

AGENDA
North American Boreal Fuel Consumption Working Group
Collaborators Meeting

Thursday – Friday, March 16-17, 2006

Northern Forestry Centre
Canadian Forest Service
Edmonton, Alberta

Meeting Objectives:

- a) To review and update Canada and US collaborator activities with emphasis on data collection and analyses from 2005 data collections of burn severity/fuel consumption.
- b) To discuss planned activities for 2006 including field sampling plans, where applicable.
- c) To review communication activities: current publication and presentation plans and data sharing opportunities.

Thursday March 16

- 8:45 – 9:00** **Arrive**
- 9:00 – 9:15 Welcome & overview of meeting agenda and goals (Ron & Nancy)
- 9:15 – 9:30 Review of previous meeting & collaborator programs (Nancy)
Review of outcomes of May 2005 Ann Arbor meeting & collaborators' projects
- Review of collaborator program progress**
- 9:30 – 10:00 NASA-NIP project progress (Nancy)
- 10:00 – 10:15 Using SAR for fuel moisture – results of work by L. Chavez (Nancy)
- 10:15 – 10:30** **Break**
- 10:30 – 11:00 Report from CFS CAT/CET on other aspects of project progress (Tim/Bill)
Provide overview of the system and methods related to estimation of carbon emissions
- 11:00 – 11:30 Canadian Forest Service Carbon Emissions Team (CET) summer data collections & other activities (Bill and Janet)
- 11:30 – 13:00** **Lunch (at NoFC proposed)**
- 13:00 – 13:30 NASA-NACP project progress – data collection & analyses (Eric)
- 13:30 – 14:00 Report of Alaska Burn Severity Working Group February meeting (Eric)
- 14:00 – 14:30 Alaska JFS succession project review and progress report (Jill)
- 14:30 – 14:50 Fire severity and fuel consumption (Ron)
- 14:50 – 15:00** **Break**

- 15:00 – 15:20 Measuring fuel consumption (Nancy)
A review of poster presented at the Fall'05 AGU meeting
- 15:20 – 16:00 Discussion of remote sensing for fuel consumption (All)
Discuss terminology & burn severity classes distinguishable by RS
- Plans for summer 2006 and other next steps**
- 16:00 – 16:30 Eric, CFS, Jill, Nancy present/discuss plans for this coming summer data collections & analyses or data needs (All)
- 16:30 – 17:00 Wrap-up of first day and plan for next day agenda (Nancy)
- 18:30 Dinner as a group, restaurant to be determined**

Friday March 17

- 8:30 – 9:00 Review of Thursday meeting activities and Friday goals (Nancy)
- Discussions related to collaboration & publication plans**
- 9:00 – 10:00 Review of papers, reports, presentations, & proposals in preparation, completed, or submitted (Nancy)
- 10:00 – 10:15 Break**
- 10:15 – 11:00 Discussions of data sharing – which data is valuable to others, when will data be “pooled/available” for a general review paper
- 11:00 – 11:45 Discussion of goals for publications and/or symposium presentations including a joint peer reviewed publication (what, who, when, where)
- 12:00 Adjourn**
Eric & Nancy (others) depart for airport

Attendees

<u>Name</u>	<u>Affiliation</u>	<u>email</u>
Ron Hall	Canadian Forest Service, Edmonton	rhall@nrcan.gc.ca
Bill de Groot	Canadian Forest Service, Edmonton	bdegroot@nrcan.gc.ca
Janet Pritchard	Canadian Forest Service, Edmonton	jpritcha@nrcan.gc.ca
Nancy French	Altarum Institute, Ann Arbor	nancy.french@altarum.org
Tim Lynham	Canadian Forest Service, Sault Ste Marie	tlynham@nrcan.gc.ca
Robert Landry	Canadian Centre for Remote Sensing	robert.landry@geocan.nrcan.gc.ca
Eric Kasischke	University of Maryland	ekasisch@geog.umd.edu
Jill Johnstone	Carleton University	jjohnsto@yukoncollege.yk.ca
Jason Freeburn	Canadian Forest Service, Edmonton	jfreebur@nrcan.gc.ca

