



Babine Watershed Monitoring Trust

2007 Annual Monitoring Plan

Babine Watershed Monitoring Trust
1090 Main Street
Smithers, BC V0J 2N0

www.babinetrust.ca

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1.0 Introduction

The Babine Watershed Monitoring Trust (BWMT) is directed through its Trust Agreement Document to be responsible for “*planning, prioritising, directing, facilitating and funding impartial monitoring research of the implementation and effectiveness of public land use plans and related natural resources management activities in the Babine Watershed*”; and “*providing credible monitoring research results as part of a formal rigorous adaptive management process that enables continuous improvement of public land use plans resulting in better management of environmental values in the Babine Watershed.*”

This document constitutes the 2007 Annual Monitoring Plan (AMP) for the Babine Watershed Monitoring Trust, which the Trustees are required to produce under Section 10.2 and Schedule C of the BWMT Agreement. The first Annual Monitoring Plan was approved by the BWMT in July of 2005. The 2005 AMP had a budget of \$39,000 and identified six projects. The 2006 AMP built on the 2005 AMP. Some projects from both 2005 and 2006 were not completed – for a variety of reasons. These projects remain a priority of the BWMT, and appear in some form in the 2007 AMP.

The 2007 AMP sets out the year’s budget, lists high-priority monitoring projects, describes projects approved for direct funding, and identifies topics requiring additional funding. The plan provides a synopsis and rationale for each approved project. The BWMT allocates funds to monitoring projects using the process for determining priorities and costs prescribed in the BWMT Agreement and described in the Babine Watershed Monitoring Framework (see www.babinetrust.ca).

2.0 Budget

The funds available from the Babine Watershed Monitoring Trust Revenue Trust Account (BWMT Agreement, Section 3.1.3) are set out in Table 1. As of April 1st, 2007, the BWMT had received one major donation with a total value of \$25,000. There is still \$411 remaining from two private donations in 2006, that are carried forward to 2007. These funds are available to directly support the 2007 AMP, and are matched by the provincial government funds under the 2:1 private/public ratio rule.

Table 1. Budget for 2007

	Contributed	Available under the 2:1 private/public ratio rule	Unavailable in 2007 (banked)
Revenue Trust Account			
Donations: non-government	25,411	25,411	
Levered funds: 2006	1,111		
BC gov't (Banked)	39,284	13,261	26,023
Operating Fund Surplus		809	
New Funds Available 2007			39,481
Funds Carried Forward from 2006			7,000
Expenses			
Administration and planning			12,000
2007 Monitoring Projects			27,481

3.0 Monitoring Priorities for 2007

The Trust supports monitoring projects, maintains the Babine Watershed Monitoring Framework and administers the monitoring program. The allocation of available funds for this year is shown in Table 2.

Table 2. Allocation of available monitoring program funds.

Activity	Projected Allocation
Carried forward from 2006	7,000
BVRC Agreement 2007	12,000
New Projects	20,000
Deferred to 2008	7,481
Total	\$46,481

The priority for maintaining the Monitoring Framework increases with the time elapsed since the last revision. The Knowledge Base and Monitoring Priority Tables, found in the Monitoring Framework, were created in 2004. Elapsed time and new information do not warrant a review or update of the Knowledge Base and Monitoring Priority Tables this year. Information from past projects is included in the synopses section of this AMP.

The Monitoring Priority Tables generated by the Monitoring Framework show priorities and associated costs for the following types of monitoring:

- collecting indicator data (implementation monitoring),
- monitoring to improve knowledge and reduce uncertainty (validation monitoring/research),
- monitoring to detect negative consequences (effectiveness monitoring).

Tables 4 to 6 of this document summarise funding decisions for high-priority monitoring topics in each of the three types. The order within each list indicates relative priority assigned by the Monitoring Framework. The tables also provide a brief rationale for each funding decision. Not all topics can be funded. Higher-priority topics will usually be funded preferentially. When a lower-priority topic is selected for funding, a rationale is provided as to why the higher-priority topics were not chosen. All non-funded topics lower on ranked lists are not funded because of insufficient funds.

4.0 Approved Projects

In addition to two projects ongoing from 2006 (Table 3a), two new monitoring projects are approved for full funding by the BWMT Trustees in 2007 (Table 3b). Two further projects are partially funded, with funds carried over from 2006 for scoping and proposal development. Funds are also approved for administrative and technical support.

Table 3a. Projects carried forward from 2006 to 2007.

Project Number	Title	Funding
2006-2	Water Quality in Relation to Stream Crossings	\$5,000
2006-3	Wilderness Value of Babine River Corridor	\$15,000
Total		\$20,000

Table 3b. Approved projects for 2007. "P" designates funding for scoping and proposal development. "A" designates administrative and technical support.

