Comprehensive Listing of SPRUCE Project Measurements

7 June 2019

Core Task Measurements are Listed First Ahead of Collaborator Activities.

Table of Contents

SPRUCE Core Project Measurements

SPRUCE CORE TASKS	Environmental Measurements					
Principal Contact:	**Paul J. Hanson; hansonpj@ornl.gov**					
Co-Investigators:	**Jeff Riggs, Robert Nettles, Steve Sebestyen (WT), Natalie Griffiths (WT), Jeff Warren (Peat WC)**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
S1-Bog Environmental Data	Paul J. Hanson	2010 to date 30 minute data	EM1, EM2, EM3	Various measurements, not all will continue indefinitely due to the addition of SPRUCE plot environmental data	Data	Level–0 , Yes Level–1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.001 https://mnspruce.ornl.gov/node/577/4944
SPRUCE Plot Environmental Data **Deep Peat Heating**	Paul J. Hanson	June 2014 to June 2015	Constructed plots 4 to 21	TA/RH (0.5, 1,2E,2W,4 m) TS (9 depths) TH (3 elevations) WT (plot center) WPeat (hummock,shallow) PAR (2.5 m) Rain (6m) Wind (2D above chamber)	Data	Level-0, Yes Level-1, Yes https://doi.org/10.3334/CDIAC/spruce.013

SPRUCE Plot Environmental Data **Whole-Ecosystem Warming**	Paul J. Hanson	June 2015 to present	Constructed plots 4 to 21	TA/RH (0.5, 1,2E,2W,4 m) TS (9 depths) TH (3 elevations) WT (plot center) WPeat (hummock,shallow) PAR (2.5 m) Rain (6m) Wind (2D above chamber) Soil water (1-2 depths, 3 reps)	Data	Level-0, Yes Level-1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.032
Snow and ice depth	P.J. Hanson	Winters 2015-2017	Experimental Plots	Occasional measurement of snow and ice depth for defined ambient and experimental plots	Data – Yes.	Level 0, Yes Level 1, Planned
S1 Bog and SPRUCE Experiment Location Survey Results, 2015	Natalie A. Griffiths	2015	Various Locations	??	Data - Yes	Level 0, Yes Level 1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.015

SPRUCE CORE TASKS	Photographic Records					
Principal Contact:	**Paul J. Hanson; hansonpj@ornl.gov**					
Co-Investigators:	**Jeff Riggs, Robert Nettles, Les Hook, Todd Ontl**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Phenology Photographs	Les Hook	2011 to date	EM Site	Tree view – 9AM and 12PM Shrub view – 9AM and 12 PM Inst view – 12 PM	Photos	Level-0, Yes Level-1, Yes
Phenology Movies	Paul J. Hanson	2010 to date	EM Site	Tree view – 9AM and 12PM Shrub view – 9AM and 12 PM Inst view – 12 PM	Compiled Movies	Level-0, Yes Level-1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.011.
Aerial Photographs	Paul J. Hanson	Periodic since 2009	S1-Bog and SPRUCE site, Some other Marcell Forest Locations	Downward looking images and side looking PR photos	Photos	Level-0, Yes Level-1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.012
Phenology, Large Flux Collar Photographs	Paul J. Hanson	Beginning 2015	SPRUCE plots and constructed enclosures	Downward looking photos into each large collar cropped to a similar size	Photos	Level-0, Yes Level-1, Yes https://doi.org/10.25581/spruce.054/1444106

Phenology, Enclosure and Plot Panaoramas	Paul J. Hanson	Beginning 2015	SPRUCE plots and constructed enclosures	Side looking panoramic photos of the interior vegetatioin	Photos	Level-0, Yes Level-1, Yes https://doi.org/10.25581/spruce.054/1444106

SPRUCE CORE TASKS	Ecosystem Carbon Cycle and Vascular Plant Growth Observations					
Principal Contact:	**Paul J. Hanson; hansonpj@ornl.gov**					
Co-Investigators:	**Jana Phillips, Deanne Brice, Les Hook, Colleen Iversen, Rich Norby and other SPRUCE Project Staff**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
S1-Bog Survey	Paul J. Hanson	Sep 2009	20 x 20 m grid across the S1-Bog	Peat Depths, Tree diameters, shrub cover	Data Only	Level-0, Yes Level-1, Yes . http://dx.doi.org/10.3334/CDIAC/spruce.003
Peat Depth Survey	Lee Slater	2009 & 2010	Across the S1 Bog	Peat probes and ground penetrating radar	Data and maps	Level-0, Yes Level-1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.002
Tree Allometric data	Paul J. Hanson	Summers of 2010 & 2011	Trees sampled from the south end of the S1-Bog	Tree DBH and various tree dimensional measurements including mass	Data Only	Level-0, Yes Level-1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.004

Shrub Allometric Data	Paul J. Hanson	Summers of 2010 &2011	Shrubs sampled from the S1-Bog	Various dimensional measurements and	Data Only	Level-0, Yes Level-1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.004
Tree Growth	Paul J. Hanson	Feb/Mar Annually	Plots 1 to 28	DBH, Height in some years	Data Only	Level-0, Yes Level-1,Yes https://doi.org/10.25581/spruce.051/1433836
0.25 m2 NPP Plots	Paul J. Hanson	August Annually	All constructed boardwalk plots	Shrub and forb	Tissues from some years	Level-0, Yes Level-1, Yes https://doi.org/10.25581/spruce.052/1433837
Standard Peat Elevation Transects	Paul J. Hanson	1x annually August	2 locations within all constructed boardwalk plots	Multiple microtransects of peat surface elevations from two permanent stands.	Data	Level-0, Yes Level-1, Yes https://doi.org/10.25581/spruce.055/1455014
Plot mean hollow Eevations	Natalie A. Griffiths	2015-2017	All 17 boardwalk plots	Assessed on each side of the octagonal boardwalk	Data only	Level–0 , Yes (2015-2016) Level–1, Yes (2015-2016) http://dx.doi.org/10.3334/CDIAC/spruce.035

