BBECA SCIENTIFIC ADVISORY PANEL WORKSHOP
Tuesday, May 9th, 2017, 10:00am – 4:00pm
Arbutus Meeting Room, Metro Vancouver, Regional Parks West Area Office
Unit 130 - 1200 West 73rd Avenue, Vancouver, BC

Attending:

- Robyn Worcester (RW) - Metro Vancouver
- Markus Merkens (MM) - Metro Vancouver
- Jeff Fitzpatrick (JF)– Metro Vancouver
- Sarah Howie (SH) – Corp. of Delta
- Mike Brotherston (MB) – Corp. of Delta
- Paul Whitfield (PW) – SAP
- Dan Moore (DM) - SAP
- Richard Hebda (RH) – SAP
- Ken Brock (Environment and Climate Change Canada)

Guests:

- Andrew Elves (AE) – UVic Ecological Restoration, MSc student of Richard Hebda

Day 1 – OVERVIEW AGENDA

1.	Introductions	RW
2.	Review Agenda	RW
3.	Review Action Items	RW
4.	Operational Update	RW
5.	Hydrological Monitoring and Research Update	SH
6.	Vegetation Monitoring	RW/MM
7.	Fire Monitoring	SH
8.	Wildlife Monitoring	RW
9.	Bog Restoration Project	RH / AE
10.	Review Scientific Research Strategy	MM
11.	Data Management/Sharing	RW/MM
12.	Birch Control Methods	RW
13.	Open Discussion	All
14.	Next Meeting	

BBECA SCIENTIFIC ADVISORY PANEL WORKSHOP NOTES

1. Review Action Items (RW)

- SH send DM raw data for moisture deficit to help get stats done
  - Done
- JJ to send SH his water level monitoring info from his research station
  - Done
- SH and JJ to connect about help collecting data in summer
  - Done
- SH to look into repeating hydraulic conductivity measurements during dry season in healthy bog site and peat-harvested site to determine impact of mire-breathing
  - Hydraulic conductivity has not been completed for wet season yet. SH to look into dry season once wet season measurements are complete.
- PW to pass along names of 'just data' journals for possibility of publishing
  - Done
- SH to purchase and install 4 piezometers (and/or wells?) at restoration study site.
  - Ongoing. Completion expected by end of summer 2017.
- All keep in mind retirees in fields of study that could potential be bog volunteers

2. Operational Updates (RW/SH/MB)

- Clearing for farmland (RW/SH)
  - Border was surveyed and a 1m cutline was created on the bog side of the property line. Posts are set at 10m intervals.
  - Encroachments – no trees cut; No filling or ditching observed on the site yet.
  - New monitoring stations
    - Water level monitoring and vegetation plots installed on April 12, with MV/Delta.
    - Gathering background info for comparison.
- Delta had asked for buffer between BBECA and farm, but the farmer was not required to provide one and chose not to.
- SAP
  - Controlling water table important
  - Richmond has commissioned report on how to do this well

- Gateway ending monitoring and final reports (RW)
    - MV/Delta received a final presentation from Gateway team regarding SFPR monitoring updates and final reports on the project.
    - Water levels in the EW ditch are increasing as is the groundwater. Water quality is stable. Wells will be left in place as project wraps up. Map locations of wells will be passed on with final data and reports in June.
    - Surface flow monitoring stations will be removed at the completion of the project this year.
    - Berm vegetation is doing well except at 80th Street where it burned in the fire. They will be monitoring for another year and will replant if needed this fall. MoTI has committed to treating the reed canary grass at the site until it is stable. Sphagnum patches have increased and cracks that were seen in berms initially are repaired and now stable.
- SAP
    - can we continue their surveys, so we can see trends,
    - water quality trends – is type 1 getting flushed out
    - Transport Canada will decide monitoring length
    - 5 years was recommended, but 3 is what they are doing
    - thought SFPR project would continue with other teams (MV, Corp of Delta)
- RH – 2000 issue was described where fire is burning is undisturbed bog. Down in natural veg by 25% or s. Good to go back and look at model – Ha per decade amount burned might stall out recovery. Select for edge occurrence was not accounted for.
- Question (SAP): Could we detect change with these data?
- KB – can recommend that they continue to 5 years