Project Number	Title	Funding
2007-1	Grizzly Bears	\$10,000
2007-2	Stand-level Biodiversity in Managed Stands	\$7,000
2007-3P ¹	Mountain Goats	\$2,000
2007-4P	Seral Stage Representation and Pattern	\$5,000
2007-A1	Technical Support	\$3,000
2007-A2	Administrative Support	\$12,000
	Deferred to 2008 – Proposal Development	\$7,481
Total		\$46,481

New and ongoing projects are described in the following synopses. Synopses for completed projects are included in Appendix 1 until the results have been incorporated into the Knowledge Base and included in other processes (e.g. BWMT Plan Amendment Process and Criteria). Subsections listing consequences for the Knowledge Base and consequences for management summarise actions precipitated by each project.

¹ 2007-3P and 2007-4P are funded from the money deferred from the 2006 Proposal Development packet.

5.0 Project Synopses

Project 2005-3 / 2006-2: Water Quality in Relation to Stream Crossings

Abstract: Changes in benthic invertebrate communities are frequently used to indicate water quality. This project investigated the relationship between stream crossing quality (as measured by project 2005-2 / 2006-1; Stream Crossing Quality) and water quality by looking at benthic communities. It used a multi-variate index to compare communities in unharvested reference streams with those below stream crossings.

Eleven streams were sampled below stream crossings in the Nichyeskwa watershed. Only one of these had a high concern rating based on the Stream Crossing Quality Index. All streams but one had unstressed communities of benthic invertebrates. The single, slightly stressed stream was fairly large (8m wide) and had no sedimentation concerns. Data are currently insufficient to relate the two indices.

Awaiting report for final results and conclusions.

Status: Ongoing. Data collection and analysis complete. Awaiting final report.

Geographic scope: Nichyeskwa watershed in 2005. Awaiting report for 2006.

Objectives listed in land-use plans: The Kispiox SRMP includes an objective to maintain water quality within its natural range, and presents specific targets relating to sediment introduction at stream crossings within Nichyeskwa, Shelagyote and Babine mainstem watersheds. The Bulkley LRMP includes an objective to maintain existing levels of water quality.

Type of monitoring: Collecting indicator data.

Leader: Ian Sharpe (Ministry of Water, Land and Air Protection)

Partners: FSP (funded a larger, multi-year project of which the BWMT contribution is part—the BWMT contribution allows more sample sites to be located in the Babine Watershed than would otherwise be possible), MoE.

Funding: \$5,000 in 2005; \$5,000 in 2006

Consequence for knowledge base: This project will assist in definition of the risk curve relating stream crossings to water quality (currently not defined). In addition, the project will allow for improved assessment of current risk and associated uncertainty to water quality in relation to stream crossings.

Consequence for management: This project will support management decisions, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with stream crossings. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

Project 2005-4 / 2006-3: Wilderness Value of Babine River Corridor

Abstract: This project has two phases, with the second phase contingent upon successful completion of the first.

The first phase aims to design a non-biased methodology to investigate perceptions of wilderness value in the Babine River Corridor. A background to potential methodologies exists from work completed in 2005. As a first step, the project investigates existing reports and discusses issues and potential for partnering with appropriate Ministry of Environment representatives.

Following the design of an acceptable methodology, phase two of the project will implement the methodology to consider socially acceptable levels of sustainable use, with particular focus on the Natural Environment Zone of the Park. Secondly, it will investigate perceptions of auditory disturbance throughout the Park, and sustainable use in the Wilderness Recreation Zone.

Status: Ongoing. Initial methodology designed in 2005/2006. Funding in 2006 deferred. Focus in 2007 is to improve methodology.

Geographic scope: Babine River Corridor Park

Objectives listed in land-use plans: The Babine River Corridor Park MDS (Management Direction Statement) includes an objective to maintain a wilderness experience in the corridor, including a sustainable level of recreation. The Kispiox SRMP includes an objective to maintain the aesthetic quality (visual and auditory) of the Babine River Corridor (BRC).

Type of monitoring: Detecting negative consequences (sustainable use); reducing uncertainty (auditory disturbance).

Leader: John Shultis, University of Northern BC (2005); to be determined for 2007

Partners: Real Estate Foundation Partnering Fund (provided matching funds; 2005), ILMB (provided logistic support)

Potential partners: Ministry of Environment will begin developing a Park Management Plan for the Babine River Corridor and has begun the process of developing Babine River Angling Management Plan

Funding: \$5,000 in 2005; \$15,000 budgeted in 2006, deferred to 2007

Consequence for knowledge base: This project constitutes the first step in detecting negative consequences to sustainable use and wilderness value of the Babine River Corridor.

Consequence for management: This project will provide information to assist with the development of targets through a Management Plan process that will be undertaken by the Ministry of the Environment.