Net CO2 x CH4 Flux	Paul J. Hanson	Nominally Monthly since 2011 less in winter	2011 & 2012 – x2 2013 & 2014 – x16	Large collar CO2, CH4 flux under light and dark daytime conditions; Also initial H2O flux in the light	Data	Level-0, Yes Level-1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.006
Net CO2 x CH4 Flux under WEW	Paul J. Hanson	Monthly since 2015 less in winter	2016 to present x12 plots	Large collar CO2, CH4 flux under light and dark daytime conditions; Also initial H2O flux in the light	Data	Level-0, Yes Level-1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.034
Peat Sampling	Paul J. Hanson	August 2012	All constructed plots 4 to 21	Peat cores by depth analyzed for a wide range of characteristics including C, N, bulk density, elements, etc. (see archive)	Data and sample archive	Level-0, Yes Level-1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.005
Peat 14C and 13C	ORNL Funded Karis J. McFarlane	August 2012 To be repeated approx. August 2020 and August 2025	All constructed plots 4 to 21	Peat cores by depth analyzed for 14C, 13C, and calibrated peat age	Data and ??	Level-0, Yes Level-1, Yes Level-2, Planned
Peat 15N and 13C and C and N	Erik Hobbie	August 2012	All constructed plots 4 to 21	Peat cores by depth analyzed for 15N, 13C, C and N. C-N ratio calculated	Data and ??	Level-0, Yes Level-1, Yes Level-2, Planned
Plot Vegetation Sampling	Paul J. Hanson	August 2013 to present	All constructed plots 4 to 21	Current and older Foliage for key plant species and Sphagnum (2013). Shrub stem counts beginning in 2016.	Data	Level-0, Yes Level-1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.038

Auto-dendrometer Bands	Paul J. Hanson / Jeff Warren	Starting in 2015	Plots 4,6, 7, 8, 10, 11, 13 16, 17, 19, 20, 21	Automated Dendrometer Bands 2 per plot 2016, 3 trees per plot 2017	Data	Level-0, Yes Level-1, Planned

SPRUCE CORE TASKS	SPRUCE Multi-Scale Mass and Energy Fluxes					
Principal Contact:	Lianhong Gu; Lianhong-gu@ornl.gov					
Co-Investigators:						
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Shrub-level EC	Lianhong Gu	Future	Untreated location	Half-hourly, long-term	Data	Level-0, Planned Level-1, Planned Level-2 Planned
Plot-level Flux	Lianhong Gu	Future 2017	Treated/Untreated	Exploratory	Data	Level-0, Level-1, Planned Level-2 Planned
Intact Picea Peatland EC	Lianhong Gu	Future	Untreated location	Half-hourly, long-term	Data	Level-0, Planned Level-1, Planned Level-2 Planned
Sun-induced fluorescence	Lianhong Gu	Future	Treated/Untreated	Exploratory to long-term	Data	Level-0, Planned Level-1, Planned Level-2 Planned

SPRUCE CORE TASKS	Plant Community Dynamics in Response to Warming and CO_2					
Principal Contact:	**Brian Palik; bpalik@fs.fed.us**					
Co-Investigators:	**Rebecca Montgomery, University of Minnesota**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Ground Layer plant community monitoring	Brian Palik	June and August 2014	three 1 x 2 m plots within each SPRUCE chamber footprint, both treated and controls	presence/absence within 50 quadrats within each 1 x 2 m plot	Data	Level-0, Yes Level-1, Planned Level-2 Planned
Seed dispersion into the SPRUCE study site	Brian Palik	2013, 2014	Seed traps located adjacent to most chamber footprints	Seed	Stored dried in, Grand Rapids	Level-0, Yes Level-1, Planned Level-2 Planned
PAR relationship to shrub cover	Brian Palik	2013	Selected plots outside of chamber footprints	PAR at ground level under varying levels of shrub cover	Data	Level-0, Yes Level-1, Planned Level-2 Planned
Preliminary ground Layer plant community monitoring	Brian Palik	Summer 2012-13	1 m^2 plots located adjacent to chamber footprints	Plant cover estimates	Data	Level-0, Yes Level-1, Planned Level-2 Planned
Ground Layer plant community monitoring	Brian Palik	June and August each year of study	three 1 x 2 m plots within each SPRUCE chamber footprint, both treated and controls	presence/absence within 50 quadrats within each 1 x 2 m plot	Data	Level-0, Planned Level-1, Planned Level-2 Planned

Seed dispersion into the SPRUCE study site	Brian Palik	Each year of study	One seed trap within each 1 x 2 m vegetation plot	seed	Data and physical samples	Level-0, Planned Level-1, Planned Level-2 Planned
Seed bank Study	Rebecca Montgome ry	Year 1, 5 and 10	All chambered plots under the boardwalk	Surface soil in triplicate, one sample per chamber to 40 cm	Data	Level-0, Planned Level-1, Planned Level-2 Planned

SPRUCE CORE TASKS	Roots, Root NPP and rhizosphere dynamics							
Principal Contact:	**Colleen M. Iversen; iversencm@ornl.gov**							
Co-Investigators:	**Joanne Childs, John Latimer, Avni Malhotra, Rich Norby, Todd Ontl, Randy Kolka, Deanne Brice, Jana Phillips, Karis McFarlane, Paul Hanson**							
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**	**Data DOI**	**Paper**
Root standing crop, production, phenology, mortality (trees and shrubs, hummocks and hollows to ~-80 cm depth)	Colleen Iversen	July, 2010 to September, 2012	Sound end of S1 bog (*n* = 12, six locations with hummock-hollow in each location) and north end of S1 bog near FS well (*n* = 12, six locations with hummock-hollow in each location)	Minirhizotrons	Images	Level 0, Yes Level 1, Yes Level 2, Yes	http://dx.doi.org/10.3334/CDIAC/spruce.019	Iversen et al. 2017 (Plant and Soil) DOI: 10.1007/s11104-017-3231-z.
S1-Bog Spruce tree basal area increment	Colleen Iversen	May, 2011 to October, 2011	North end of S1 bog near FS well (*n* = 8 trees)	Automated dendrobands	Data	Level 0, Yes Level 1, Yes Level 2, Yes	http://dx.doi.org/10.3334/CDIAC/spruce.024	Iversen et al. 2017 (Plant and Soil) DOI: 10.1007/s11104-017-3231-z.