- Fire season 2017, service yard, etc. (RW)
    - Collaborative Wildland Field Exercise 80th Street
    - Maps have been updated and provided to Delta Fire
    - Assessing site access and safety hazards

- Invasive Management
    - Same as last year – garlic mustard and Japanese knotweed
    - Will keep working with MOTI about reed canary grass

- Pineland Peat Proposal (MB/SH)
    - MV - We have photo documentation of breaches from the Pineland Peat berm showing their ditch flowing into the BBECA. All breaches (sometimes multiple locations at one time) were reported to Delta.
    - MV – it is concerning that people are often attracted to the forest/bog so fencing at the interface of the BBECA should be installed by the developer.
    - Delta
        - pre-application phase zoning change to light industrial
        - have been required to monitor changes to the bog surface elevation

    - subsidence has been observed, invasives specie are present
    - Gabor is working on it – proposing double ditch system with 2 weirs to raise water levels 1.7-1.9m which would flood some lower-lying areas of the bog. To maintain inward gradient towards development like landfill double-ditch system.
- SAP
    - If they want to fill it and so they also need to raise the water higher as well – could increase greenhouse gases
    - Hard to know what level is the right level? Ditches are sea level currently

- MK Delta Update on ALC review and property east of Vancouver Landfill (MB)
    - Delta
        - Proposal went to Agricultural Land Commission who asked for a longer drone flyover video. In the meantime a special Delta council meeting was held to discuss the addition of Southlands to the ALR as part of the MK Delta proposal, to consider as overall net increase of Delta ALR.
        - The next step is to take this to the MV Board for approval.
        - 30m to 50m buffer from SAP advice. Will look at other recommendations through the detail design process.
    - Question (SAP): What process exists for the Agricultural Land Commission to recommend that lands are set aside for conservation?
    - Delta - no formal way to do that…Delta has agreed to it
    - SAP - Leads to loss of agricultural land, does not guarantee conservation
    - Delta
        - MB - Delta stated at the public council meeting that they have agreed to lease 71 hectares (175 acres) of municipally owned land south of the Vancouver Landfill, which had originally been intended to be added to the Burns Bog Ecological Conservancy Area, for farming. This is a change in direction, and will require more work to be done
    - SAP
        - This is not okay because the original intent was to add it to BBECA
        - we need to ensure other proposed transfers still happen.
        - Recommendation to have federal government hold covenants on all additional Burns Bog lands so that it is out of municipal hands.
    - Question (MV): Has it been approved? Still in line with original mgt plan?

- 72nd Ave interchange (MB)
    - Work has begun
    - SAP
        - We have not seen a plan for fire management from the province even though Delta, SAP, MV have requested. Not good.
        - Suggestions were made to remove the trees near the new overpass due to fire hazard; installing a screen was also recommended

    - Buffer distances may have been sent to the Province by some SAP members, but was done verbally.
    - The risk of leaving the trees next to the road is too high to protect the ecological integrity of the bog. Compare that to the fire risk to jumping the highway and into the neighborhood. Fire model would help in this case
    - Restoration plan should be made for tree removal, get it wetter in there
  - MV – Maybe Delta fire could get involved.
  - Question (Delta): Can we get SAP recommendations sent to us?
  - SAP –moving forward recommendations from SAP should be in writing so we can refer back. As a contractor for MOTI, they can take advice or not.
  - **Action: MV/Delta to work on preparing a letter about fire risks and deadline for answer to MOTI – to speak to SAP's concerns for clarity about what they are doing.**

