

Notes from the Thursday May 18 2006 Meeting of the Scientific Advisory Panel

Burns Bog Ecological Conservancy Area

SAP members: Richard Hebda, Allan Dakin, Geoff Scudder (by phone), Hamish Kimmins, John Jeglum, Bert Brink and Bob Peart

Planning Team Members: Greg Paris, Verne Kucy

Guests: Sarah Howie, Paul Whitfield, Hugh Fraser

1. Notes from the April 20, 2006 meeting were modified. Bob will circulate a corrected copy.
2. The agenda was approved as distributed. Hebda and Jeglum were recently in the Bog and they commented on the valuable work of the beavers and how their dams were raising the water to serve the whole peat body.
3. Burns Bog Perimeter and Lagg
 - a. A Healthy Lagg Checklist
 - A desired lagg attributes document was distributed and discussed. Attached is the updated version based on the input of the SAP members. This document is to be finalized at our next meeting.
 - b. 'Walk Around the Bog' Map
 - The map as prepared by Sarah Howie based on our previous meeting was reviewed and modified. The attached map reflects our discussion.
 - There was agreement that this map indicates patterns and that it will change as our knowledge base grows.
 - It was agreed that the map will remain internal and that it must be field tested with transects to determine its accuracy as it has been developed based on a number of assumptions that may not be accurate.
 - This map does generally indicate where the lagg is and where it is not. Where it is not there need to be conversations about 'how to get the best lagg possible in place'
 - This map will be discussed at the next meeting and next step actions finalized.
4. Applied Research and Monitoring Strategy

Bob circulated a draft research and monitoring framework. It was discussed and modified – refer to Appendix Two. This framework will be finalized at the June SAP meeting.
5. Monitoring Results

SAP members reviewed two maps that provided some preliminary data related to Type I and Type II water along the perimeter of the Bog.
6. Next Meeting

The next meeting will be at the usual time and place --- Thursday June 15 **330-730**. **Please note the starting time is 330** as the agenda is anticipated to be full:

 - Wildfire Strategy Update and Discussion
 - Finalize the Research and Monitoring Framework
 - Finalize the Healthy Lagg Checklist and set priorities based on the 'Walk Around' map.
 - Review/discuss the draft Burns Bog Management Plan
 - Brief Gateway Program Update

APPENDIX ONE

A Healthy Lagg Checklist

May 18, 2006 Draft

The lagg is a transition zone – a buffer from outside influences - that performs three functions: hydrological, hydrochemical and biological. Each of these three functions must be in existence and working together or you haven't a naturally functioning lagg --- they are integrated, not independent. Following are attributes of each that can be defined, measured and aimed for. These attributes need to be unambiguous so they can be easily recognized/measured so that it can be determined 'whether you are in the lagg or not' and 'whether it is healthy'. A healthy functioning lagg is necessary for the Bog's restoration.

➤ Hydrological

- Depth to water table: ~ **not below 30-40 cm in summer**
- Water Storage: **static (catotelm, deep pools); dynamic (acrotelm, shallow pools, ditches/water courses)**
- Water Balance: **Seasonal variance to be positive**
- Water Mound: **Variation: @ true elevation, including surface water elevations in ditches and ponds.**
- Drainage:
 - Historical/Modern comparison --- **internal patterns, % disturbed**
 - Ditches: **Length, density**

➤ Hydrochemical

- Water Types:
 - **Type I Bog Water:** pH 3.5-5.5 Calcium 0-3 mg/l
 - **Type II Transitional Water:** pH 4.5-6.0 Calcium 3-10 mg/l
 - **Type III Non-bog Water:** pH 5.0-8.0 Calcium > 10 mg/l
- Minerals: **Determine the initial characterization of dissolved minerals (Sodium, Calcium, Magnesium) and how that can change over time.**
- Ambient Precipitation: **Input**