S1-Bog Spruce tree basal area increment	Colleen Iversen	May, 2012 to September, 2012	North end of S1 bog near FS well (separate set of trees, *n* = 8 trees)	Manual dendrobands	Data	Level 0, Yes Level 1, Yes Level 2, Yes	http://dx.doi.org/10.3334/CDIAC/spruce.024	Iversen et al. 2017 (Plant and Soil) DOI: 10.1007/s11104-017-3231-z.
Root morphology, C/N	Colleen Iversen	May, 2011	South end of bog	Voucher specimens	Ground roots	Level 0, Yes Level 1 Pending		
New root morphology, C/N, depth distribution (spruce, larch, shrubs, hummocks to -10 cm and hollows to -30 cm)	Colleen Iversen	June, 2013 to June, 2014 (summer, winter)	South end of S1 bog (*n* = 12, six locations with hummock-hollow in each location, adjacent to minirhizotrons)	Ingrowth cores	Ground roots	Level 0, Yes Level 1, Pending		
Plant-available NH_4+, NO_3-, PO_4- with soil depth (hummocks and hollows)	Colleen Iversen	May, 2011 to July, 2012 (bi-weekly collection)	Sound end of S1 bog (*n* = 9 access tubes, three at -10 cm, three at -30 cm, three at -60 cm)	Ion-exchange resins	Data	Level 0, Yes Level 1, Yes Level 2, Yes	http://dx.doi.org/10.3334/CDIAC/spruce.022.	Iversen et al. 2017 (Plant and Soil) DOI: 10.1007/s11104-017-3231-z.
Root standing crop, production, phenology, mortality (trees and shrubs, hummocks and hollows ~-80 cm depth)	Colleen Iversen	October, 2012 to current	SPRUCE experimental plots (*n* = 4 per plot, two locations with hummock-hollow in each location) Plots 4, 6, 7, 8, 10, 11, 13, 16, 17, 19, 20, 21	Minirhizotrons	Images	Level 0, Yes Analysis ongoing		

Root and hyphal standing crop, production, phenology, mortality (trees and shrubs, hummocks only to ~-50 cm depth)	Colleen Iversen	October, 2012 to current	SPRUCE experimental plots (*n* = 1 per plot in a hummock) Plots 4, 6, 7, 8, 10, 11, 13, 16, 17, 19, 20, 21	Automated minirhizotrons	Images	Level 0, Yes Analysis ongoing		
New root morphology, C/N, depth distribution (spruce, larch, shrubs, hummocks to -10 cm and hollows to -30 cm)	Colleen Iversen	June, 2014 to current (summer, winter)	SPRUCE experimental plots (*n* = 4 tubes per plot, 2 tubes in two locations in hummock-hollow) Plots 4, 6, 7, 8, 10, 11, 13, 16, 17, 19, 20, 21	Ingrowth cores	Ground roots	Level 0, Yes Analysis ongoing		
Net nutrient mineralization	Jana Phillips (Colleen Iversen)	Summer 2018, ongoing	SPRUCE experimental plots (*n* = 2-4 cores per plot; 1-2 locations with 1 hummock and 1 hollow core in each location) Plots 4, 6, 7, 8, 10, 11, 13, 16, 17, 19, 20, 21	Modified resin-core method (see Noe 2011, SSSAJ)	Data	Pending		

Root morphology, standing stock, depth distribution, C/N, ^{14}C (spruce, larch, shrubs, hummocks and hollows)	Colleen Iversen	August, 2012	All SPRUCE plots with boardwalks (*n* = 16, hummock-hollow, treed, non-treed for transect 1) Plots 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 19, 20, 21	Biomass cores	Ground roots	Level 0, Yes Level 1, Yes Level 2, Yes	http://dx.doi.org/10.3334/CDIAC/spruce.005	Iversen et al. 2017 (Plant and Soil) DOI: 10.1007/s11104-017-3231-z.
Plant-available NH_4+, NO_3-, PO_4- with soil depth (hummocks and hollows)	Colleen Iversen	June, 2013 to current (monthly collection)	SPRUCE experimental plots (*n* = 12 tubes per plot, two locations with 6 tubes distributed across hummock-hollow surface) Plots 4, 6, 7, 8, 10, 11, 13, 16, 17, 19, 20, 21	Ion-exchange resins	Data	Level 0, Yes Level 1, Yes Level 2, Yes	http://dx.doi.org/10.3334/CDIAC/spruce.036	Iversen et al. 2017 (Plant and Soil) DOI: 10.1007/s11104-017-3231-z.
Areal coverage of hummock and hollow microtopography across S1 bog	Colleen Iversen	July 2012	Three 60-m SPRUCE transects across S1 bog	Ten 4 m × 4 m plots across each transect, point intercept method within plots	Data	Level 0, Yes Level 1, Yes Level 2, Yes	http://dx.doi.org/10.3334/CDIAC/spruce.023	Iversen et al. 2017 (Plant and Soil) DOI: 10.1007/s11104-017-3231-z.

SPRUCE CORE TASKS	Woody Plant Physiology and Water Relations					
Principal Contact:	**Jeffrey M Warren; warrenjm@ornl.gov**					
Co-Investigators:	**Stan Wullschleger; Joanne Childs; Deanne Brice; Anna Jensen & other SPRUCE Project Staff**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Picea mariana (spruce) Gas exchange, C:N, LMA	Jeffrey Warren	May-Oct 2010-2014	From Across Bog	Amax, gs, Jmax, Vcmax, Rd, N and LMA for Spruce foliage – mainly 1st, 2nd cohorts T, CO_2, Light response curves seasonally	Yes, dry leaf and data	Level-0, Yes Level-1, Pending
Larix laricina (larch,tamarack) Gas exchange, C:N, LMA	Jeffrey Warren	May-Oct 2010-2014	From Across Bog	Amax, gs, Jmax, Vcmax, Rd, N and LMA for Larch foliage – mainly 1st cohort T, CO_2, Light response curves seasonally	Yes, dry leaf and data	Level-0 Level-1, Pending
Shrub Species Gas exchange, C:N, LMA	Jeffrey Warren	May-Oct 2010-2014	From Across Bog	Amax, gs, Jmax, Vcmax, Rd, N and LMA for Chamaedaphne and Ledum foliage T, CO_2, Light response curves seasonally	Yes, dry leaf and data	Level-0 Level-1, Pending
Other vascular species Gas exchange, C:N, LMA	Jeffrey Warren	May-Oct 2010-2014	From Across Bog	*Limited* Amax, gs, Jmax, Vcmax, Rd, N and LMA for other vascular species seasonally	Yes, dry leaf and data	Level-0 Level-1, Pending
Gas exchange	Jeffrey Warren	May-Oct 2010-2014	Across Bog	*Limited* (all species) twig respiration	Data only	Level-0 Level-1, Pending

