in streams, lakes and wetlands. A key indicator of stream and watershed health, water quality can be tested continually and used as a reference for long term monitoring. Water quality results assist in identifying and evaluating problems in the watershed, such as consistently lower water temperatures or excessive sedimentation. Monitoring of water quality can assist in selecting necessary or appropriate restoration initiatives and can also help evaluate the effectiveness of completed restoration projects.

The WFSG and RMOW Parks and Recreation are the most appropriate stakeholders to engage in general water quality monitoring. As monitoring data for the following indicators are collected, they should be summarized and passed on to the position outlined in Action 6.2.1. The established protocol for preserving information, as developed according to Action 6.1.3, should be followed.

Streams

The following include some primary indicators of water quality that should be sampled on lower reaches of streams within the River of Golden Dreams watershed at least three times per year (i.e. spring freshet when flows are highest; late summer when stream flow is lowest; and fall) every year. It is also useful to conduct water quality monitoring during normal base flows.

- a) pH;
- b) turbidity/suspended solids;
- c) conductivity/dissolved solids;
- d) temperature; and
- e) dissolved oxygen (percent saturation/absolute concentration).

Water temperature can be measured continually with the installation of a continuous data logger (i.e. ONSET Corp. model) at the site of gauging stations or other suitable permanent locations.

The following parameters are also good indicators of water quality that should be sampled at least once annually during midsummer months on the lower reaches of streams within the River of Golden Dreams watershed, in addition to the main channel:

- a) nitrates;
- b) nitrites; and
- c) phosphates.

Lakes and Wetlands

Alta Lake has been determined to be oligotrophic, or lacking in nutrients. Studies indicate that the limiting nutrient is phosphorous, while nitrogen was also found only in small concentrations.

Monitoring water quality in Alta Lake should be performed at least three times annually (i.e. spring, summer and fall) every year and indicators should include the following parameters:

- a) temperature
- b) nitrogen;
- c) phosphorous;
- d) pH; and
- e) secchi disk depth (may be calibrated with phosphorous levels).

Water quality parameters listed above should also be tested annually in all other lakes within the watershed.

Indicators for monitoring water quality in wetlands should be sampled at least three times per year (i.e. spring, summer and fall) every year and should include:

- a) pH;
- b) water depth (may be measured using permanent baseline markers e.g. staff gauge or nail on a tree);
- c) secchi disk depth/visibility;
- d) nitrogen; and
- e) phosphorous.

Known inlets and outlets of wetlands should also be monitored for the above water quality indicators using the same timing schedule.

Water Conservation

Various recommended Actions under this Goal aim to improve community water conservation and efficiency. Some useful monitoring indicators for tracking changes in water use trends include:

- a) percent change in overall consumption;
- b) percent change in overall wastewater volume;
- c) percent change in municipal infrastructure consumption;
- d) percent change in commercial/recreational infrastructure consumption;
- e) percent change in residential consumption; and
- f) percent change in summer consumption after implementation of sprinkler use bylaw.

Monitoring of general water quality parameters should also include mention of ongoing or proposed initiatives such as changes in legislation or relevant procedures.

Goal 2: Suggested Indicators

The River of Golden Dreams watershed supports healthy, protected networks of riparian and aquatic habitat.

Watershed Inventory

Recommended Actions under this Goal aim, in part, to increase knowledge and mapping of watershed conditions, species, and critical habitat requirements. Some useful monitoring indicators that should be sampled include:

- a) bird, fish and wildlife counts;
- b) components of relevant RMOW mapping inventory.

These indicators should be assessed at least annually. The position outlined in Action 6.2.1 is responsible for obtaining information on fish, bird and wildlife counts from local groups such as the Whistler Naturalists, the Jenny Jones Whistler Bear Foundation and the WFSG, provided that monitoring/counting protocol is consistent and appropriate. Records from all conducted species counts should be preserved according to the protocol outlined in Action 6.1.3. Monitoring should also include mention of ongoing or proposed initiatives such as changes in legislation or relevant procedures.

Instream Habitat

The following indicators should be monitored to establish baseline conditions and track changes in the quality of instream habitat throughout the River of Golden Dreams watershed.

Water Quality

The water quality indicators (i.e. general stream water quality) suggested above for Goal 1 should also be monitored for the instream habitat component of this Goal.