3. Hydrological Monitoring and Research Update (SH)

- Ditch blocking
  - Edges of the bog are where they are focusing efforts
- Water level monitoring
  - Rainfall trends show winter is wetter and summer is drier
  - Earlier and lower water levels in 2016 than even in 2015
  - Cumulative moisture deficit so 2015 is dry and so is 2016
  - Good evidence to support tree removal in burn sites
  - PW - New tool Google Earth Engine researcher access to Landsat 1985-2012 (Apr-Oct) every 16 days. Standard change in bandwidth, not peatland.
    - Calculated in Normalized Differential Vegetation Index (NDVI) dark green is bigger trends (more sphagnum) white is no trend.
    - To correlate hydrological change relates to vegetation.
    - Can show seasonal, abrupt changes, etc
    - NDWI – water index - blue are wetter, purple are drier
  - UAV – could be used at bog as well for scaling from bog site to whole bog
- Flow monitoring
  - 2012 priority stations – 2017 RFP to get remaining ones done (except 2)
  - All this data will help water balance model
- Open water monitoring
  - SNC Lavalin's work helps inform weir design
  - Ponds and ditch monitoring to compare with peat monitoring – during watering up in fall, the peat fills with water quicker than the ponds
  - Blocked ditch is now a bunch of ponds – at peak of summer bog feeds ditch, adding bog surface and rainfall to next data iteration
  - Share data with PW
- Soil moisture measurements

  - Density increases = moisture decreases, fluffy moss holds more moisture
  - Johannes to measure soil moisture at vegetation sites
- Hydraulic conductivity measurements
  - Looked at all 9 terrestrial plant communities
  - 90% complete
  - Finish this spring or fall
  - Varies from 1 sec to 8 hours – great variation between acrotelm and catotelm, and between sites that are impacted/compacted versus interior bog
- Water chemistry monitoring
  - Post fire – july, aug, feb
  - 3 samples in and 3 samples outside fire zone
  - Temporary spike in sulphate, no phosphorous showed up
  - River water impacts were there, but flushed through by winter
  - RH - May have consequences on plant communities
  - JW/ RH– has it left or been taken up by plants? Next time measure the outflow to see if there is a flush event
- SAP - Need more coroplast for research projects

4. Vegetation Monitoring (RW)

- 2016 results - Continued as usual at 50 plots, Seeing trends
- Results 2016 - Zone A
  - Sphagnum had originally colonized 5 plots, now 3, never reached more than 1%
  - Greatest average increase in ericaceous shrubs
  - Largest decrease in Cladina portentosa
- Results 2016 – Zone B,C,D
  - Sphagnum cover estimates have remained consistent and relatively high
  - 2016 shows the lowest mean cover of Sphagnum - driest conditions observed since 2005
  - Ericaceous shrubs in Zone B are shading out Cladina portentosa
- Results 2016 – Control
  - Rhyncospora alba and Cladina portentosa are showing greatest average increase in hollows
  - Vaccinium uliginosum and Gaultheria shallon have greatest average increase on hummocks
  - C. portentosa and Polytrichum strictum show decreases in cover in this zone - shaded out by ericaceous shrubs
- RH – illustrates that you need a long time to see changes
- JW – lots of variability between plots
  - Control plots have maintained over 90% cover
  - The most pronounced Sphagnum declines were on plots in Zone B and Zone C
  - 60% of plots showed vertical Sphagnum shrinkage
- Results 2016 – Trees
  - 17% of trees being monitored have died in zones A-D; 8% in control plot

  - Only lodgepole pine died; hemlock are thriving
  - Fewer trees have died and tree health is more stable toward the center of Burns Bog and control plots
- RH - Doesn't make sense – no hemlocks in 1970s. Is it a novel ecosystem?
- Kill more hemlocks
- JW – how many hemlocks? They die with water table increases. Tree ring analysis compare to pine
- DM - Get Lori Daniels to do an undergrad project?