Project 2005-6P / 2007-1: Human/bear Interaction and Open Road Density

Abstract: This project aims to measure road density per watershed within the Babine using a roving window approach. To improve the robustness of the study, it will include nearest community and estimates of the amount of bear use per watershed as model variables and will investigate the success of access controls and the extent of mitigative activities (e.g. screening, line-of-sight). Orthophotos and digital access-control points exist for the Bulkley and Kispiox TSAs.

Some information relevant to this project is currently being analysed by the Ministry of Forests. As this analysis is completed, the project may be modified to take advantage of the information, and design incremental work.

Status: Proposals to Grizzly Bear Conservation Strategy in 2005 and 2006 were unsuccessful. New project for 2007. Project design and requests for proposals will await information from ongoing MoFR project.

Geographic scope: Babine watershed

Objectives listed in land-use plans: The Babine LUP (Bulkley) and the Kispiox SRMP include objectives and associated strategies relating to road use and forest harvesting, for reducing the number of human-bear interactions. The SRMP includes specific road density targets for two watersheds.

Type of monitoring: Collecting indicator data.

Possible leaders: To be identified.

Possible partners: Ministry of Forests; awaiting information from Jane Lloyd-Smith on an ongoing project

Funding: Unknown amount (less than \$1,500) from proposal development budget for 2005 (not listed as a separate item under BV Centre budget). \$10,000 for 2007.

Consequence for knowledge base: This project will allow for assessment of current risk and associated uncertainty to human/bear interactions in relation to open road density.

Consequence for management: This project will support management decisions, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with current open road densities in each watershed. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

Project 2007-2: Stand-level Biodiversity in Managed Stands

Abstract: This project aims to measure stand structure in young managed stands.

Project 2005-5P estimated the range of natural variability in stand structure following fire, beetle and wind disturbance in three productivity classes of the SBSmc2 and ESSFmc. This project will compare remnant structure in managed stands (the number and size-class distribution of standing live and dead trees and the volume of downed wood) with the range of structure found following natural disturbance, and hence allow for assessment of current risk. Sampling will be stratified by biogeoclimatic subzone and productivity class as appropriate, and will be conducted to allow comparison with existing land-use targets.

Status: Initiated in 2007

Geographic scope: Available funding limits field work to easily accessible sites. Parts of Nichyeskwa watershed and Nilkitkwa watershed are the most likely candidates for sampling. Scope will be refined as part of project design.

Objectives listed in land-use plans: Both the Bulkley LUPs and the Kispiox SRMP include objectives to maintain structural attributes and diversity within managed stands. Indicators include wildlife tree patches (both Forest Districts) and amounts of specified attributes (Kispiox)². The Bulkley LUPs also include an objective, and associated indicators, to maintain a diversity of tree species.

Type of monitoring: Collecting indicator data related to stand structure in managed stands

Potential leaders: Ruth Lloyd

Potential partners: Doug Steventon, MoFR

Funding: \$7,000

Consequence for knowledge base: This project will allow for assessment of current risk and associated uncertainty to stand structure in relation to forest harvesting activities.

Consequence for management: This project will support management decisions, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with current levels of stand-level retention. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

² See Knowledge Base for details and rationale for indicator (www.babinetrust.ca)

Project 2007-3P: Mountain Goat Habitat

Abstract: This project aims to summarise ongoing work by MoE on harvesting near to goat habitat and on harvesting during the natal period. The intent is first to determine whether sufficient information already exists to update the knowledge base or whether additional work is necessary, and second, to describe an additional work.

Status: Initiated in 2007

Geographic scope: Babine watershed

Objectives listed in land-use plans: Bulkley LUPs include specific objectives for goats. Although the Kispiox LRMP includes objectives for goats, the SRMP has no specific objectives, assuming that the Atna-Shelagyote SMZ and access control strategies address the LRMP objectives. The SRMP notes that LRMP direction could result in future guidelines.

Type of monitoring: Reducing uncertainty and detecting negative consequences

Potential leaders: To be determined

Potential partners: To be determined

Funding: \$2,000

Consequence for knowledge base: This project will determine whether existing work can be used to decrease uncertainty and detect consequences in relation to harvesting near goat habitat and during the natal period.

Consequence for management: This project will support management decisions, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with harvesting near goat habitat, especially during the natal period. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

Project 2007-4P: Spatial distribution of mature and old forest

Abstract:

This project aims to reduce uncertainty relating to the distribution of mature and old forest. Two recent analyses examining the distribution of forest have the potential to reduce this uncertainty. First, an analysis conducted for the Bulkley Higher Level Plan, by Dave Daust, examined the distribution of mature and old forest relative to productivity classes within biogeoclimatic subzones. Second, Doug Steventon has completed work on landscape pattern in the Morice.