Meeting Notes
North American Boreal Fuel Consumption Working Group
Thursday-Friday, March 16-17, 2006
CFS-Northern Forestry Centre

Thursday, March 16

09:00	Welcome and Review of the Agenda	Nancy French Ron Hall
	<ul style="list-style-type: none"> - Review of the previous meeting and collaborators programs. - Review of outcomes from May 2005 Ann Arbor meeting. - Changed part of working group's title to: "North American Boreal Fuel Consumption Working Group", rather than "North American Boreal Carbon Consumption Working Group". - Objectives: to review field data collections, remote sensing work, and plans for 2006, followed by publication plans. - Overview of current projects and teams involved in fire effects, severity, fuel consumption and carbon emissions. 	
	Review of Collaborator Program Progress	
09:15	NASA-NIP Project Progress	Nancy French
	<ul style="list-style-type: none"> - Title: <i>Assessment of Biomass Consumption in North American Fire.</i> - To quantify variability in biomass consumption during fires in forested ecosystems for better estimation of carbon emissions. - Since 2004: compiled various data sources, field info in Western US, land cover map in Central Alaska, Landsat data, defining fuel types, various vegetation coverages, and compilation of Alaskan fire history data. - Focused primarily in forested Canada and the forested region of the Western US. - Some assessment of ASTER data (onboard the MODIS platform), similar to Landsat but collects extra data in the shortwave infrared (SWIR). ASTER data collected in Alaska does not cover any recent fires. Nancy notes such work is largely academic at this time because ASTER data scenes must be tasked individually, challenging operational feasibility, not to mention the unlikely chance of having a pre-fire image for the area. It may be of assistance, however, for scaling up to MODIS data. - Desire to create AOI by ecoregions for fuel consumption analysis. BAER (burn area emergency response) burn severity maps for remedial response created by Alaska Fire Service (Randy Jandt). Used to assess severity of damage caused by fire for remedial action purposes (e.g., salvage logging). Uses ΔNBR, though anniversary date imagery is not always acquired. The burn severity map created was then used to fly-over (fixed-wing) to 	

	verify accuracy of burn severity classes (hundreds of points). Eric notes this technique is completed primarily for silviculture/erosion purposes, so they are looking at only one aspect of ‘burn severity’.	
09:45	Report from L. Chavez on Her Progress with SAR	Laura Chavez
	<ul style="list-style-type: none"> - Purpose: <i>Assessing Fuel Moisture with SAR.</i> - Strong relationships observed between fuel moisture and C-band backscatter, with larger changes observed in burned areas. - Uses a time series of SAR data, computing the average backscatter from a large area. Applied to 8 burns over a 12-year period. - <i>In situ</i> moisture collected at several sites from 2000-2005. - Developed a method to predict the FWI Drought Code (DC) from SAR backscatter ($R^2 = 0.72$). - Work is continuing to assess the applicability of this approach on other sites, as well as comparing values using the gravimetric moisture code rather than volumetric moisture. - Collaborators in Alaska are very excited at the potential applications of this work. Alaska currently uses weather stations to estimate FWI, but the stations are scattered, so estimations of soil moisture are limited. - Robere is concerned about the post-burn temporal considerations, and effect of early regeneration on signal strength, though Eric believes the methodology could work for several years after fire. - Robere suggested the use of ‘extended arm’ Radarsat, which may be more sensitive to moisture, than the ‘operational’ mode - Some efforts were also made to predict duff moisture code (DFC) and fire weather index (FWI), but more work may be developed on this front in the near-future. 	
10:15	Report from CFS CAT/CET on Other Aspects of Project Progress	Bill deGroot
	<ul style="list-style-type: none"> - Purpose: <i>Provide overview of the system and methods related to estimation of carbon emissions.</i> - Estimating annual carbon emissions from wildland fires. - Long term intent is to have a scientifically-accepted method for reporting carbon emissions for each ecozone in Canada, on an annual basis. - Rationale: national forest carbon accounting team need wildland fire C emission estimations for the carbon budget model. - There is extreme variability in carbon emissions in Canada due to variation in area burned, fuel types, burning season, etc. - Surface fuel consumption contributes up to half the total carbon storage and most of the fuel consumed in a burn. - Above-ground fuel consumption is dependent on what was present before fire (eg., above-ground biomass), and contributes much less to overall carbon released. - Crown fire modeling experiments showed the quantity of fine 	