Leaf water potential	Jeffrey Warren	May-Oct 2010-2014	From Across bog	Predawn, midday and diurnal measurements for all vascular species (limited for lily)	Data only	Level-0 Level-1, Pending
Non-structural carbohydrates	Jeffrey Warren	Seasonal 2013-2014	Along each Transect	Root, branch, foliage spruce, larch and shrubs	Yes, dry tissue, data	Level-0 Level-1, Pending
Sap flow	Jeffrey Warren	Seasonal 2010-2014	S End near EM1	Sap flux density for spruce and larch	Data only	Level-0 Level-1, Pending
PV curves, Leaf hydraulic Conductivity	Jeffrey Warren	July,Sept 2011-2013	From Across bog	Spruce and larch pressure-volume curves and Kleaf	Data only	Level-0 Level-1, Pending
Root PLC	Jeffrey Warren	2011-2013	S End near EM1	*Limited* data from spruce and larch roots – sapflow calibration trees	Data only	Level-0 Level-1, Pending
Sapwood depth	Jeffrey Warren	2010-2014	From across bog	Spruce and Larch stems @ ~1m	Data only	Level-0 Level-1, Pending
Tree Sap Flow	Jeffrey Warren	Varies - Annually or every 2 years	0-6 sensors per treatment plot	Sap flux density in larch or spruce (> 5 cm dbh)	Data only	Level-0 Level-1, Pending
Leaf water potential	Jeffrey Warren	Varies - Annually or every 2 years	From all treatment plots	Predawn, midday and diurnal measurements for all vascular species	Data only	Level-0 Level-1, Pending
NSC	Jeffrey Warren	Varies - Annually or every 2 years	From all treatment plots	Branch and foliage from spruce larch and shrubs	Data only	Level-0 Level-1, Pending
Gas exchange Amax, Rd at 25 deg C and Growth T and 400 ppm and 900 ppm CO2	Jeffrey Warren	Seasonally May/June 2016 – May 2017	From all treatment plots	Larix, Picea, Chamaedaphne, Rhododendron photosynthesis and respiration	Planned	Level-0 Level-1, Pending
Gas exchange Woody Rd x T	Jeffrey Warren	June-July 20172018	From all treatment plots	Larix, Picea, Chamaedaphne, Rhododendron woody respiration	Planned	Planned

Gas exchange A-Ci x T	Jeffrey Warren	June and August 20162017	From all treatment plots	Larix, Picea, Chamaedaphne, Rhododendron photosynthesis and respiration	Planned	Planned
Foliar morphology	Jeffrey Warren	June and August 20162017	From all treatment plots	Branch LMA, C:N, anatomy	Planned	Planned
Foliar chlorophyll fluorescence	Jeffrey Warren	Periodically	From all treatment plots	Leaf level LICOR, PAM and SIF	Planned	Planned
Branch PLC/anatomy	Jeffrey Warren	Periodically	From all treatment plots	Xylem vulnerability to embolism curves hydraulic anatomy of spruce, larch and shrubs	Planned	Planned

SPRUCE CORE TASKS	Sphagnum Growth and N Cycling					
Principal Contact:	**Richard J. Norby; norbyrj@ornl.gov**					
Co-Investigators:	**Joanne Childs, David Weston**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Sphagnum Growth	Rich Norby	May and October Annually	All constructed plots: 4, 6, 8, 10, 11, 13, 16, 17, 19, 20	Brush wire and bundle methods	Data	Level 0, Yes Level 1, Yes https://doi.org/10.25581/spruce.049/1426474
Sphagnum Community Assessment	Rich Norby	Annual in October	Community Assessments within permanent plots: 4, 6, 8, 10, 11, 13, 16, 17, 19, 20		Data	Level 0, Yes Level 1, Yes https://doi.org/10.25581/spruce.049/1426474

SPRUCE CORE TASKS	Sphagnum Physiology and Water Relations					
Principal Contact:	**David J. Weston; westondj@ornl.gov**					
Co-Investigators:	**Jeff Warren and other??? SPRUCE Project Staff**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
In vitro Physiology Assessments	Dave Weston	All year	lab	A-Ca Response; Temperature Response, tissue water content response, N response	data	Level 0
In situ Sphagnum Community CO2 Flux	Dave Weston	April - November	14	CO2 flux	data	Level 0, Yes Level 1, Yes http://dx.doi.org/10.3334/CDIAC/spruce.039
Sphagnum water content Evaluations	Dave Weston	April - November	14	Echo probes, tissue water content	data	Level 0
In vitro and field plot *Sphagnum* – microbiome constructed communities	Dave Weston	All year	lab	Growth, photosynthesis, N fixation rates	data	Level 0

SPRUCE Core TASKS	Microbial Community Composition and Enzyme Activity					
Principal Contact:	**Christopher W. Schadt; schadtcw@ornl.gov**					
Co-Investigators:	**Meg Stainweg, Laurel Kluber**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Microbial Community Assessments (pre treatment)	Schadt	Seasonally in 2010 - 12	EM1&2 Area Transects 1, 2, & 3	Frozen Peat (-20C) DNA samples (-20C) QPCR data (rRNA for archaea/bacteria/fungi, as well as mcrA for methanogens)	Yes	In Progress
Microbial Community enzyme activity (pretreatment)	Schadt	Seasonally in 2010 - 12	EM1&2 Area Transects 1, 2, & 3	Frozen Peat (-20C) Carbon and Nitrogen Cycle panel of 8 enzyme activity measures	Yes	In Progress
Microbial Community Assessments (DPH)	Schadt	June and August 2014	Heated and Control Plots	Frozen Peat (-20C & -80C) DNA samples (-20C) QPCR data including rRNA for Archaea/Bacteria/Fungi, as well as mcrA for methanogens	Yes	Ongoing
Microbial Community Assessments (DPH)	Schadt	Biweekly, June – Oct 2014	Heated and Control Plots	Frozen Porewater (-20C) (Were going to use for QPCR/rRNA-gene seq, however DNA yields not good)	Yes	Ongoing