- Conclusion
  - Sphagnum colonies are stable in both vertical and horizontal growth, but ericaceous shrubs and reindeer lichen, are now covering established Sphagnum populations, reducing visual cover estimates.
  - In dry zones shrubs are increasing overall, whereas in the wet zone, bog lawn species are increasing.
- Next steps:
  - Combining vegetation and water table data sets
  - **Q1**. Should we move to every few years? Move to veg plots every 2 years, but keep sphagnum with every year and compare to climate data. Note any new species on plot.
  - MM – mountain ash showed up near landfill.
  - MM – digitize his 12 years of sphagnum drawings to see how it grows
  - **Q2**. Post-fire vegetation monitoring contract for 2017?
  - Yes. Get Thomas to add it.

5. Post-Fire Monitoring

- Heli flights
- Time lapse camera (RW)
  - From 10am series (Aug – Jan)

6. UVIC Bog Restoration Project (AE/RH)

  - Andrew will send link too Google map and PDF of presentation
  - Diaspore candidates are shown to be good candidates S. capillifolium and S. fuscum and put more biomass out– more details in handout
  - Spectral indices (NDVI, landsat) gone with a 6 channel camera measures 6 bandwidths for relationship to 4 sphagnum species – emblematic of hummock hollow gradient
  - Will help explain absorption, photosynthesis, water content, peat normalized index
  - Monitor seasonal variations in S. – never 4 species together in one growing period
  - Q: Which statistical analysis of the variables is the best is a big question
  - Outcomes: Baseline establishment, what to use spectrally annually
  - DM – temporal variables related to non-temporal – look at mechanistic relationship

  - JW – analysis of conditions is important – ex. one day versus two days after rain
  - JW – Looking at hydrology must consider landscape effects. Consider when you are teasing out biological processes. Atmospheric difference will matter
  - RH - Finding sites that meet criteria is important. Also clipping interfering vegetation. Looking at big picture.
  - MM – Nicolas Coops and Zoran Micovic at UBC mounted spectral reluctant camera and measured for a year at the horizon. Maybe they had a pattern Andrew could see and don't have to replicate.

- Related Carbon Offset bog project
  - Metro van is undertaking a related Carbon Offset Measurement Methodology project for the BBECA
  - SAP - healthy bogs are net carbon sequesters, but there is not a great way develop the protocols at this point.
  - SAP - Some from Europe may be helpful.

7. Review Scientific Research Strategy (RW/SH)

- Study Areas
  - Characteristic ecological processes
  - Structure and composition
  - Biota
  - Water balance and budget
  - Environmental changes

- Baseline Data Needed:
  - Establishing water levels and bog surface levels based on true elevations – to determine the 'growth' of the existing water mound, annually and seasonally and the seasonal mire surface fluctuation (mire breathing) and storage fluctuation.
  - Determination of water balance inputs and outputs including surface flow, groundwater flow and evapotranspiration.
  - Standard climatological data including temperature, precipitation and evapotranspiration.
  - A characterization of spatial and temporal water chemistry attributes - analyzing water chemistry and water quality to determine the link between plant communities and Type I and Type II waters
  - Status of key biotic species and the critical indicators of biodiversity
  - RH - Should be looking at soil biota and fungi, genetics
  - RH – what characterizes the special bog community, changes from fire, invasive species, etc.
  - RH – DNA of commoner plants and how different are they to other habitats ex. Rubus commimorous
  - Adolf and Aluna Ceska from observatory mountain

  - Ants and spiders - BC museum has spider guys
  - Status and variation of critical ecological processes such as peat formation.
  - Look at biomass accumulation of areas of known peat extraction – make a peat accumulations map. We have 20 years (1940's – 1985).