	<p>fuels before fire affects above-ground carbon emissions.</p> <ul style="list-style-type: none"> - Also, differences in fuel types have an affect on carbon emissions. - Two key pieces of information: fuels data (fuel type and fuel load) and burning conditions (FWI). - Annual data flow: <ul style="list-style-type: none"> o Daily processes: hot spot and weather data collection, image acquisition planning o End of fire season: compile coarse and fine resolution satellite data o Daily fire spread information and fire weather burning conditions are generated, fuel type information is included, and fire behavior and emissions are calculated, which are then reported annually to the CAT. - Focus is on the managed forest since that is where the reporting is undertaken - Hot spot data, collected from MODIS and AVHRR, and weather data for FWI creation, collected from 900 stations across Canada, compiled for mapping daily fire spread after fire ignition. - Burned area mapping is completed with Landsat and SPOT-VGT (65% of the total burned area mapped was mapped with Landsat in 2004). - The FBP system is used only to compute fire spread. BORFIRE modeling is then used for making emission estimates. - CanFI provides the list of all stands within a 10km X 10km cell. The interest is trying to identify which stands were burned during fire, so those stands can be ‘burned’ in BORFIRE to compute the best estimate of fuel consumption. - BORFIRE: based on fire behavior data from experimental fires and post-wildfire field surveys. Uses fuel consumption submodels for estimating carbon emissions, based on fuel load, fuel type and fire weather index data. - The CWFIS uses remote sensing to monitor daily fire spread, and to produce burned area maps, and uses daily weather for the FWI system that provides information on burning conditions, which is then combined with fuels information to compute fire behavior conditions. - Nancy asked whether BORFIRE is spatial, and Bill replied it is “semi-spatial”. - Eric has a bulk of fuels data from black spruce-dominated sites, but notes that in Alaska there is a significant consideration for topography and aspect, because of its impact on fuel moisture and permafrost. - Bill and Tim note that ‘slope’ is considered ‘wind’, to be accounted for in the FWI numbers generated, and that is where slope and aspect are accounted for in this methodology. 	
11:00	<p>Report from Canadian Forest Service Carbon Emissions Team (CET) Summer Data Collections & Other Activities</p>	Janet Pritchard