Microbial Community Assessments (DPH)	Schadt	June and August 2014	Heated and Control Plots	Frozen Peat (-80C) DNA samples 16S rRNA-gene (Archaeal/Bacterial) and ITS (Fungal) community sequencing analyses with JGI	Yes	Ongoing
Microbial Metagenome Assessments (DPH)	Schadt	August 2014 (4 depths)	Heated and Control Plots	Frozen Peat (-80C) DNA samples 16S rRNA-gene (Archaeal/Bacterial) and ITS (Fungal) community sequencing analyses with JGI	Yes	Ongoing

SPRUCE Core TASKS	Organic Matter Decomposition					
Principal Contact:	**Natalie Griffiths, griffithsna@ornl.gov; Randy Kolka, rkolka@fs.fed.gov**					
Co-Investigators:	**Colleen Iversen, Deanne Brice, Sarah Shelley, Cassandra Ott (moss decomp), Scott Tiegs (cotton-strip decomp)**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Moss decomposition experiment	Natalie Griffiths	2014 – 2019	South end of S1 and Bog Lake Fen	Moss decomposition (*Sphagnum* sp., *Polytrichum*) in hummocks, hollows, lawns. Litterbags at 0, 1, 5 years. Analyses: mass loss, C, N, P, possibly other chemical characterization.	Some oven dried material	Level-0, Yes Level-1, Pending Level-2, Pending
Main decomposition experiment	Natalie Griffiths	2015 – 2025	10 enclosures	Decomposition of spruce needles and fine roots, Labrador tea leaves and fine roots, and *Sphagnum magellanicum* and *Sphagnum angustifolium* in hummocks and hollows. Litterbags at 0, 0.5, 1, 2, 5, 10 years. Analyses: mass loss, C, N, P, %carb, %aromatics (with Jeff Chanton), possibly other chemical characterization.	Some oven dried material	Level-0, Yes Level-1, Pending Level-2, Pending

Cotton-strip decomposition experiment	Natalie Griffiths	2015 – 2025	10 enclosures	Decomposition of 1-m long cotton strip (divided into 10-cm segments for depth-specific decomposition analysis). Deployments twice a year to analyze seasonal and inter-annual variability. 3 replicates per chamber per year. Tensile loss analysis.	Data	Yes-0, Pending Level-1, Pending Level-2, Pending
Sphagnum/litter mix decomposition experiment	Natalie Griffiths	2016 – 2020	10 enclosures	Decomposition of mixes of *Sphagnum* with spruce needles or Lab tea leaves. Litterbag retrievals at 0, 1, 2, 4 years. Analysis includes mass loss, C, N, P, possibly other chemical characterization.	Some oven dried material	Level-0, Yes Level-1, Pending Level-2, Pending
Peat decomposition experiment	Randy Kolka	2017 – 2025	10 enclosures	Decomposition of peat with depth (0-10, 10-20, 20-30, 30-40 cm) using ladders. Peat bag retrievals at 0, 3, 6, 9 years. Analysis includes mass loss, C,N,P, possibly other chemical characterization.	Some oven dried material	Level-0, Pending Level-1, Pending Level-2, Pending
Senescent litter chemistry	Natalie Griffiths	2019 – 2020 (and possibly in future years)	10 enclosures and 2 unchambered plots (7, 21)	Collect senescent litter from spruce, larch, *Ledum*, *Chamaedaphne*, *Vaccinium*, *Maianthemum*, *Eriophorum*, *Sphagnum*, and tree and shrub roots (latter from ingrowth cores). Measurements include elemental analyses, lignin, potentially carbohydrates and aromatics.	Some oven dried material	Level-0, Pending Level-1, Pending Level-2, Pending

Decomposition of aboveground litter from elevated and ambient CO_2 plots and cooler and warmer plots	Natalie Griffiths	~2020 – 2025	10 expt plots	Compare decomposition of aboveground senescent litter that had grown in experimental enclosures. Litterbag retrievals at 0, 1, 2, 3 years. Analysis includes mass loss, C, N, P, possibly other chemical characterization.	Data	Level-0, Pending Level-1, Pending Level-2, Pending

SPRUCE Core TASKS	Hydrology and Porewater Biogeochemistry					
Principal Contact:	**Natalie Griffiths (griffithsna@ornl.gov), Steve Sebestyen (ssebestyen@fs.fed.us)**					
Co-Investigators:	**Keith Oleheiser (keithcoleheiser@fs.fed.us)**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
S1 depth-specific porewater chemistry (Test 1-6, EM1 piezometers)	Natalie Griffiths	2011 – present	South end of S1 (near EM1)	Unfiltered water sample from one nest of depth-specific samplers Test 1-6 (0 – 3 m depth) and EM1 (0 m) sampled weekly or monthly (until 2016). In 2017 onwards, Test 1-6 sampled once per year, and EM1 sampled monthly. Analyzed for pH, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes. Samples – Yes but will be discarded soon	Level 0 – Yes Level 1 – Yes http://dx.doi.org/10.3334/CDIAC/spruce.018
S1 depth-specific porewater chemistry (other south end piezometers)	Natalie Griffiths	2011 – 2014	South end of S1 (near EM1)	Unfiltered water sample from a variety of depth-specific samplers (Test 7-10, 29-34, Test 36-41 at 0 – 3 m depth) sampled periodically. Analyzed for pH, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes. Samples – Yes but will be discarded	Level 0 – Yes Level 1 – Planned Level 2 – Planned
S1 surface porewater samplers lagg to bog	Natalie Griffiths	2011 – 2013	South end of S1 (near EM1)	Unfiltered water sample from near surface (0 m) porewater samplers (N13-27) sampled ~monthly. Analyzed for pH, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes. Samples – Yes but will be discarded	Level 0 – Yes Level 1 – Planned Level 2 – Planned