This project has two phases, with the second phase contingent upon successful completion of the first. The first phase assesses the applicability of existing work and summarises findings; the second conducts analyses or prepares proposals for analyses. Within phase one, the first task will be to assess the feasibility and cost of applying the Higher Level Plan analysis to the Babine. The second task will be to review Doug's work and assess (with guidance from Doug) whether his results can reduce uncertainty in relation to pattern and whether they can be applied to the Babine. If Doug's work is applicable and potentially useful, the third task will be to summarise results relevant to the Babine. Finally, following acceptance by the BWMT, if remaining funds are sufficient, the project can complete the type of analyses described in the Higher Level Plan; otherwise, the project will develop a proposal to complete the work.

All analysis will be conducted to allow comparison with current targets as listed in land-use plans.

Status: Initiated in 2007

Geographic scope: Babine watershed. Although a larger scale is required for calculation of the natural benchmark (these calculations already exist), it is acceptable to calculate current spatial distribution of mature and old forest at the watershed scale, particularly for a large watershed such as the Babine, for comparison with this benchmark

Objectives listed in land-use plans: Maintaining biodiversity is a general goal of all the land-use plans for the watershed and of legislation. The objectives of creating core ecosystems and landscape corridors are a large part of the strategy to fulfill this objective. However, to ensure sufficient representation, the land-use plans call for analysis over the entire landscape rather than just within core areas. Legislation and land-use plans also include objectives to create harvest patterns that reflect the spatial patterns of natural disturbance. The objective in the Kispiox SRMP specifically focuses on patch-size distribution while the objectives in the Bulkley LUPs and in legislation are more general (i.e., pattern).

Type of monitoring: Reducing uncertainty and detecting negative consequences

Potential leaders: To be determined

Potential partners: Doug Steventon

Funding: \$5,000

Consequence for knowledge base: This project will reduce uncertainty related to old and mature forest distribution and check for negative consequences in the applicable regions. It will also attempt to reduce uncertainty in relation to pattern.

Consequence for management: This project will support management decisions, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with current distribution of old and mature forest by productivity class and biogeoclimatic subzone. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

Project 2007-A1: Technical support

Abstract: Continuity of technical support is necessary for effective and efficient management of the monitoring framework, and the BWMT in general. Karen Price will provide technical support to the BV Research Centre and the BWMT as needed.

Status: Initiated in 2007

Geographic scope: Not applicable

Objectives listed in land-use plans: Not applicable

Type of monitoring: Not applicable

Leader: Karen Price

Potential partners: BV Centre

Funding: \$3,000

Consequence for knowledge base: Not applicable

Consequence for management: Not applicable

Project 2007-A2: Administrative Support

Abstract: The BV Research Centre provides administrative support in the form of contract management, meeting support, website maintenance, and communications. Please see contract schedules for further information.

Status: Ongoing since 2005

Geographic scope: Not applicable

Objectives listed in land-use plans: Not applicable

Type of monitoring: Not applicable

Leader: BV Research Centre

Potential partners: Karen Price

Funding: \$12,000

Consequence for knowledge base: Not applicable

Consequence for management: Not applicable

Table 4. Funding decisions for high priority topics for collecting indicator data. Topics are ordered by relative priority as determined by Monitoring Framework⁴. Topics below the dashed lines have a low priority for funding within the next 5 years.

Objective	Indicator	Decision	Project #	Project name	Funding	Project length	Status and Rationale
Stand structure	% of natural riparian habitat	Proposal to FSP funded 2005. Fund in 2007.	2005-5P ⁵ , 2007-2	Stand-level biodiversity	\$776 in 2005 \$7,000 in 2007	1 – 3 years	Project on structure in natural stands complete, funded by the FSP; project 2007-2 initiated 2007 to examine structure in managed stands
Fish habitat	% of natural riparian habitat	Funded in 2005	2005-1	Riparian ecosystems	\$15,000	1 year	Project 2005-1 complete for Nichyeskwa. Conclusion that risk is low in that watershed means that repeating the project elsewhere is no longer a high priority.
Riparian biodiversity	% of natural riparian habitat	Funded in 2005	2005-1	Riparian ecosystems	as above	1 year	Project 2005-1 complete (as above)
Rare ecosystems	% of natural riparian habitat	Re-assess each year	—	—	—	—	Requires PEM – Unlikely to be completed in the near future.
Human/bear interaction	Road density	Proposal to Habitat Conservation Trust Fund funded 2005. Fund in 2007.	2005-6P, 2007-1	Human/bear interaction and open road density	< \$1,500 in 2005. \$10,000 in 2007.	1 year	Proposals to Habitat Conservation Trust Fund were unsuccessful. Ongoing work by MoFR facilitates efficient use of BWMT funding in 2007.
Human/bear interaction	Screening	Not funded	2005-6P, 2007-1	Human/bear interaction and open road density	as above	1 year	May be used to modify project 2007-1
Human/bear interaction	Education	Not funded	—	—	—	—	Uncertainty not resolvable within the Babine

⁴ Ordered by secondary score (all topics have high priority for data collection; see Monitoring Framework for methods www.babinetrust.ca).