	<ul style="list-style-type: none"> - Site location criteria: accessibility, nearby fire weather stations, areas with high fuel consumption, fuel information available. - Used a ‘paired’ sampling process to select unburned and burned plots with similar pre-burn ecological characteristics. Also assessed CBI for support of RS ΔNBR work. - Field sampling plot locations were based on various sources of information, such as a post-burn severity image and inventory information where available. - Established 100m transects, with some measurements taken every 5m (duff depth), while others were recorded every 20m (duff core, basal area/density). The CBI plot was placed in the middle of each transect. - Eric asked whether ‘lowland C2’ is physiographically-based or ecologically-based. Janet said it is ecologically-based (depth of forest floor, distance between spruces). - Combined data resulted in a decent model of actual vs. predicted forest floor consumption. - Janet feels insufficient data has been collected for lowland sites. - Eric spoke to analysis being considered/completed by David Verbyla with regard to the CBI-ΔNBR relationship, and the noise being attributed to burn severity AND differences in fuel type (or some other ecological measure). 	
12:45	<p>NASA-NACP Project Progress: Assessing Burn Severity in Alaska</p>	Eric Kasischke
	<ul style="list-style-type: none"> - A meeting was held in February for the Alaska Burn Severity Working Group, regarding the assessment of severity for 2004 Alaskan fires through satellite and field observations. - Research under the NASA Carbon Cycle Science Program - Principal Investigators: Eric Kasischke, Merritt Teretsky, Dave McGuire - Graduate Students: Elizabeth Hoy, Evan Kane, Mike Balshi - Collected burn severity information at 73 road sites and 12 helicopter sites for 2004/05, focusing on black spruce at a variety of topographic positions, from mid-June to September. - Collected end-of-growing-season measurements, to assess the affect of permafrost (used moisture and soil temperature measurements). - Data was collected from 10 different burns, though most was from two burns. Used sampling transects: 40 meter transect, with three 30 meter transects perpendicular at midpoint. - Collected CBI, photos, organic layer depths, samples for bulk density and %C, tree dbh and tree burn severity rating for each tree within 1 m of sample transects, whether tree was fallen or standing, and tree cookies from 2 large, mature trees. - Burn severity from 0-6: 0-not touched . . . 6-no branches and trunk scarred. - Found a difference in CBI between south and north facing slopes 	

	<ul style="list-style-type: none"> - CBI = $f(\Delta\text{NBR})$ produced an $R^2 = 0.1$ with OLS - CBI = $f(\Delta \text{ depth of organic layer})$ also produced $R^2 = 0.1$. - Tree burn severity = $f(\Delta\text{NBR})$ produced an $R^2 = 0.2$ - Jill’s perspective may be more of burn severity as a function of how much bare mineral soil is exposed. - Several new indices were developed which are thought to be linked to fuel consumption, and were compared with CBI to determine how well CBI actually captures variables of interest from a fuel consumption perspective. These indices were 1) Depth Index (DI): how much organic matter remains, 2) Ground Cover Change Index (GCCCI): how much deep duff and mineral soil is exposed, and 3) Depth Reduction Index (DRI): how much organic matter is consumed. - CBI = $f(\text{DI})$ produced an $R^2 = 0.22$, CBI = $f(\text{GCCCI})$ produced $R^2 = 0.3$, and CBI = $f(\text{DRI})$ produced $R^2 = 0.55$ - The average surface fuel consumption (SFC) in Alaska is estimated at 30 t C/ha, controlled by timing of the fire, aspect and slope. They also found the depth of organic layer after fire is deeper under trees than between trees. - C emitted from fires ranges from 4 – 100 t C/ha. - South facing slopes are warmer and drier than north facing slopes, with flat areas being the coldest and wettest, due to poor drainage and temperature inversions in valley bottoms. - During early season when wet, more burning occurs higher in the organic layer. Later in the season with drier conditions results in burning lower in the organic layer near the mineral soil. - Post-fire organic depths are also dependent on slope and aspect, with north-facing and flat sites retaining deeper duff layers. - Future work: collect organic layer depth measurements from unburned stands, collect observations from peatland fires, and integrate and analyze data from other studies: USGS (AK), JPSP (AK), CFS/CCRS (Canada), and Johnstone (YK). 	
01:15	<p>Alaska JFS Succession Project Review and Progress Report</p>	Jill Johnstone
	<ul style="list-style-type: none"> - Purpose: <i>Study impacts of ‘fire severity’ on successional trajectory and future forest flammability, toward managing fire in black spruce ecosystems.</i> - Most fires in Alaska are too remote for active fire protection, yet the Alaskan landscape is dominated by flammable black spruce ecosystems. It’s important to understand patterns of succession and future flammability in such ecosystems. Furthermore, such knowledge can aid prescribed burning efforts to develop desired forest types. - Black spruce can associate with both aspen and birch. - Objectives: relate patterns of fire severity to future stand composition, site moisture, pre-fire vegetation, etc. - Interested in linking fire severity to recruitment responses with respect to tree recruitment, understory (ecological) response, and 	