➤ Biological

- Lagg
 - Native Soils: **Organic to mineral transition**
 - Plant mosaic: **Low woody or non-woody vegetation. Hardhack Thicket *Spirea* and the Mixed Conifer Forest (Red Cedar-Skunk Cabbage)**
 - Width: **Variation; Upland to diffuse.**
- Species Composition
 - Indicator Vegetation: **% of study area by category; forested -> shrub and herb dominated -> non vegetated and anthropogenic**
 - Indicator Species: **Monitor common species types that can be recognized 'when you are in the Bog'; numbers; range; variation with pH**
 - Disturbed/Undisturbed: **% variation**
 - *Sphagnum*: **Sequencing/gradient of species from outside to inside**
 - Invasive Species: **As few as possible. Species, numbers of each species, link to water type.**
 - Connectivity through adjacent lands: **Determine existence and use.**
 - Boundary: **Natural contours, not right angles**

Applied Research and Monitoring Strategy for Burns Bog Ecological Conservancy Area Draft May 24, 2006

1.0 Introduction

- Brief background on Burns Bog
- Reference to Hebda and McDade documents
- Brief history of Scientific Advisory Panel, etc
- Map of Burns Bog

2.0 Preamble

- Critical context of climate change as an overriding consideration
- Covenant essential as it directs management actions
- Why Burns Bog isn't fully protected yet even though key lands were purchased
- Why we need to collect more data and conduct research.
- Time frame --- 100 years
- Rationale why we need to restore Burns Bog, conduct research and monitor our approach.
- How this framework will be shared with decision makers and how it can assist with decision making related to Burns Bog.
- The importance/value of communicating the scientific results and data with the public.

3.0 Strategic Approach and Principles

- Scientific Advisory Panel Terms of Reference
- All research at Burns Bog to be related to this framework.
- Previous research at Burns Bog
- Two fundamental components:
 1. Collect fundamental baseline data and develop a monitoring strategy as both are a necessary component and background for future research.
 2. Develop a research strategy based on the need for information related to restoration and public use.
- Incorporate the research outline previously approved by SAP

Return Burns Bog to an ecological condition shaped by raised bog processes, buffered from disruptive or disturbing processes on the adjacent landscape, over a timeframe of 100 years. Achieve this ecological condition by maintaining characteristic ecological processes, structure and biota interacting over time, while recognizing the directional forces of urbanization, adjacent land uses and climate change. Measure and analyze the ecological condition using the following indicators:

- *Characteristic ecological processes: hydrological systems and water chemistry, peat accumulation, trophic interactions, connection with adjacent ecosystems and landscapes.*
- *Structure and composition: the set of plant species or communities that define the bryophyte dominated shrubby structure and function of the bog habitat.*
- *Biota: the set of key, rare and/or critical acidophilic species (plants, vertebrates and invertebrates) that are collectively capable of natural*

or progressive evolution into other related bog ecosystem(s) with ecological integrity.

- Terms of reference for all research. Clear operating principles are required. Certain research and monitoring principles are necessary:
 - Template --- format, expect certain approach
 - Standards --- peer review, do's and don'ts of research as Bog so sensitive
 - Monitoring to be built in.
 - Scope and focus --- applied to bog restoration only and to facilitate management decisions
 - Integration and Collaboration --- link to each other, encourage collaboration, etc
 - Communication --- important to communicate results, not only among researchers and within the scholarly and applied community, but also to the people living in and adjacent to Burns Bog.
 - Use of Volunteers. When appropriate, who and under what circumstances?

4.0 Baseline Data and Monitoring

- Description of why it is essential to collect baseline data and monitor conditions.
- Description of current monitoring status and what the data to date indicates --- what information is being gathered, who is collecting the data, the operations that Delta and Gateway have underway, etc
- Outline the requirement to set standards to measure against and to determine success whether the interventions are working. Point of reference for future research.
- After data is gathered there will be a requirement for subsequent monitoring and/or re-analysis to determine trends, etc.
- Listing of what baseline data are crucial and the status of each:
 - Standard Data
 - Establishing water levels, based on true elevations. This data is important for determining the 'growth' of the existing dome, annually and seasonally.
 - Analyzing water chemistry
 - Standard climatological data.
 - Status of key biotic species and the critical indicators of biodiversity.
 - Determining a water balance model
 - Determining healthy lagg attributes and mapping the location of the functioning lagg
- PRIORITIES
 - Calculate the actual water balance data for Burns Bog --- because in the big picture it is the water balance that we are trying to manipulate. . In its simplest form the water balance appears as **Water in minus water out equals change in water stored.** This balance was discussed in the March 2000 Ecosystem Review – Section 4.2.5.6 Water Balance, but it requires updating. We need to determine the water loss by evaporation, evapotranspiration and the interception by trees/shrubs that prevents water even getting to the Bog. It is important to get a sense of how much it would cost to determine an updated water balance model, so that the associated agencies can budget for the work.
 - Mapping and studying the functioning lagg to determine where it is, and where are the gaps. Obtaining a true picture of water flow within and around the Bog. Apply the healthy lagg checklist to determine future data needs. Determine a soil profile characterization.
 - Annual monitoring as initially established by Munson in July 2005 to measure ecosystem restoration.