Benthic Invertebrates

Benthic macroinvertebrates, large invertebrates which live on the bottom of lakes and streams, can provide critical information about the quality of instream habitat. The structure and composition of benthic communities in streams is strongly connected to the surrounding land environment and instream chemical, hydrologic, and geomorphologic gradients. As such, stream invertebrate communities can be appropriate candidates for use as aquatic ecosystem health indicators in mountain watersheds (Culp, Cash and Halliwell 1997).

It is recommended that, in addition to stream discharge, benthic macroinvertebrates be monitored as key indicators of stream and watershed health.

An extremely useful guide for benthic monitoring is provided by the publication *Volunteer-Based Monitoring Program for the Salmon River: Using Benthic Indicators to Assess Stream Ecosystem Health* (Culp, Cash and Halliwell 1997). It is recommended that this document be used as a model for annual benthic monitoring in the River of Golden Dreams watershed. Monitoring results should be recorded by the WFSG, reported to the position outlined in Action 6.2.1 and preserved according to the archiving protocol recommended in Action 6.1.3.

Fish

Monitoring of fish presence can help determine the changing quality of aquatic habitat conditions and can help assess the success of restoration initiatives. Annual juvenile and spawning sampling should be conducted to continually assess trends and abundance for rainbow trout and kokanee salmon. Monitoring should be conducted every year specifically on the lower reaches of streams within the River of Golden Dreams watershed, in addition to the main River of Golden Dreams channel. These data, in addition to other significant trends and occurrences noted by local groups should be recorded by the WFSG, reported to the position outlined in Action 6.2.1 and preserved according to the archiving protocol developed as per Action 6.1.3.

Instream Habitat

Continue annual fish habitat assessment surveys (similar to those conducted in the past by L. Krzesinska) to monitor changes in habitat quality and availability. These assessments will aid in the development of potential instream habitat restoration projects.

The following are indicators for reach surveys that will help determine status and changes in fish habitat conditions:

- a) reach gradients;
- b) percent pool habitat;
- c) percent riffle habitat;
- d) percent glide habitat;
- e) substrate composition (percent fines, gravel, cobble boulder, bedrock);
- f) substrate embedment (percent);
- g) instream cover (percent log, boulder, cutbank, instream vegetation, overstream vegetation);
- h) pieces of large woody debris per mean stream width;
- i) obstructions to fish passage (e.g. impassable culverts); and
- j) velocity of flow.

Monitoring results for fish habitat should be recorded, reported to the position outlined in Action 6.2.1 and preserved according to the archiving protocol recommended in Action 6.1.3.

Wetland Habitat

Baseline information on River of Golden Dreams watershed wetlands should be collected, including the following general information:

- a) location and size of wetlands;
- b) depth to water table;
- c) soil classification;
- d) texture (Von Post scale);
- e) depth of organic;
- f) soil moisture regime/soil nutrient regime;
- g) flood/saturation frequency;
- h) wetland class;
- i) percent of tree/shrub/herb/moss cover;
- j) most common plant species; and
- k) notable features.

Wetland habitat within the River of Golden Dreams watershed should be monitored at least annually using various indicators, including:

- a) abundance of frogs and salamanders;
- b) bird species and significant habitat;

- c) water quality (see suggested indicators for Goal 1);
- d) benthic invertebrates (see above); and
- e) types and condition of wetland vegetation.

Monitoring of some of these wetland indicators may be performed according to methods outlined in *The Wetlandkeepers Handbook* (e.g. initial wetland assessment, survey of wetland plants, survey of wetland birds). Some indicators may be monitored informally, through general site notes and observations of wetland conditions (e.g. note dead trees, discoloured vegetation). Results should be recorded, reported to the position outlined in Action 6.2.1 and preserved according to the archiving protocol recommended in Action 6.1.3. Monitoring should also include mention of ongoing or proposed initiatives such as changes in legislation or relevant procedures.

Additional indicators for monitoring overall fish habitat within the watershed include:

- a) total length of fish-bearing waterways; and
- b) total area of spawning habitat.

Baseline data should be collected for these indicators and should be assessed every 3-5 years or more often if relevant changes in watershed conditions are known to be occurring (e.g. removal or addition of fish habitat).

Riparian Areas

The integrity of riparian ecosystems within the River of Golden Dreams watershed must be assessed and evaluated according to changes within the system (e.g. restoration efforts, development, and/or naturally occurring conditions).