	<p>the functional role of mosses.</p> <ul style="list-style-type: none"> - Measurements collected from 92 extensive and 32 intensive sites. - Fuel consumption measurements include: residual organic layer depth, estimation of pre-fire organic depth, consumption of spruce canopy, and CBI. - The ‘adventitious root system’ was used to help estimate pre-fire organic depth. - Remote sensing of ‘burn severity’ completed by Ruth & Verbyla. - Burn severity was defined in terms of future stand trajectories, therefore ecological effects such as canopy consumption, mineral soil exposure, and proximity to seed source were considered. - Relationship between ground and image indices: <ul style="list-style-type: none"> o CBI and ΔNBR, o Investigated only one vegetation type (black-spruce stands) o National Park Service (NPS) investigated all vegetation types. - Date of imagery is July 2003-Sept2004, and Aug 2002-Sept 2004, thus immediate post-fire (T2) imagery - $R^2 = 0.42$ for all data combined, or $R^2 = 0.53$ and 0.41 for each dataset respectively. - NPS R^2 values range mainly from $0.70 - 0.84$, except one fire at 0.45, and they sample all vegetation types within a burn. - Some confounding issues include considerations for phenology relative to temporally restricted image acquisition opportunities, finding cloud-free data, imperfection of atmospheric normalization routines, etc. 	
01:45	CBI-ΔNBR Comparisons from Alaska	Eric Kasischke
	<ul style="list-style-type: none"> - Alaska Burn Severity Working Group meeting: February 23, 2006. - David Verbyla, Scott Rupp, Eric Kasischke (NASA, UAF), NPS, Randy Jandt, Alaska Fire Service, USGS (ground measurements). A very large, interconnected group. - The group agreed upon: <ul style="list-style-type: none"> o An Alaskan CBI protocol o Date of next meeting: June 2006 o A presentation at the IFEM Congress in San Diego: November 2006 o A special issue in IJWF on assessment of burn severity in boreal forests and overview article on satellite fire assessment in North American boreal forests. - Objectives: Assessment of CBI-ΔNBR correlations, collecting field-based measurements of burn severity in black spruce stands, and investigating new approaches to using satellite data for assessment of burn severity. - Fish and Wildlife Service (FWS) research on $CBI = f(\Delta NBR)$ 	

	<p>yielded R^2 values ranging from 0.35 - 0.5</p> <ul style="list-style-type: none"> - NPS has the best results with R^2 values mainly between 0.70-0.84, as reported by Epting et al. - Future work includes: <ul style="list-style-type: none"> o examining sources of variation for ΔNBR signatures (what affects residual error/unexplained variability) o assessing the use of other spectral indices to improve predictions of burn severity o developing a classification protocol for black spruce ecosystems (3 levels). - Tim enquired as to how important this information is to fire people in Alaska. Eric feels it is very important, because of how much disturbance occurs in these landscapes. Potential implications include dramatic changes to permafrost, and loss or changes to vegetation reproductive capacity, such as post-fire regeneration from seedlings. 	
02:15	<p>Burn Severity and Fuel Consumption</p>	Ron Hall
	<ul style="list-style-type: none"> - Objective: assess the potential of refining fuel consumption estimates through EO estimates of burn severity. - Collected imagery and field data from 6 fires, forming 4 datasets. - Data was pooled for two fires from Manitoba and two fires from Saskatchewan, occurring in the same eco-regions at almost the same time, and possessing statistically-similar distributions. - The Manitoba dataset was an immediate assessment of burn severity (T1/T2), while the Saskatchewan, Dawson (YT), and Wood Buffalo National Park (WBNP) datasets were extended assessments of burn severity (T1/T3). - ΔNBR and CBI distributions were similar across all datasets, though the Manitoba T1-T2 assessment yielded higher ΔNBR values. - $CBI = f(\Delta NBR)$ produced R^2 values of 0.76, 0.82 and 0.87, for linear, non-linear, and 2nd order models respectively in WBNP. - The natural saturation of CBI values across the higher range of ΔNBR values favors use of a non-linear model, though the asymptote (maximum) associated with a 2nd order function cannot theoretically be justified for this application (i.e., as ΔNBR values continue to increase past a certain point, burn severity should not decrease, as a 2nd order relationship would suggest). - If ΔNBR-measured burn severity classifications are to be produced, consideration must be given as to appropriate ΔNBR thresholds for producing the desired classes (e.g., Unburned, Low, Moderate, and Severe). In this instance, CBI thresholds were selected to determine class breaks, and the relationship of $CBI = f(\Delta NBR)$ was used to determine the associated ΔNBR thresholds. This methodology is thought to make more sense because values are derived based on <i>in situ</i> changes, rather than a RS-based number (which has no real-world value attached). 	