⁵ Project numbers followed by a “P”: proposals will be prepared to seek funding (i.e. no operational budget in 2005).

Objective	Indicator	Decision	Project #	Project name	Funding	Project length	Status and Rationale
Water quality	Stream crossing	Funded in 2005 and 2006	2005-2, 2006-1 and 2005-3, 2006-2	Water quality and stream crossings	\$12,500 to 2005-2 \$15,000 to 2006-1; \$5,000 to 2005-3 and 2006-2	2 years	Stream crossing projects funded in two watersheds in 2005 and 2006. Water quality monitoring at a subset of the same sites funded in 2005 and 2006.
Water quality	Landslides	Re-assess in 2008	—	—	—	—	Some data already collected and analysis in progress - re-assess status before pursuing
Water quality	Planning	Not funded	—	—	—	—	—
Bull trout	Bridge location	Not funded	—	—	—	—	—
Bull trout	Protected habitat	Not funded	—	—	—	—	—
Steelhead	Repeated capture	Not funded	—	—	—	—	—
Deciduous stands	% of natural	Not funded	—	—	—	—	—
Wildlife	% of wildlife areas in ETDs	Not funded	—	—	—	—	—
Water quantity	ECA	Not funded	—	—	—	—	—
Connectivity	Winter logging	Not funded	—	—	—	—	—
Timber salvage	% susceptible	Not funded	—	—	—	—	—
Timber salvage	% controlled	Not funded	—	—	—	—	—
Timber salvage	% salvaged	Not funded	—	—	—	—	—
Backcountry recreation	Amount primitive	Not funded	—	—	—	—	—
Gunanoot Lake	Visual quality	Not funded	—	—	—	—	—
Pine	% mature	Not funded	—	—	—	—	—

Objective	Indicator	Decision	Project #	Project name	Funding	Project length	Status and Rationale
mushroom habitat	sites						
Huckleberries	% sunlight in cutblocks	Not funded	—	—	—	—	—
Huckleberries	% soil disturbance	Not funded	—	—	—	—	—
Access to recreation	Inaccessible destinations	Not funded	—	—	—	—	—

Table 5. Funding decisions for high-priority topics for monitoring to improve knowledge and reduce uncertainty. Topics are ordered by relative priority as determined by Monitoring Framework⁶. Topics below the dashed lines have a low priority for funding within the next 5 years.

Objective	Indicator	Decision	Project #	Project name	Funding	Project length	Status and Rationale
Natural seral	% of natural old and old + mature	Fund proposal development in 2007	2007-4P	Spatial distribution of mature and old forest	\$5,000	1 year	Although PEM is not available, productivity classes are—and some analysis has already been completed as part of the Bulkley Higher Level Plan that would facilitate this project.
Tree species	% of natural	Proposal to FSP funded 2005. Fund in 2007.	2005-5P, 2007-2	Stand-level biodiversity	See Table 4	1 – 3 years	Some information in project 2005-5P funded by the FSP; project 2007-2 initiated 2007 to examine species in managed stands
Pattern	% of natural (biggest patch)	Fund proposal development in 2007	2007-4P	Spatial distribution of mature and old forest	See 2007-4P above	1 year	Doug Steventon has completed work on pattern in the Morice. This project would summarise his work and investigate applicability to the Babine.
Connectivity	% of mature and old	Fund proposal development in 2007	2007-4P	Spatial distribution of mature and old forest	See 2007-4P above	1 year	Elements of connectivity may also be covered by Doug's work. This project would investigate these elements.
Grizzly habitat	% high-value	Seek funding	—	—	—	—	Low priority within grizzly bears
Goat habitat	% unmodified nearby	Fund proposal development in 2007	2007-3P	Mountain goat habitat	\$2,000	1 year	MoE has relevant analysis in progress. This project summarises the current work and investigates the necessity of further work in the Babine.
Goat habitat	Harvest during natal period	As above	2007-3P	Mountain goat habitat	As above	1 year	As above
Wilderness value of BRC	Auditory disturbance	Funded in 2005. Fund in 2007	2005-4, 2006-3	Wilderness value of BRC	\$5,000 in 2005, \$15,000 in 2007	2 – 3 years	Methodology development initiated in 2005; deferred in 2006; continued in 2007

⁶ Ordered by priority to reduce uncertainty and then by secondary score (see Monitoring Framework for methods www.babineTrust.ca).