Monitoring should include a baseline evaluation establishing what percentage of riparian vegetation is sufficiently intact along both the main stem and headwater tributaries. This can be done through ground surveying or orthophoto analysis (the mapping inventory must first be completed for the watershed). Priority areas for restoration to restore natural riparian characteristics and functions may then be selected. Monitoring should be conducted annually to determine changes in riparian integrity throughout the watershed. Monitoring should also include mention of ongoing or proposed initiatives such as changes in legislation or relevant procedures.

The following indicators may be used to assess baseline riparian conditions. A regular assessment of the following indicators may assist in detecting changes within the watershed over time:

- a) percent stream length with intact riparian zone;
- b) number of plants effectively planted (i.e. alive one year later) in riparian area restoration initiatives;
- c) diversity in age/class structure of riparian species;
- d) diversity in composition of riparian wetland vegetation;
- e) species presence indicative of riparian soil moisture characteristics;
- f) species presence with root masses able to withstand high flow events;
- g) adequate riparian cover to protect banks;
- h) adequate natural source of small organic and large woody debris; and
- i) potential for riparian widening.

Watershed Restoration Projects

WFSG should report annually to the position outlined in Action 6.2.1 regarding the number, location and type of watershed restoration projects conducted within the River of Golden Dreams watershed. The WFSG should monitor the success of each project, with photopoint monitoring techniques as well as others (e.g. tree and shrub survival counts).

Additional indicators for monitoring habitat restoration projects include:

- a) meters of riparian planting;
- b) meters of riparian fencing erected;
- c) number of restoration sites; and
- d) meters of instream channel restoration.

Photopoint Monitoring

Photopoint monitoring permits both qualitative and quantitative assessments using photogrammetric products. Photopoint monitoring should be performed at all watershed restoration project sites.

Goal 3: Suggested Indicators

Potential flooding risks to life and property within the River of Golden Dreams watershed are minimized through ecologically sensitive means.

Hydrologic Characteristics

To ensure appropriate management decisions for stormwater management and fish habitat issues, critical information is needed pertaining to channel capacity and seasonal mean, peak and low discharge rates of the River of Golden Dreams watershed systems. It is recommended here that stream discharge (i.e. mean, peak, and low flows) for all major tributaries to the River of Golden Dreams, in addition to the main channel, is used as a key indicator of trends in stream and watershed condition.

The following additional indicators should be primary in stream monitoring initiatives:

- a) relative frequency of bankfull conditions;
- b) relative frequency of low flow conditions; and
- c) relative frequency and magnitude of flood stage conditions (e.g. frequency of above bankfull, magnitude of theoretical 2 year, 10 year, 100 year flood).

All of the above indicators may be measured with the installation of additional gauging station on the lower reaches of streams throughout the watershed. Data should be collected at regular intervals throughout the year, in addition to significant high and low flow events.

The following includes additional significant indicators suggested for assessing and monitoring the hydrologic characteristics of streams within the River of Golden Dreams watershed:

- a) percent increase or decrease in total impervious area;
- b) percent increase or decrease in effective impervious area;
- c) sinuosity, width/depth ratio, and gradient in balance with landscape setting;
- d) excessive erosion/sedimentation levels (sediment analysis); and
- e) floodplain and channel characteristics (rocks, overflow channels and large woody debris) adequate to dissipate stream energy.

Other indicators for monitoring progress towards this Goal include:

- a) number of flood protection projects completed in conjunction with habitat needs;
- b) number development approvals with maximum impervious levels specified; and
- c) area (m²) of floodplain reclaimed/restored.

Monitoring should also include mention of ongoing or proposed initiatives such as changes in legislation or relevant procedures.

Goal 4: Suggested Indicators

The River of Golden Dreams watershed experiences minimal ecological impacts of diverse recreation opportunities.

Minimizing impacts of recreation activities within the River of Golden Dreams watershed is important to protecting and restoring overall watershed health.

Indicators for monitoring recreational boat traffic impacts on watershed conditions should include:

- a) approximate number of boat trips (commercial/public) on River of Golden Dreams;
- b) number of commercial boating operator business licenses granted/rejected for the River of Golden Dreams;
- c) number of access points for boaters to River of Golden Dreams;
- d) amount and quality of interpretive signage (regarding minimizing impacts) for boating audience at rental locations, access points and along River of Golden Dreams;
- e) voluntary compliance/non-compliance to specific boating restrictions developed through Action 4.1.4;
- f) number of commercial boating operators on the River of Golden Dreams who are active WFSG members; and
- g) occurrences of motorized boat traffic on the River of Golden Dreams and Green Lake estuary.