	<ul style="list-style-type: none"> - Notable differences exist in the literature concerning chosen ΔNBR thresholds, which suggests ΔNBR thresholds for classification purposes should be based on eco-region, if not on a per fire basis, and with consideration for the intended application. - Pearson's correlations between ΔNBR and 'surface' fuel consumption produced r values ranging from 0.6-0.8, using the full datasets. - Correlations improved when the datasets were stratified by fuel type, suggesting the possibility for a unique relationship of Fuel Consumption = $f(\Delta\text{NBR})$ for each fuel type. - Analysis at this time is limited by the small datasets, and the lack of measured above-ground fuel consumption values. Further field sampling is necessary to determine if results would be consistent with preliminary findings. It is insufficient for publication otherwise. 	
02:45	Review of the Poster Presented at the '05 AGU Meeting	Nancy French
03:00	General Discussion of Remote Sensing for Fuel Consumption	All
	<ul style="list-style-type: none"> - Nancy presented spectral signatures of healthy vegetation, newly burnt vegetation, old burnt vegetation (7 years since fire), water and gravel for ASTER VNIR and SWIR bands. Burnt vegetation reflects high in SWIR, and can easily be separated from gravel, healthy vegetation and water. - Using ground photos from Janet, a comparison could be made between the spectral signatures of the paired plots from outside and inside the burn to get direct <i>in situ</i> observations of spectral changes. - Tim brought up his plan with Martin Wooster to investigate fire radiative power (FRP) - Eric mentioned the work of Chris Justice (and Lewis Julio), and their MODIS global hotspot product that includes a measure of FRP and fire duration, on a global basis, for a six-year period. Eric is interested in knowing if this product can be helpful in estimating fuel consumption from large fire events in the boreal. Does higher FRP coincide with high fire years? His plan is to look first on a regional basis and then work toward individual fires. Eric mentioned Martin Wooster originally got started with FRP, based on the work by Chris Justice. - Tim stressed the relationship between FRP and fuel consumption in the boreal is unknown, though early results have been favorable from the grasslands work Martin did in Africa. - Martin has demonstrated a linear relation between FRP and fuel consumption. This is an instantaneous measurement, and he is working toward integrating measurements over time. - Eric is interested in looking at how long smoldering is going on after the initial fire pass, and if that significantly affects fuel consumption. - Tim and Bill feel smoldering for most fires in the boreal would 	