- Monitoring the 2005 fire to measure its effects, especially related to the regeneration of vegetation, the presence of invasive species and the regrowth of *Sphagnum*. Compare to previous fire regeneration in Bog. Both place based and temporal.

5.0 Applied Research

- Research is necessary to gather essential science information related to restoration of the Bog and to assist in determining the implications for public use.

RESTORATION RESEARCH

- Ecosystems share a basic set of attributes called Essential Ecosystem Characteristics (EEC's) as outlined in the March 2000 Ecosystem Review by Hebda.

Ecosystem Characteristic	Description and Indicators
Habitat Quality	<ul style="list-style-type: none"> ▪ Landscapes and community diversity; connectivity and fragmentation; habitat structural diversity
Integrity of the Biotic Community	<ul style="list-style-type: none"> ▪ Biodiversity; trophic structure; key or critical species
Ecological Processes	<ul style="list-style-type: none"> ▪ Production and decomposition; biogeochemical cycling; succession; dispersal and migration
Water Quality	<ul style="list-style-type: none"> ▪ Biological, chemical and physical characteristics
Hydrological System	<ul style="list-style-type: none"> ▪ Water flows, storage and supply; structural characteristics
Disturbance Regime	<ul style="list-style-type: none"> ▪ Fire; floods; storms; drought; disease or pest outbreaks; anthropogenic influences
Sediment/Soil Quality	<ul style="list-style-type: none"> ▪ Biological, chemical and physical characteristics; erosion and accumulation

- The SAP Research Outline leads to the following research themes
 - Hydrology and Hydrochemistry
 - Bog Community Ecosystems, Processes and Key Species
 - Forest Management
 - Lagg
 - Wildfire
 - Invasive Species
 - Rare and Endangered Species

- The following research approach, which brings together the EEC framework with the research themes, was suggested. This table may help define research priorities. Each research themes should be developed in more detail, including a literature review on previous work in the Bog.

EEC's	Research Themes						
	Hydrology Hydrochemistry	Forest Mgmt	Lagg	Wildfire	Invasive Plants	R/E Species	Bog Ecosystems
Habitat Quality							
Biotic Community							
Ecological Processes							
Water Quality							
Hydrology							
Disturbance Regimes							
Sediment/ Soil Quality							

- **PRIORITIES**

- Invasive Species and Water Table Type. Determine which species are present and test the hypothesis that ‘bog water’ is not ‘good for’ most invasives and as the Bog restores the most detrimental species won’t be able to survive.
- Wildfire research related to fire management (tree removal, vegetation type, acrotelm compression) and the capacity to regenerate *Sphagnum*.
- Forest Management and Bog
 - A three sample operational field trial along the bog edge where the forest has taken over
 - Selective thinning of trees
 - Controlled burns

PUBLIC USE RESEARCH

- We need to know where, when and if public use is appropriate. Investigation is required on such matters as:
 1. Public use and the sensitive nature of the Bog
 2. The implications of use to the Bog --- where might a zone of public influence be that won’t be harmful.

6.0 Application and Communication

- Transparency is important.
- Research is applied and is meant to be communicated.
- Share with both the effected agencies and the public.
- Public inclusion important so they continue to support the Bog’s protection and restoration.
- Also important to communicate to university settings and research scientists.

7.0 Anticipated Annual Operational and Capital Costs

- A formal operations and capital budget needs to be established. A rough 'guesstimate' is included below.