Indicators for monitoring non-motorized land based recreation impacts on watershed conditions should include:

- a) number of trails traversing riparian areas/wetlands/sensitive habitat;
- b) number of trail crossings (bridge, culvert or neither) over streams;

- c) length (m) of boardwalk trail constructed in or around sensitive habitat areas;
- d) length of trail (m) closed or re-routed due to sensitive habitat concerns; and
- e) length of fencing (m) constructed around sensitive habitat areas.

Indicators for monitoring public learning about watershed health and potential impacts of recreation uses include:

- a) number and type of local initiatives regarding sensitive trail construction and maintenance;
- b) number and type of local initiatives for/by recreation groups and operations regarding minimizing ecological impacts of recreation activities;
- c) number and quality of signage regarding minimizing recreation impacts; and
- d) number and type of community workshops conducted regarding minimizing ecological impacts of recreation uses.

Monitoring should also include mention of ongoing or proposed initiatives such as changes in legislation or relevant procedures.

Goal 5: Suggested Indicators

River of Golden Dreams watershed stakeholders demonstrate cooperative stewardship.

Progress towards this Goal is not measurable with biophysical indicators. It is possible, however, to get a sense of progress by monitoring trends in stakeholder and community involvement in and commitment to watershed stewardship. A regular assessment (e.g. annually) of the following suggested indicators will help reveal progress towards fulfilling this Goal:

- a) participation of residents and/or visitors in watershed stewardship/restoration initiatives (e.g. volunteers for riparian planting, attendance at watershed walks);
- b) familiarity with and understanding of key watershed issues by residents and visitors;
- c) experience of environmental learning by residents and/or visitors as a result of interpretive signs, literature or demonstrations;
- d) participation of key stakeholder group staff (e.g. RMOW, Whistler/Blackcomb, Whistler Golf Course) in environmental learning;
- e) participation of schools in environmental learning and watershed stewardship;
- f) development of new environmental or watershed stewardship groups;
- g) development and maintenance of new and existing partnerships relating to environmental or watershed stewardship; and
- h) frequency of newspaper articles relating to watershed issues and/or community initiatives in stewardship.

Other suggested indicators for monitoring progress towards this Goal include:

- a) number of policy amendments concerning environmental stewardship; and
- b) number of higher level government environmental policies incorporated into RMOW legislation;
- c) number of zoning changes in favour of environmental preservation; and
- d) percent area of watershed with protected status (e.g. PAN or other legally designated conservation areas).

These indicators should be assessed annually and reported to the position outlined in Action 6.2.1. Monitoring should also include mention of ongoing or proposed initiatives such as changes in legislation or relevant procedures.

Goal 6: Suggested Indicators

Watershed management initiatives within the River of Golden Dreams watershed reflect the principle of adaptive management.

Progress towards this Goal is not measurable with biophysical indicators. Fulfilment of this Goal will become evident as the management plan is implemented and adapted to reflect changes in information and watershed conditions. The progress checklist outlined in Action 6.1.1 and provided in Appendix B will help indicate fulfilment of this Goal as it is updated annually. No additional monitoring indicators are suggested for this Goal. Monitoring should also include mention of ongoing or proposed initiatives such as changes in legislation or relevant procedures.