	<p>last hours at most (citing an example of a severe burn from northeast Ontario).</p> <ul style="list-style-type: none"> - Eric intends to look at MODIS data containing both burned and unburned areas, and look at the thermal IR response. He notes it could be tough to relate observations to direct field measurements. He plans to look at areas where there is knowledge of burn severity, and fuel consumption information is available. - Robere noted there will be heat release (and thus something will show up in the imagery), but that may not represent fuel being consumed. He states such image observations are useful only if they can be related to some real-world phenomena. - Tim noted Martin came to Ontario, and one partial-burn was done for a boreal fire, but plans are to better replicate this process on one or two fires this summer. - Eric noted the possible value of this work, particularly with MODIS and AQUA getting 4-6 looks/day (more in the higher latitudes). - Robere warns of distortion with MODIS in the higher latitudes, noting possible interpretation errors as a result of poor registration. - GOES could be worth exploring, because it is geostationary, but it too has some issues north of 60. 	
03:30	Planned Presentations	All
	<ul style="list-style-type: none"> - Nancy will show the poster again at a NASA program meeting in April. - IBFRA: August 2006, Umea Sweden <ul style="list-style-type: none"> o Abstracts due April 30th o Session topic: Carbon Accounting (Keynote speaker: Werner Kurz) o Nancy is planning to propose a paper o Bill has intentions to attend, but is dependent upon management approval. - 3rd International Fire Ecology and Management (IFEM) Congress <ul style="list-style-type: none"> o November 2006, San Diego California o Abstracts due May 19th o http://emmps.wsu.edu/firecongress/ o A special session has been planned, titled: “Scientific Foundations of Burn Severity Mapping” o Eric has been requested to speak at this session o Eric is interested in presenting results from a series of groups on this topic, in an overview format o Robere stresses the CFS needs to report themselves first, as part of commitment to CSA and NRCan, and then could possibly look to pool the data for an overview o Ron feels the need to ‘leave it open’ right now, to determine if CFS is ready to get their work published by 	

	<p>that time, and if so, such work could be included in overview-type presentations</p> <ul style="list-style-type: none"> o Eric suggests just putting in a generic abstract for now, and then if things come together, include more specific results. 	
04:00	General Discussion on Terminology	All
	<ul style="list-style-type: none"> - Discussion of appropriate fuel consumption terms: ‘below-ground’ vs. ‘forest-floor’ vs. ‘surface’ and ‘organic layer’. - We seem to be converging on a consensus for using three terms: <ul style="list-style-type: none"> o ‘ground’ consumption means the deep roots and anything else in the mineral soil o ‘surface’ consumption includes the litter + moss + fibric + humic o ‘above-ground’ is herbaceous plants, shrubs, all trees and standing dead woody debris - Discussion continued over dead woody debris being surface fuel or above-ground fuel, which Tim thinks could be based on whether the trees are greater or less than 45 degrees to the surface; noting that you could also make down woody debris its own category. - Eric is wondering how Werner Kurz is accounting for the consumption and carbon released from the dead woody debris which resides on the ‘surface’. - Discussion regarding how much dead standing timber left from one fire will remain standing. - Tim feels that in the boreal most standing timber falls sometime after fire, and thus from then on would be considered ‘surface’ fuel. 	
4:30	First-Day Wrap-Up, Plan for Day Two	Nancy French

Friday, March 17

09:00	Review of Thursday’s Discussion and Overview of Friday’s Goals	Nancy French
09:15	General Discussion on Terminology (cont’d)	All
	<ul style="list-style-type: none"> - Discussion on proper use of ‘fire severity’ vs. ‘burn severity’ and when/where each is appropriate. - Nancy presented a slide equivalent to that printed on page 3 of Theresa Jain’s article, progressing from pre-fire, to the fire environment itself, to the post-fire environment (severity), and ultimately to ecological response. - Tim stressed that ‘fire intensity’ is a specific quantitative measure which has a known definition that has been agreed upon for years, whereas ‘severity’ is a qualitative measure, incorporating many changes/observations. - ‘Fire severity’ is the direct effect from combustion processes that integrates, or is a function of fire intensity, fuel consumption and 	