Wilderness value of BRC	Visual quality	Not funded	—	—	—	—	—
Grizzly bear habitat	% critical habitat	Not funded	—	—	—	—	—
Goat habitat	Kotsine connector	Not funded	—	—	—	—	—
Goat population	Road density	Not funded	—	—	—	—	—

Table 5 (Continued). Funding decisions for high-priority topics for monitoring to improve knowledge and reduce uncertainty.

Objective	Indicator	Decision	Project #	Project name	Funding	Project length	Status and Rationale
Timber growth	% old	Not funded	—	—	—	—	—
Grizzly bear disruption	Forest harvesting	Not funded	—	—	—	—	—
Grizzly bear disruption	Other activities	Not funded	—	—	—	—	—
Sustainable use	Campsites	Not funded	—	—	—	—	—
Timber salvage	% susceptible	Not funded	—	—	—	—	—

Table 6. Funding decisions for high-priority topics for monitoring to detect negative consequences. Topics are ordered by relative priority as determined by Monitoring Framework⁷. Topics below the dashed lines have a low priority for funding within the next 5 years.

Objective	Indicator	Decision	Project #	Project name	Funding (2006)	Project length	Status and Rationale
Sustainable use	Encounters in Natural Environment Zone	Funded in 2005. Fund in 2007	2005-4 2006-3	Wilderness value of BRC	See Table 5	2 – 3 years	Methodology development initiated in 2005; deferred in 2006; continued in 2007
Natural seral	% of natural old and old + mature	Fund proposal development in 2007	2007-4P	Spatial distribution of mature and old forest	See Table 5	1 year	Although PEM is not available, productivity classes are—and some analysis has already been completed as part of the Bulkley Higher Level Plan that would facilitate this project.
Tree species	% of natural	Not funded	—	—	—	—	Difficult to detect
Pattern	% of natural (biggest patch)	Not funded	—	—	—	—	Difficult to detect
Connectivity	% of mature and old	Not funded	—	—	—	—	Very difficult to detect
Goat habitat	% unmodified nearby	Fund proposal development in 2007	2007-3P	Mountain goat habitat	See Table 5	1 year	MoE has relevant analysis in progress. This project summarises the current work and investigates the necessity of further work in the Babine.
Goat habitat	Harvest during natal period	As above	2007-3P	Mountain goat habitat	See Table 6	1 year	As above
Timber salvage	% susceptible	Not funded	—	—	—	—	Data already collected
Wilderness value of BRC	Auditory disturbance	Funded in 2005. Fund in 2007	2005-4 2006-3	Wilderness value of BRC	See Table 5	2 – 3 years	Methodology development initiated in 2005; deferred in 2006; continued in 2007
Sustainable use	Floatcraft encounters	Funded in 2005. Fund in 2007	2005-4 2006-3	Wilderness value of BRC	See Table 5	2 – 3 years	Methodology development initiated in 2005; deferred in 2006; continued in 2007
Wilderness value of BRC	Visual quality	Not funded	—	—	—	—	—

⁷ Ordered by priority to detect consequences and then by secondary score (see Monitoring Framework for methods www.babinetrust.ca).

Abbreviations

BRC	Babine River Corridor
BWMT	Babine Watershed Monitoring Trust
CFS	Canadian Forest Service
DFO	Department of Fisheries and Oceans
ECA	Equivalent Clearcut Area
ETD	Enhanced Timber Development Zones
FRPA	The British Columbia Forest and Range Practices Act
FSP	Forest Sciences Program
GIS	Geographic Information System
LRMP	Land and Resource Management Plan
LUP	Landscape Unit Plan
MoE	Ministry of Environment
MDS	Management Direction Statement
PEM	Predictive Ecosystem Mapping
SFM Network	Sustainable Forest Management Network
SRMP	Sustainable Resource Management Plan

Appendix 1. Completed monitoring projects

Synopses of completed monitoring projects are included in the Annual Monitoring Plan until the results are incorporated into the Knowledge Base and included in other processes as appropriate (e.g. BWMT Plan Amendment Process and Criteria). Subsections listing consequences for the Knowledge Base and consequences for management summarise actions precipitated by each project.

Project 2005-1: Riparian Ecosystems and Fish Habitat

Abstract: This project examined the status of riparian forest ecosystems adjacent to fish-bearing and non-fish-bearing streams within the Bulkley portion of the Nichyeskwa watershed. A group of experts designed the project in 2005. The project included analysis of existing remote data, new air photo data and limited field checks to assess the status of riparian forest around unmanaged and managed streams.

Classification by biogeoclimatic subzone, size and gradient captured the variation in 302 stream reaches in 6 study sub-basins. Unharvested riparian forest was mostly old (91% > 140 years in the ESSFmc and 73% > 140 years in the SBSmc2), with relatively open canopies. Deciduous trees were rare.