S1 outlet chemistry	Natalie Griffiths and Steve Sebestyen (historical data)	2011 – present (historical data, some back to the 1980s available from USFS)	S1 outlet stream	Unfiltered water sample from the S1 outlet stream (~weekly unless not flowing). Analyzed for pH, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes. Samples – Yes but will be discarded	Level 0 – Yes Level 1 – Yes http://dx.doi.org/10.3334/CDIAC/spruce.018
S1 groundwater chemistry	Natalie Griffiths	2013 – present	S1 uplands	Unfiltered water sample from each well (DW101, 102, 105, 106) ~monthly. Analyzed for pH, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes. Samples – Yes but will be discarded	Level 0 – Yes Level 1 – Yes http://dx.doi.org/10.3334/CDIAC/spruce.018
S1 precipitation chemistry	Natalie Griffiths	2014 – present	S1	Unfiltered water sample collected from each of 3 collectors (one per boardwalk) on an event basis. Analyzed for pH, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes. Samples – Yes but will be discarded	Level 0 – Yes Level 1 – Planned Level 2 – Planned
S2 precipitation chemistry	Steve Sebestyen	2011 – present	S2 MET station	Unfiltered water sample collected from one collector at the S2 MET station on an event basis. Analyzed for pH, ANC, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes.	Forest Service data, but can be made available through Steve.

S2 groundwater chemistry	Steve Sebestyen	2009 – present	S2 uplands	Unfiltered water sample from one well (DW202) sampled every 2 weeks. Analyzed for pH, ANC, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes.	Forest Service data, but can be made available through Steve.
S1/S2/S3/Bog Lake comparison	Natalie Griffiths	2014 – 2016	S1, S2, S3 Bog Lake	Unfiltered water sample from 3 nests of depth-specific samplers per peatland sampled monthly (2014) or periodically (2015 and 2016). Analyzed for pH, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes. Samples – Yes but will be discarded	Level 0 – Yes Level 1 – Planned Level 2 – Planned
Piezometer hydraulic head	Steve Sebestyen	2011 – present	All locations	Depth to water and distance from bog surface to top of piezometer. Measured each time a water sample is collected for chemistry.	Data – Yes.	Level 0 – Yes Level 1 – Planned Level 2 – Planned
Test corral outflow	Steve Sebestyen	2012 – present	S1 SPRUCE test corral	Water height in the test corral reservoir. Measured every 4 hr when no or slow infilling rate or every 30 sec when the water level changed by 50 or more mm. Data will likely be released in summary form, whether weekly, monthly, or event-based.	Data – Yes.	Level 0 – Yes Level 1 – Planned Level 2 – Planned

SPRUCE depth-specific porewater chemistry	Natalie Griffiths	2013 – present	S1 expt treatment + ambient plots 7 & 21	Unfiltered water sample from 1 nest of depth-specific piezometers per plot. Sampling was weekly/biweekly in 2013 and biweekly (10 expt chambers) starting in 2014 to present. Two ambient plots sampled weekly/biweekly in 2013, and monthly from 2014 – 2017, and biweekly from 2018 onward. Analyzed for pH, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes. Samples – Yes but will be discarded	Level 0 – Yes Level 1 – Yes http://dx.doi.org/10.3334/CDIAC/spruce.028
SPRUCE depth-specific porewater chemistry	Natalie Griffiths	2015 – 2025	S1 ambient plots	Unfiltered water sample from 1 nest of depth-specific piezometers per ambient plot (2, 5, 9, 14, 15). Sampled weekly/biweekly in 2013, monthly in 2014, seasonally in 2015 and 2016, and once per year (August) starting in 2017. Analyzed for pH, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes.	Level 0 – Yes Level 1 – Yes http://dx.doi.org/10.3334/CDIAC/spruce.028
SPRUCE outflow chemistry	Natalie Griffiths	2015 – 2025	S1 expt plots	Unfiltered water sample from each autosampler. Sampling every week or on an event basis. Analyzed for pH, specific conductivity, TOC, nutrients (nitrate, ammonium, ortho-phosphate, TN, TP), cations, anions, TOC, water isotopes, UV absorbance.	Data – Yes.	Level 0 – Yes Level 1 – Planned Level 2 – Planned
Well water level	Steve Sebestyen	2015 – 2025	S1 expt plots	Depth to water and distance from bog surface to top of well. Measured every 2 weeks as a manual measurement to compare to logged water level data.	Data – Yes.	Level 0 – Yes Level 1 – Planned Level 2 – Planned

SPRUCE outflow	Steve Sebestyen	2015 – 2025	S1 expt plots	Water outflow from each experimental plot. Measured every 4 hr when no or slow infilling rate or every 30 sec when the water level changes by 50 or more mm.	Data – Yes.	Level 0 – Yes Level 1 – Planned Level 2 – Planned
Throughfall	Steve Sebestyen	Planned	S1 expt plots	Throughfall volume and chemistry under different canopy types in the experimental plots.	Data – Yes.	Level 0 – Planned Level 1 – Planned Level 2 – Planned
Water level in piezometers via sensors	Steve Sebestyen	Planned	S1 expt plots and test corral	Sampling frequency and durations to be determined. In the expt plots, measurements will be occasional, though likely repeated seasonally or annually. The data will be used to calculate saturated hydraulic conductivities with depth in the plots.	Data – Yes.	Level 0 – Planned Level 1 – Planned Level 2 – Planned
Ammonium isotopes	Natalie Griffiths	Planned	S1 expt plots	Natural abundance ammonium isotopes in porewater from deep porewater samplers (2-3m).	Data – Yes.	Level 0 – Planned Level 1 – Planned Level 2 – Planned

SPRUCE Collaborator Data Sets

Projects listed in the order in which they joined the SPRUCE Effort.
Subsequent data summaries are in that same order.