	O& M	Capital	Outside \$\$\$\$\$ ¹
<u>Data Collection and Monitoring</u>		20000 ⁴	
○ Baseline Data (on going until complete)	50000		
○ Water Balance (1 year)	20000		20000 (PhD) ⁵
○ Lagg Determinations (2 years)	20000		5000 (MSc)
○ Annual Restoration Sampling	5000		
○ Periodic Aerial Monitoring	20000 ²		
○ Fire Baseline and Vegetation Regeneration (5 years)	10000 ³ (5000)		
<u>Research</u> ⁶ (3 year projects typically)			
RESTORATION			
○ Invasive Species/Water Table	20000		20000 (PhD)
○ Forest Mgmt/Bog Restoration	20000	10000 ⁸	20000 (PhD)
○ Next Priority ⁷			
PUBLIC USE			
○ Implications of Public Use to Ecological Integrity	20000		20000 (PhD)
Coordinator	30000 ⁹		
SUB-TOTAL	170000	30000	85000
TOTAL			\$285000 ¹⁰

8.0 Implementation

This research and monitoring strategy framework:

- Needs to be approved by SAP and adopted by the Planning Team and incorporated as an essential component of the Burns Bog Management Plan.
- The implementation of this research strategy will be the focus of the Scientific Advisory Panel. Below is the proposed Terms of Reference for SAP beginning September 2006.
- The Planning Team will determine who will Chair/Facilitate SAP beginning September 2006, as the replacement for Bob Peart's role. This person might also finalize this framework and expand it into a more formal research and monitoring strategy for Burns Bog.

¹ Potential for leverage money.

² \$20000 every 3-4 years.

³ \$10000 year one, then \$5000.

⁴ Essentially making a \$100K commitment over 5 years. \$60-70K in first two years.

⁵ Typical PhD project is \$40K: \$20 K to the student and \$20K to support the project.

⁶ Typical per project cost of \$40000, of which BB agencies and university grants split the cost.

⁷ Will begin when either of two above is complete.

⁸ Expect large equipment costs --- perhaps a helicopter, small bulldozer.

⁹ Contract or internal position to facilitate/chair the Scientific Panel.

¹⁰ Some SAP members feel that a Centre of Excellence for Burns Bog research could be established. This would be an initial cost of perhaps \$1M with an on-going cost of \$50000.

- A formal research approval process needs to be established by GVRD. This approval process will entail the following steps.
1. Research scientist forwards application of interest to conduct research in Burns Bog to GVRD Parks. GVRD 'screens' the application to ensure it fits the framework of the Research and Monitoring Framework.
 2. GVRD Parks refers the application to Delta and the Scientific Advisory Panel.
 3. SAP reviews and provides advice to GVRD and Delta.
 4. Delta and GVRD determine whether research is to proceed.
 5. If the research is to proceed GVRD issues the appropriate permit.
 6. SAP monitors the research process and results as appropriate.

**Burns Bog Ecological Conservancy Area
Scientific Advisory Panel (SAP)
Terms of Reference
(effective September 2006)**

The members of SAP are:

Dr. Richard Hebda
Dr. Geoff Scudder
Dr. Hamish Kimmins
Allan Dakin (P.Eng.)
Dr. John Jeglum

Honorary Members: Dr. Bert Brink and Dr. David Bellamy

Terms of Reference

- Review and comment on the implementation of the Burns Bog Research and Monitoring Strategy Outline with the purpose of identifying gaps and critical issues needing attention;
- As appropriate, review and comment on the implementation of the Burns Bog Management Plan with the purpose of helping to develop longer-term management strategies to protect the ecological assets of the Bog; and
- Provide advice and make recommendations on other critical matters referred to them by the Planning Team.

Panel members will make a concerted attempt to reach consensus on their recommendations, if that is not possible the Planning Team will make the final determination.

The Panel will meet 3-4 times annually, and the GVRD will cover the members travel and accommodation costs associated with attendance.

Work Plan and Priorities

The work plan of SAP will be guided directly by the Planning Team. Following are SAP's work plan priorities:

- To finalize the development of Research and Monitoring Strategy.
- To provide advice related to the restoration/placement of the lagg.
- To advise on the implementation of the Research and Monitoring Strategy.
- To review formal research requests, referred to the Panel by the GVRD.
- As requested, to review the scientific and technical soundness of the any actions that may influence the future of the Bog --- for example the South Fraser Perimeter Road.
- As requested, to provide advice on the implementation of the Burns Bog Management Plan.