	<p>residence time.</p> <ul style="list-style-type: none"> - ‘Burn severity’ is more an ecologically-based term that is qualitative, incorporating ecological effects and ecological response. From a remote sensing point of view, the spectral response at the point of observation integrates both the condition of the site resulting from fire, and the vegetation response that may have occurred after fire and before the date of image acquisition. - Ron noted it is possible to have high fire severity but low burn severity, for example a grass fire. - Jill had difficulty accepting the difference between burn severity and fire severity, from an ecological standpoint. She noted that from an ecological mechanistic perspective, the term ‘burn severity’ cannot include both fire effects and ecological response to those effects. However, as she pointed out, from an RS perspective, these two things can’t be separated. - Jill also noted the apparent difference between the group’s consensus and the use of the terms by Stan Rowe in his 1983 paper. - Eric again stressed the difference as ‘fire severity’ being direct physical changes, and ‘burn severity’ being a qualitative, subjective, holistic measure/description. - Jill thinks she could live with that distinction, using just fire severity for her purposes. - Nancy feels we are converging on a consensus that ‘fire severity’ is the direct physical changes caused by fire. 	
10:00	2006 Planned Summer Field Collections and Analysis	All
	<ul style="list-style-type: none"> - Tim presented the tentative CWFIS plans for field work in summer of 2006: <ul style="list-style-type: none"> o Particular attention to work in peatlands, due to larger uncertainty in such ecosystems, as a result of previous work o The FRP work with Martin Wooster o More of what Janet has done the previous two seasons (fuel consumption, possibly some CBI work, etc.). - As well, Bill raised the possibility of working towards a proposal for the International Polar Year (IPY), during 2007 and 2008, getting some procedures setup in peatlands this summer, and being ready to move forward with big field seasons the following two years, with IPY \$ (has to occur in the polar region). - Eric is talking about working with Merritt in more peatlands. - Eric also has intentions to: <ul style="list-style-type: none"> o Sample some ‘unburned’ plots to compare information with old and new ‘burned’ plots o Collect fuel consumption information to investigate relationships with other indices he has been examining (DI, DRI, GCCI) 	

	<ul style="list-style-type: none"> ○ Determine if variability in ΔNBR could be attributed to more than just burn severity, possibly using spectral information and developing other indices on the pre-fire (T1) image, or stratifying ΔNBR by some other variable (e.g., fuel type) - Jill is not certain, but intends to hopefully do some work in the Yukon, noting the difficulty of getting a permit on Native land. - Eric is also interested in meeting up with Tim in the northeast Ontario fires this summer, to get a feel for comparison between those fires and what he has witnessed in Alaska. 	
10:30	Planned Papers	
	<ul style="list-style-type: none"> - Review of field measurements of fuel consumption for Alaska and the western US (French et al). - Terminology paper (Kasischke and French): issues for using satellite data to assess fire/burn severity. - Eric was interested in the CWFIS publishing timeline. - Tim stressed the accountability of CFS, because of Kyoto and the need to produce emission estimates. - Robere stressed that CFS is very accountable to NRCan and the country as a whole, and that the schedule now thru 2008 is largely decided, thus making it very difficult to add more commitments or augment plans. - Eric wanted an idea of plans for the next year, considering if CWFIS had their work submitted for review by fall, the group could look at collaborative overview publications next January. - The group agreed January 2007 may be a suitable timeline to look at publishing collaborative efforts/data. 	
11:00	Next Group Meeting	All
	<ul style="list-style-type: none"> - Tentative plan for January 2007 <ul style="list-style-type: none"> ○ To be located in Victoria, Vancouver, or Seattle ○ Will be used to more-formally discuss collaborative efforts, data sharing, and publications ○ Eric plans to extend an invitation to the Alaskan group ○ Other possible invitees mentioned include Parks Canada, Ottmar & Sandberg, WM Hao. 	
11:15	Final Wrap-Up and Adjournment	Nancy French
	<ul style="list-style-type: none"> - Jill to present her work to the NoFC fire group in the fire boardroom at 1:00 p.m. 	