- Monitoring priorities
  1) Development and monitoring of a comprehensive water balance model
  2) Inventory and characterization of remaining lagg
  3) Annual hydrological monitoring of ditch blocking intervention
  4) Monitor the impact of ditch blocking and raised water table on the plant communities
     Need to analyze water with veg
  5) Monitoring the 2005 fire to measure its effects

- Restoration Research Priorities
  - Regeneration of Peat-forming Complexes - Trophic interactions; successional sequences; characterization of healthy bog areas; acrotelm management
  - Lagg Research - experimental establishment of other engineered laggs
  - SFPR berms, princess farms, MK Delta, Pineland Peat – monitor and research success
  - Invasive Species (salal, cranberry, blueberry, birch) - develop a plan and protocol to monitor condition; field-testing of possible methodologies; establishment of permanent monitoring plots
  - Should focus on actual invasives. Birch is a serious problem. Eriophorum viriginicum is another serious problem.
  - Forest Canopy – (2005 fire zone) impact on the water balance followed by experimental removal and monitoring of seedlings if deemed appropriate; restore a more natural transition from the lagg to the Bog and to decrease the pine stock
  - Tree removal and monitor for 5 years. No one has analyzed yet. Sarah will do
  - Fire Research - fire control practices; fire behaviour effects and recovery; design and the construction of fire breaks; investigation of fire management practices that foster bog recovery.
  - SAP - Needs to be done. Fire break protocol has already been created by Sarah. Can be implemented.
  - SAP -Impact of cutting in snow is much less than not. We want some compaction, but not too much.

- Integrated Georeferenced Database
  - Each data set will consist of a Metadata file describing data characteristics as well as geo-referenced data tables
  - Data templates along with specific data quality standards will be developed and distributed to approved research groups for the purposes of creating the input files for the database

Template for date type – special, temporal, naming files

- Communication
  - Academic researchers will be encouraged to publish results in peer-reviewed literature and attend meetings and conferences
  - Regular Bog Monitoring and Research Newsletters
  - Public information meetings will provide another venue for information transfer.
  - Host a Peatland/Bog Conference

  2 peatland sessions CGU at UBC coming up in May 2017

8. Review Management Plan (RW/SH)

- Priority Actions Identified in BBECA Management Plan (May 2007)
  - Review
  - Status update

9. Data Management/Sharing (RW)

- MV has consultant to create geodatabase for BBECA.
- RW/SH and MM are working to gather all data and ensure the database is complete and up to date.
- It may be done by the end of 2017
- Maps to use: properties, access, utilities, fire, historical extent, TEM, SEI, conservation value, hydrology, water monitoring, vegetation monitoring, other research
- Please pass any outstanding data you have on to us

Future meeting - Data management workshop – create subcommittee for strategies

10. Birch Control Methods (RW)

- Review info passed on by Angela
- Used in trial by Metro Van at Burnaby Lake Park on holly
- Need a research notification through the Pest Management Regulatory Agency (PMRA)
- Questions Answered:
  - What type of environments, e.g. riparian, forest etc, has the product been applied to?
  - What is the biology and ecological function of the fungus? e.g life cycle, preferences :
  - Why will it only target woody trees? What about woody shrubs?
  - What other tree species have been used?
  - Do you have any information on drift? If not, how confident and why do you believe it not to drift?
- **Q: Are we okay to move forward with Mychrologic testing?**
  SAP – is okay with it

11. Wildlife Monitoring

- Camera Traps – online database
  - Switched from video to photos
  - Wildlife Observer Network - provides infrastructure to manage project
    - track cameras locations
    - upload photos and assign them to a geographic location
    - assemble the data
    - easy to download for further analysis
  - Results: Black-tailed deer, Coyote, Beaver, Eastern Grey Squirrel, European rabbit, Birds: red-tailed hawk, dark-eyed junco

- Bird Surveys
  - Incidental surveys
  - Collected in EBird for easy storage and retrieval
  - 9 surveys, 17 hours, 47 species

- Bat survey
  - With South Coast Bat Conservation Society (SCBats)
  - Part of the North American Bat Monitoring Program (Deas and BUB)
  - June 3-9, 2016
  - Ultrasonic bioacoustics recording device to detect species presence
  - Bat identification by professional biologist trained in AnaLook
  - 5 species recorded: Big brown bat, Silver-haired bat, Yuma Myotis, Little brown myotis, Brazilian free-tailed bat (surprise visitor!)

- SACR monitoring – proposed