Forest harvesting has affected a small portion of the riparian forest within a 60-m ribbon in the study area. Sixty-metre strips provide an ecologically precautionary estimate of the extent of riparian forest. In the ESSFmc, harvesting primarily affected forest around small, gentle streams. In the SBSmc2, harvesting affected all stream types. The highest proportion of harvested riparian forest within a 60-m ribbon was 15% (11 – 27% by sub-basin) for small streams with a gentle slope in the SBSmc2.

Streams containing fish were somewhat disproportionately harvested, although only 8% of riparian forest within 60 m of fish-bearing streams have been harvested. Field work next to five fish streams found that buffers ranged from 20 – 50m. Hence, much of the harvested forest was likely beyond these buffers.

Field work in buffers and paired unmanaged riparian forest corroborated the observation from the air that blowdown poses little risk in the Bulkley portion of the Nichyeskwa watershed.

Status: Complete

Geographic scope: Bulkley portion of Nichyeskwa watershed

Objectives listed in land-use plans: Legislation and planning documents pertinent to this project include: 1) FRPA, which establishes objectives for conservation of ecological values associated with riparian areas, 2) The Kispiox LRMP, which includes an objective (within the goal of maintaining biodiversity) to maintain riparian areas, and 3) The Bulkley LUP, which include objectives (within goals of maintaining fish habitat) to retain structure within riparian management zones. Both the Bulkley LUPs and Kispiox SRMP include maps of Landscape Riparian Corridors.

Type of monitoring: Collecting indicator data about standing riparian forest; reducing uncertainty in relation to windthrow.

Project leaders: Ruth Lloyd and Karen Price

Partners: Ministry of Forests (provided data), Pacific Inland Resources (shared helicopter time and provided data), Canadian Forest Service (time for Phil Burton to

assist with remote data collection); Research design participants: Phil Burton (CFS), Steve Gordon (MoE), Tom Pendray (DFO), Karen Price (consultant), Dave Wilford (chair, Bulkley Aquatic Resources Committee).

Funding: \$15,000

Consequence for knowledge base: In the Bulkley portion of the Nichyeskwa watershed, current levels of harvesting pose low risk to ecological function or fish habitat. Exceptions to low risk were due to a rare stream type or to low levels of natural old forest in sub-basins. Forest within 60m of moderately-sized, steep streams in the SBSmc2 covered only 25ha. Almost half of this area lay within a single cutblock, posing moderate risk.

In addition, buffers in this area have very low susceptibility to windthrow, reducing associated uncertainty.

Consequence for management: This project supports current strategies of riparian retention.

Recommendations for further monitoring: The low levels of harvesting next to streams means that further projects of this type are currently not a high priority. As harvesting increases within sub-basins, risk to riparian ecosystems and fish habitat should be monitored for increased levels of risk. Existing databases, modified by silvicultural prescriptions, should be sufficient for coarse-filter monitoring in accordance with the indicators included in Babine Watershed land-use planning. A similar project in the Nilkitkwa watershed, and in other watersheds over time, would be useful to assess risk and uncertainty levels elsewhere in the Babine watershed. Unless blowdown is more prevalent elsewhere, field work should not be necessary for coarse-filter monitoring.

Project 2005-2 / 2006-1: Stream Crossing Quality

Abstract: Roads are a dominant source of sediment introduced into riparian systems, particularly where they cross streams. This project examined the quality of stream crossings in the Nichyeskwa Watershed and Upper Babine River Corridor, using a Stream Crossing Quality Index developed by Pierre Beaudry. The index assesses the hazard level of accelerated erosion and sediment delivery associated with roads. It does not assess the impacts of changed sediment regimes on the aquatic ecosystems (see Project 2005-3 / 2006-2; Water Quality in Relation to Stream Crossings).

The project sampled 60 streams in the Nichyeskwa in 2005 and 103 in the Upper Babine in 2006. In the Nichyeskwa, 17% of streams had a water quality concern rating of high to very high; in the Upper Babine, only 4% had this rating. At these levels, sediment potentially impairs fish habitat. Larger streams generally fared better than small streams: all crossings of streams greater than 5m wide had low or nil concern ratings; in the Nichyeskwa, about two-thirds of crossings of streams between 0.5 and 5m had low or nil concern ratings and in the Upper Babine, about 85% had low or nil concern ratings.

The project provided maps of the location of each sampled streams, with associated concern rating.

Status: Complete

Geographic scope: Nichyeskwa watershed and Upper Babine River Corridor

Objectives listed in land-use plans: The Kispiox SRMP includes an objective to maintain water quality within its natural range, and presents specific targets relating to sediment introduction at stream crossings within the Nichyeskwa, Shelagyote and Babine mainstem watersheds. The Bulkley LRMP includes an objective to maintain existing levels of water quality.

Type of monitoring: Collecting indicator data; Improving Knowledge and Reducing Uncertainty

Leader: Pierre Beaudry

Partners: None

Funding: \$12,500 in 2005; \$15,000 in 2006.