Order	Principal Investigator	Project Title	Primary institution	Other Investigators and Institutions	Funding Source	Funded Project Duration	Postdocs, students	Summary of Meas. & Obs. Provided
1	Joel E. Kostka	The response of soil carbon storage and microbially mediated carbon turnover to simulated climatic disturbance in a northern peatland forest: revisiting the concept of soil organic matter recalcitrance.	Georgia Institute of Technology	Jeff Chanton, Florida State University	US DOE BER	2012-2013	Georgia Tech students: Patrick Chanton, Kait Esson, Melissa Warren; Georgia Tech postdoc: Xueju Lin; FSU postdoc: Malak Tfaily; ORNL postdoc: Meg Steinweg	Yes
2	Scott D. Bridgham	Understanding the mechanisms underlying heterotrophic CO_2 and CH_4 fluxes in a peatland with deep soil warming and atmospheric CO_2 enrichment	University of Oregon	Jason Keller, Chapman University	US DOE BER	2013-2015 (will ask for extension)	Laurel Pfeifer-Meister, Cassandra, Medvedeff, Anya Hopple	Yes
3	Brandy Toner	Mercury and sulfur dynamics in the spruce experiment	University of Minnesota	Ed Nater (University of Minnesota) in collaboration with Randall Kolka and Stephen Sebestyen (Forest Service)	LCCMR; NSF GRF	2017-2020; 2019-2022	Caroline Pierce (Ph.D. student, NSF GRF)	Yes
4	Andrew D. Richardson	Improving models to predict phenological responses to global change.	Harvard University	Morgan Furze NSC Work	US DOE BER	2013-2015	Miriam Johnston (PhD student, Harvard University); Donald Aubrecht (Postdoc, Harvard University)	Yes

5	Bruce McCune	Lichen community responses to warming.	Oregon State University	Sarah Jovan, USDA Forest Service; Peter R. Nelson, Univ of Maine Fort Kent.	USFS-FHM	2013-2019	Robert J. Smith, OSU	Yes https://doi.org/10.25581/spruce.048/1425889
6	Erik Lilleskov	Fungal, bacterial, and archaeal communities mediating C cycling and trace gas flux in peatland ecosystems subject to climate change.	USDA Forest Service	None	Joint Genome Institute Support	2013-	None	For Reference
7	Joel E. Kostka	Toward a predictive understanding of the response of belowground microbial carbon turnover to climate change drivers in a boreal peatland.	Georgia Institute of Technology	Jeff Chanton & William T. Cooper, Florida State University	US DOE BER	2014-2017	Georgia Tech students: Melissa Warren; Georgia Tech postdoc: Max Kolton; FSU postdoc: Rachel Wilson	Yes
8	Kirsten Hofmockel	Can microbial ecology inform ecosystem level c-n cycling response to climate change?	Iowa State University	Erik Hobbie, University of New Hampshire	US DOE BER	2014-2017		Yes
9	Carl Mitchell	Peatland Mercury Cycling in a Changing Climate: A Large-Scale Field Manipulation Study	University of Toronto Scarborough	Randy Kolka, USFS	University of Toronto, NSERC	2013-2015	Kristine Haynes, PhD Candidate	Yes
10	Adrian Finzi	Effects of experimental warming & elevated CO_2 on trace gas emissions from a northern Minnesota black spruce peatland: measurement and modeling.	Boston University	N/A [single investigator award]	US DOE BER	2014-2017	Allison Gill (PhD Student)	Mostly Planned
11	Karis McFarlane	Functioning of wetlands as a source of atmospheric methane: a multi-scale and multi-disciplinary approach.	LLNL-CAMS	Xavier Mayali, Mike Singleton, Ate Visser, Jennifer Pett-Ridge, Brad Esser, Tom Guilderson	LLNL LDRD	2014-	Gavin McNicol Mary Whelan	Yes

12	Terri Jicha	Using microbial enzyme decomposition models to study the effects of peat warming and/or CO_2 enrichment on peatland decomposition.	US EPA, Duluth	Colleen M. Elonen, Terri M. Jicha, Mary F. Moffett US Environmental Protection Agency	US EPA	2014-		Yes
13	Joel E. Kostka	The role of the Sphagnum microbiome in carbon and nutrient cycling in peatlands - JGI's Community Science Program.	Georgia Institute of Technology	Gen Glass, Georgia Institute of Technology, David Weston Oak Ridge National Laboratory, Erik Lilleskov USDA Forest Service – Houghton, MI, Jon Shaw Duke University, and Susannah Tringe	Joint Genome Institute	2015-2017	Georgia Tech postdoc: Max Kolton	Yes?
14	Zoë Lindo	Soil fauna biodiversity sampling at SPRUCE	University of Western Ontario		?????	2015-	Carlos Barreto (PhD student)	Planned
15	Michael J. Falkowski	Monitoring warming and elevated CO_2 induced changes in photosynthetic efficiency via canopy spectral reflectance.	University of Minnesota	Evan Kane Michigan Technological University, Brian Benscoter Florida Atlantic University, & Randy Kolka US Forest Service	????	2015-		Planned
16	Jonathan Schilling	Wood decomposition rates and functional types in a shifting climate	University of Minnesota	Jason Oliver, University of Minnesota, Randy Kolka, United States Forest Service	????	2015-		Planned

17	Jessica Gutknecht	Microbial growth and carbon and nutrient use partitioning under peatland warming and elevated CO_2.	University of Minnesota		UofM Start-up Funds	2014-		Yes
18	Steven Hall	Cryptic Fe cycling in peatland watersheds: linkages to SOM stabilization and loss	Iowa State University	Stephen Sebestyen, Natalie Griffiths	Startup funds	2016-	Holly Rich, PhD student (beginning fall 2017)	Yes
19	Jalene LaMontagne	Cone production patterns in black spruce and tamarack with experimental warming and elevated CO_2.	DePaul University		DePaul University	2018-		
20	Joel E. Kostka	Merging advanced analytical chemistry with metagenomics to provide a predictive understanding of belowground carbon recalcitrance and the controls on greenhouse gas production ratios in high latitude peatlands	Georgia Institute of Technology	Jeff Chanton, Rachel Wilson, Max Kolton, K. Konstantinidis, Bill Cooper, and Chris Schadt	U.S. DOE TES	2018-	Tianze Song, Jose Rolando, Alex Cory, Beth Holmes	
21	Nancy Glenn	Terrestrial Laser Scanning Point Clouds and Products	Boise State University	Jake Graham, Luke Spaete				
22	Danielle Way	Integrating acclimation capacity of tree species into assessments of climate change impacts on Canada's boreal forest productivity.	University of Western Ontario	Norm Hüner (UWO), Peter Reich (U Minnesota), Martin Girardin and Jiua Metsaranta (Canadian Forest Service)	NSERC	2018-2021	Jake Hauger (starting May 2019)	
23	Sue Eggert	Responses of aerial peatland insects across an experimental temperature gradient and elevated carbon dioxide	USDA Forest Service	Randy Kolka, US Forest Service	USFS, Northern Research Station	2019	Coleson Wrege, technician	Yes