APPENDIX D

River of Golden Dreams Watershed Management Plan Summary of Recommended Actions

Highest priority recommended Actions are shaded in the Priority column

ACTION	LEAD STAKEHOLDERS	PRIORITY
GOAL 1 Water quality and quantity are protected and restored in all streams, lakes and wetlands within the River of Golden Dreams watershed.		
Objective 1.1 Maintain high surface water quality in drinking water supply watersheds		
1.1.1 Finalize no logging agreement for Twenty One Mile Creek and Agnew Creek watersheds	RMOW Planning (initiative a) RMOW Parks (initiative b) FWAC (initiative b)	H
1.1.2 Stabilize slide locations in Twenty One Mile Creek watershed above intake	RMOW Public Works RMOW Parks	H
1.1.3 Deactivate historic logging roads in Twenty One Mile Creek and Agnew Creek watersheds	RMOW Parks FWAC RMOW Public Works	M
1.1.4 Prohibit motorized and commercial recreation in Twenty One Mile Creek and Agnew Creek watersheds above intakes	RMOW Parks FWAC	H
1.1.5 Assess water quality impacts of non-motorized recreation activities in Twenty One Mile Creek and Agnew Creek watersheds and manage activities accordingly	RMOW Public Works RMOW Parks	H
1.1.6 Pending fulfilment of Action 1.1.4, increase education initiatives regarding water supply protection	RMOW Parks	H
1.1.7 If non-motorized recreation is to continue in Twenty One Mile Creek, create “Watershed Protection Officer” position	RMOW Parks	H
1.1.8 Add clause to RMOW Animal Control Bylaw prohibiting dogs within water supply watersheds above intakes	RMOW Parks RMOW Bylaw	M
1.1.9 Pending fulfilment of Action 1.1.1, prohibit pesticide application in Twenty One Mile Creek and Agnew Creek watersheds above intakes	FWAC	H
1.1.10 Develop drinking water information and programs for consumers	RMOW Public Works	M
Objective 1.2 Improve community water supply testing and treatment methods		
1.2.1 Evaluate and improve water supply testing and treatment methods	RMOW Public Works	H
Objective 1.3 Minimize non-point source pollution in streams, lakes and wetlands		
1.3.1 Conduct water quality monitoring program for streams, lakes and wetlands	WFSG RMOW Parks	H
1.3.2 Reduce pesticide use by industrial and recreational facilities	RMOW Planning Nicklaus North Golf Course	H

ACTION	LEAD STAKEHOLDERS	PRIORITY
	Whistler Golf Course	
1.3.3 Develop bylaw prohibiting cosmetic use of pesticides	RMOW Parks	H
1.3.4 Distribute public information brochure about stormwater and non-point source pollution issues	WFSG AWARE RMOW Public Works	M
1.3.5 Install fish-stamped storm drains	RMOW Public Works	H
1.3.6 Conduct storm drain marking program with schools	WFSG	M
1.3.7 Implement RMOW water quality response program	RMOW Public Works	M
1.3.8 Facilitate and enforce proper storage and disposal of hazardous substances	RMOW Bylaw	M
1.3.9 Keep manure piles far away from streams and riparian areas	Whistler Outdoor Experience Edgewater Lodge	H
1.3.10 Ensure adequate measures in place for spill prevention along transportation corridors	RMOW Public Works BC Rail BC Ministry of Transportation/Hwy	H
Objective 1.4 Minimize sources of excessive human activity related sedimentation and resulting impacts on waterways		
1.4.1 Dump snow away from watercourses and riparian areas	RMOW Public Works (Roads)	H
1.4.2 Implement RMOW construction site guidelines	RMOW Planning	H
1.4.3 Implement ditch and storm drain maintenance schedule	RMOW Public Works (Roads) RMOW Parks	H
1.4.4 Rehabilitate roads with known erosion problems on Whistler Mountain	Whistler/Blackcomb	M-H
1.4.5 Stabilise and rehabilitate slides in Twenty One Mile Creek watershed below intake	RMOW Parks WFSG	M-L
Objective 1.5 Maintain and restore water quality in Alta Lake		
1.5.1 Remove and clean up septic systems when wastewater collection is extended to Alta Lake Road	RMOW Public Works	H
1.5.2 Consider re-introducing partial flows from Twenty One Mile Creek into Alta Lake, within context of comprehensive study	RMOW Parks RMOW Public Works	M
Objective 1.6 Protect water quality in groundwater aquifers		
1.6.1 Develop groundwater protection program for potential water supply aquifers	RMOW Public Works	H
1.6.2 Develop municipal groundwater protection legislation	RMOW Public Works RMOW Planning	H
Objective 1.7 Improve community water conservation and efficiency		
1.7.1 Implement volume-based water pricing system	RMOW Public Works	H
1.7.2 Implement water efficiency standards for municipal infrastructure	RMOW Public Works RMOW Parks	H