Consequence for knowledge base: This project assesses current hazard associated with individual stream crossings. In collaboration with project 2005-3 / 2006-2 (Water Quality in Relation to Stream Crossings), it will define the currently undefined curve relating stream crossings to water quality. Site selection was coordinated between the two projects. Data analysis is complete, but conclusions have not been drawn as of June 2007.

Consequence for management: This project assessed each crossing for its potential to produce sedimentation, and ranked them into hazard groups (nil, low, moderate, high, very high concern). These rankings have been used by forest managers through appropriate processes which are separate from the BWMT.

Recommendations for further monitoring: Future monitoring of crossings with high to very-high concern ranking, particularly following any efforts at mitigating hazard could be useful.

Project 2005-5P: Stand-level Biodiversity in Natural Stands

Abstract: Forest management prescribes retention of structural attributes in harvested stands, but questions remain about the amount of each attribute to retain. This study documented the range of natural variability in the number of standing and dead trees, and the volume of downed wood, remaining after fire, insects and wind disturbances in and around the Babine watershed, to allow risk assessment of management options relating to structural attributes.

The project measured structural legacies in 140 plots in 27 sites that had been disturbed by fire, wind and insects over the past 50 years. In the study area, fire caused the most extensive catastrophic disturbances; beetles were extensive, but often not catastrophic; wind disturbance was least common. Salvage of disturbed stands severely reduced the number of potential sites.

Overall, the range of natural variability was large, and covered all possible values of retention. However, the mean and standard error of numbers of snags and volume of downed wood left after disturbance can guide risk analyses (Table 1). Analyses found very few significant effects of biogeoclimatic subzone or site productivity on the amounts of structure retained. The only exception for standing live and dead trees was in stands disturbed by balsam bark beetles: this effect was related to the proportion of subalpine fir in the stand. For downed wood, the only pattern detected was that mesic-rich sites had a higher proportion of larger-diameter downed wood.

Table 1. Structural legacies of natural disturbance (mean \pm standard error) for disturbances within the past 10 years.

	Live trees (#/ha)	Dead trees (#/ha)	Downed wood (m ³ /ha)
Fire (n=2)	55 \pm 11	1140 \pm 94	216 \pm 62
Beetles (n=6)	422 \pm 59	328 \pm 59	165 \pm 35
Wind (n=4)	281 \pm 29	172 \pm 48	632 \pm 28

Wind and beetles left more large than small snags and downed wood. Size-class distribution of snags following fire initially was negatively exponential, but became unimodal over time as the smallest snags fell. This size-class distribution suggests that within-stand retention guided by natural patterns should either leave snags in a size distribution that matches the pre-disturbance distribution of live trees (to mimic fire) or should bias retention towards larger snags and downed wood (to mimic beetles and wind).

Status: Complete. Proposal development funded in 2005. Project funded by FSP.

Geographic scope: 1:250,000 NTS sheet 93M (which includes the Babine Watershed), but expanded to include sheet 93L and parts of 93E

Objectives listed in land-use plans: Both the Bulkley LUPs and the Kispiox SRMP include objectives to maintain structural attributes and diversity within managed stands. Indicators include wildlife tree patches (both Forest Districts) and amounts of specified attributes (Kispiox)³. The Bulkley LUPs also include an objective, and associated indicators, to maintain a diversity of tree species.

Type of monitoring: Collecting indicator data related to natural amounts of stand structure; reducing uncertainty related to tree species composition.

Leaders: Ruth Lloyd, Phil Burton, Karen Price

Partners: FSP (provided \$63,000 funding), CFS (provided \$11,500 in-kind funding), University of Northern BC (provided \$10,000 in-kind funding), MoF (provided data).

Funding: \$776 from proposal development budget for 2005.

Consequence for knowledge base: To estimate the risk to biodiversity associated with different levels of stand retention, it is necessary to compare retention in managed stands with retention following natural disturbance. Before this study, no data existed to estimate stand-level retention following natural disturbance and hence it was not possible to estimate risk to biodiversity. This project thus provides the natural baseline for in-stand retention. It allows for assessment of future risk and associated uncertainty based on targets included in land-use plans. In combination with project 2007-2 (Stand-level biodiversity in managed stands), it will allow for assessment of current risk and associated uncertainty to stand structure and to tree species composition in relation to forest harvesting activities.

Consequence for management: In combination with project 2007-2, this project will support management decisions, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with current and target levels of stand-level retention. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

Recommendations for further monitoring: No further estimation of natural retention levels in the area is necessary: improving the power to detect trends would require a vast investment. This project forms the natural baseline for comparisons with retention in managed stands (Project 2007-2).

³ See Knowledge Base for details and rationale for indicator (www.babinetrust.ca)