ACTION	LEAD STAKEHOLDERS	PRIORITY
1.7.3 Implement water efficiency standards for large-scale commercial and recreational infrastructure	RMOW Public Works RMOW Planning	H
1.7.4 Implement water efficiency standards for residential developments	RMOW Public Works RMOW Planning	M
GOAL 2 The River of Golden Dreams watershed supports healthy, protected networks of aquatic and riparian habitat.		
Objective 2.1 Increase knowledge and inventory of watershed conditions and critical habitat requirements		
2.1.1 Conduct species/habitat inventory	RMOW Planning RMOW Parks	H
2.1.2 Build mapping inventory	RMOW Parks RMOW Planning WFSG	M
2.1.3 Complete information gaps identified in <i>River of Golden Dreams Background and State of the Watershed Report</i>	RMOW Parks WFSG	H
Objective 2.2 Protect and restore instream, wetland and riparian habitat		
2.2.1 Implement riparian setbacks	RMOW Planning	H
2.2.2 Apply riparian setbacks to RMOW	RMOW Planning	H
2.2.3 Conduct riparian replanting	WFSG RMOW Parks	M-H
2.2.4 Develop and implement WFSG strategic plan	WFSG	H
2.2.5 Construct fencing for riparian areas	RMOW Parks WFSG	H
2.2.6 Improve signage re: dogs	RMOW Parks WFSG	M
2.2.7 Minimize horse access to stream and riparian areas	Whistler Outdoor Experience Edgewater Lodge	M-H
2.2.8 Facilitate habitat stewardship group initiatives	RMOW Parks	H
2.2.9 Encourage naturescaping	RMOW Parks WFSG AWARE	M
2.2.10 Conduct beaver dam study	RMOW Parks WFSG AWARE	H
2.2.11 Implement Crabapple Creek Watershed Management Plan	RMOW Parks Other relevant stakeholders	M
2.2.12 Incorporate sensitive machine operation techniques	RMOW Public Works RMOW Parks	M-H
2.2.13 Perform sensitive operations and maintenance in and around streams	RMOW Public Works	H

ACTION	LEAD STAKEHOLDERS	PRIORITY
2.2.14 Design and complete wetland restoration projects	WFSG AWARE RMOW Parks	M
2.2.15 Incorporate ecological sensitivity into ski area development	Whistler/Blackcomb	H
<i>GOAL 3 Potential flooding risks to life and property within the River of Golden Dreams watershed are minimized through ecologically sensitive means.</i>		
Objective 3.1 Minimize increase in impervious area		
3.1.1 Implement maximum impervious site coverage requirements	RMOW Planning RMOW Public Works	M-H
3.1.2 Reduce impervious surfaces	RMOW Planning RMOW Public Works	L
3.1.3 Encourage BMPs to for site design to minimize impervious areas	RMOW Planning RMOW Public Works	H
3.1.4 Implement guidelines for minimizing impervious areas	RMOW Planning RMOW Public Works	H
3.1.5 Incorporate impervious area as indicator for RMOW monitoring program	RMOW Public Works	L
Objective 3.2 Improve stormwater management initiatives		
3.2.1 Develop municipal stormwater management plan	RMOW Public Works	H
3.2.2 Require zero net increase in peak runoff from development sites	RMOW Planning RMOW Public Works	H
Objective 3.3 Preserve and restore natural floodplain functions		
3.3.1 Conduct flood protection in conjunction with habitat initiatives	RMOW Public Works	H
3.3.2 Incorporate in policy to leave riparian area between training berm and stream	RMOW Public Works	M-H
3.3.3 Restrict floodplain development through policy tools	RMOW Planning RMOW Public Works	H
3.3.4 Reclaim and restore floodplain areas	RMOW Public Works RMOW Planning	M-L
<i>GOAL 4 The River of Golden Dreams watershed experiences minimal ecological impacts of diverse recreation opportunities.</i>		
Objective 4.1 Manage recreational boat traffic to minimize ecological impacts		
4.1.1 Conduct recreational carrying capacity study on ROGD main channel	RMOW Parks	H
4.1.2 Foster stewardship initiatives among commercial boating operators	Commercial boat operators WFSG	M-H
4.1.3 Recommend that all commercial boating operators become WFSG members	RMOW Parks WFSG	M-H
4.1.4 Implement Code of Ethics for commercial boating operators	Commercial boat operators WFSG RMOW Parks	M-H
4.1.5 Anchor large trees on main channel	WFSG	M-L

ACTION	LEAD STAKEHOLDERS	PRIORITY
	Commercial boat operators RMOW Parks	
4.1.6 Minimize impacts of boating access points	RMOW Parks Commercial boat operators WFSG	M-H
4.1.7 Provide educational signage at boating access points	Commercial boat operators WFSG RMOW Parks	M-H
4.1.8 Prohibit motorized boats/jet skis on ROGD main channel and estuary	RMOW Parks RMOW Planning & Development	H
Objective 4.2 Manage non-motorized land-based recreation to minimize ecological impacts		
4.2.1 Close or re-route and restore trails	RMOW Parks WORCA WFSG	H
4.2.2 Facilitate sensitive mountain bike trail construction and maintenance	WORCA RMOW Parks	M
Objective 4.3 Increase public learning about watershed health and potential impacts of recreation uses		
4.3.1 Increase interpretive signage	RMOW Parks WFSG Whistler/Blackcomb	H
4.3.2 Improve educational component in RMOW publications	RMOW Parks WORCA	M
4.3.3 Conduct workshops for recreation user groups on minimizing impacts	RMOW Parks WFSG AWARE	M
Objective 4.4 Manage motorized recreational activities to minimize ecological impacts		
4.4.1 Prohibit motorized recreational vehicles in sensitive habitat areas	RMOW Parks RMOW Planning Whistler/Blackcomb	H
GOAL 5 River of Golden Dreams watershed stakeholders demonstrate cooperative stewardship.		
Objective 5.1 Facilitate community and stakeholder support and endorsement of the River of Golden Dreams Watershed Management Plan		
5.1.1 Include stakeholders in development of watershed management plan	Coordinator	H
5.1.2 Encourage participating stakeholders to become signatories of management plan	Coordinator RMOW Parks	H
5.1.3 Hold an Open House to share project with community and solicit feedback	Coordinator	H
Objective 5.2 Encourage and facilitate community learning and involvement in watershed management and stewardship initiatives		
5.2.1 Implement watershed interpretive network along Valley Trail	RMOW Parks	H
5.2.2 Foster community learning and stewardship initiatives through local groups	WFSG	H

ACTION	LEAD STAKEHOLDERS	PRIORITY
	AWARE Whistler/Blackcomb (HIT) RMOW Parks	
5.2.3 Celebrate watershed initiatives at relevant festivities (e.g. Rivers Day)	WFSG RMOW Parks AWARE	M-H
5.2.4 Provide articles to newspapers etc. about watershed initiatives	WFSG RMOW Parks	M
5.2.5 Highlight watershed initiatives at Spirit Day	RMOW Parks WFSG	M
5.2.6 Develop internet site about watershed initiatives	RMOW Parks WFSG	M
5.2.7 Accomplish restoration in conjunction with schools and community groups	RMOW Parks WFSG AWARE	H
5.2.8 Distribute summary of watershed management plan to public	Coordinator	H
Objective 5.3 Facilitate cooperation among stakeholders in addressing and resolving conflicts, multiple use and jurisdiction issues		
5.3.1 Develop conflict resolution protocol	RMOW Parks	M
5.3.2 Foster stakeholder partnerships	All active stakeholders	M
5.3.3 Communicate with downstream stakeholders about watershed issues	RMOW Parks RMOW Public Works RMOW Planning	M
Objective 5.4 Encourage and facilitate stakeholder use of available legislative tools to their utmost capabilities for watershed protection		
5.4.1 Submit watershed management plan to RMOW Council for approval	Coordinator RMOW Parks	H
5.4.2 Review RMOW OCP to ensure consistency with watershed plan	RMOW Parks RMOW Planning	M
5.4.3 Incorporate higher level government environmental policies into local legislation	RMOW Planning	M
GOAL 6 Watershed management initiatives within the River of Golden Dreams watershed reflect the principle of adaptive management.		
Objective 6.1 Monitor progress towards fulfilling recommended Actions, Objectives and Goals		
6.1.1 Develop and update progress checklist	Coordinator RMOW Parks	H
6.1.2 Develop watershed monitoring program	Coordinator RMOW Parks	H
6.1.3 Establish protocol for preserving data and other information	RMOW Parks WFSG	M

ACTION	LEAD STAKEHOLDERS	PRIORITY
Objective 6.2 Treat the River of Golden Dreams Watershed Management Plan as a living document, open to change		
6.2.1 Ensure RMOW permanent position includes implementation of watershed plan	RMOW Parks	H
6.2.2 Hold annual/semi-annual Working Group meetings	RMOW Parks	H
6.2.3 Update plan as necessary according to changes in stakeholders and relevant policies	RMOW Parks	H

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