SPRUCE Collaborator TASKS	Response of Belowground C Stocks to Climate Change					
Principal Contact:	**Joel Kostka, joel.kostka@biology.gatech.edu; Jeff Chanton, jchanton@fsu.edu**					
Co-Investigators:	**Max Kolton, MaxKolton@gmail.com; Bill Cooper, wcooper@fsu.edu, Rachel Wilson, rachelmywilson@gmail.com**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
DOC characterization by FTMS	Kostka Chanton	2013, 2016	Transect 1	Porewater	Data	Level-0, Yes Level-1, Pending
DOC characterization by GCMS, NMR, and LCMS	Chanton	4, 2016	Selected	Porewater	Data	Level-0, Yes Level-1, Pending
DOC characterization by SUVA and EEMS	Chanton	4,6,7, and 9 2013-2017	1-10	Porewater	yes	Level-0, Yes Level-1, Pending
Porewater CO2, CH4 Concentrations and d13C:	Chanton	4, 6, 7 and 9 2013-2017	1-10	Porewater	yes	Level-0, Yes Level-1, Pending
Radiocarbon on PW DIC, DOC And CH4 with LLN (Karis, Tom)	Chanton	2014 2017	1-10 selected	Porewater Porewater	yes	Level-0, Yes Level-1, Pending
Peat characterization by NMR and FTMS	Chanton	6 2014	selected	Peat	yes	Level-0, Yes Level-1, Pending

Peat characterization by FTIR	Chanton	2014-2017	1-10	Peat	yes	Level-0, Yes Level-1, Pending
OUT FLOW DOC 14C, SUVA and EEMS	Chanton	9 2014 4-10 2017	outflow	Porewater	yes	Level-0, Yes Level-1, Pending
Microbial community characterization SSU rRNA genes	Kostka	6, 9 2014 6,8 2015 6,8 2016, 8 2017	1-10	Peat	yes	Level-0, Yes Level-1, Pending
Microbial community characterization SSU rRNA genes	Kostka	6, 2016	selected P19, P4, P10, P6,P13, P17 (top 30 cm)	Porewater		
Microbial community characterization Meta-genomes/ transcriptomes	Kostka	6,8 2015 6,8 2016 8 2017	P19, P4, P10, P6,P13, P17 (10-20cm; 40-50cm; 75-100cm)	Peat	yes	Level-0, Yes Level-1, Pending
Modeling CO_2 and CH_4 production rates	Chanton	6-7, 2015 8-9, 2016 5-8, 2017	1-10	Porewater	Data	Level-0, Yes Level-1, Pending
Enzyme Activity	Kostka	7, 9 2015	1-10	Peat		Planned
Microcosms Sample adjacent to enclosures Microbial community characterization SSU rRNA genes	Kostka	6 2017	10-30 cm Ambient samples	PeatPeat		Planned
Microcosms Sample adjacent to enclosures	Kostka	6 2017	10-30 cm Ambient samples	Porewater		

Living, green Sphagnum for microbiome Microbial community characterization SSU rRNA genes	Kostka Weston	8 2015	Ambient samples	Vegetation		Planned
Living, green Sphagnum for microbiome Microbial community characterization Diazotrophic communities nifH gene	Kostka Weston	8 2015	Ambient samples	Vegetation		Planned
Living, green Sphagnum for microbiome Microbial community characterization Fungal communities ITS gene	Kostka Weston	8 2015	Ambient samples	Vegetation		Planned
Living, green Sphagnum for microbiome Meta-genomes/ transcriptomes	Kostka Weston	8 2015	Ambient samples	Vegetation		Planned

SPRUCE Collaborator TASKS	Merging Advanced Analytical Chemistry with Metagenomics to Predict Belowground CO_2 and CH_4 production					
Principal Contact:	**Joel Kostka, joel.kostka@biology.gatech.edu; Jeff Chanton, jchanton@fsu.edu**					
Co-Investigators:	**Rachel Wilson rachelmywilson@gmail.com, Max Kolton, MaxKolton@gmail.com; Kostas Konstantinidis, Bill Cooper, wcooper@fsu.edu, Chris Schadt**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Nitrate addition in lab incubations	Kostka	2017	selected	Peat	yes	Level-0, Yes Level-1, Pending
Distilled water addition in lab incubations	Kostka	2017	selected	Peat	yes	Level-0, Yes Level-1, Pending
Porewater addition in lab incubations	Kostka	2017	Selected	Peat/porewater	Yes	Level-0, Yes Level-1, Pending
DOC characterization by FTMS, SUVA, EEMS	Chanton	6, 7, 8 2018	1-10	Porewater	Data	Planned
DOC characterization by GCMS, NMR, and LCMS	Chanton	7, 2018	1-10	Porewater	Data	Planned
Pore water CO2, CH4 Concentrations and d13C:	Chanton	6, 7, 8 2018	1-10	Porewater	yes	Planned
Radiocarbon on PW DIC, DOC And CH4 with LLN (Karis, Tom)	Chanton	2018	selected	Porewater	yes	Planned

Peat characterization by FTIR	Chanton	9, 2018	1-10	Peat	yes	Planned
Peat characterization by NMR and FTMS	Chanton	9, 2018	1-10	Peat	yes	Planned
OUT FLOW DOC 14C	Chanton	7 2018	Outflow of selected	porewater	yes	Planned
Outflow DOC SUVA and EEMS	Chanton	6-10 2018	Outflow of 1-10	porewater	yes	Planned
Microbial community characterization SSU rRNA genes	Kostka	6, 8 2018	1-10	Peat	yes	Planned
Microbial community characterization SSU rRNA genes	Kostka	6, 8 2018	selected	Porewater	yes	Planned
Microbial community characterization Meta-genomes/ transcriptomes	Kostka	6, 8 2018	P19, P4, P10, P6,P13, P17 (10-20cm; 40-50cm; 75-100cm)	Peat	yes	Planned
Microbial community characterization Meta-genomes/ transcriptomes	Kostka	6, 8 2018	P19, P4, P10, P6,P13, P17 (10-20cm; 40-50cm; 75-100cm)	Porewater	yes	Planned
Enzyme Activity	Kostka	6, 8 2018	1-10	Peat	yes	Planned
Enzyme Activity	Kostka	6, 8 2018	1-10	Porewater	yes	Planned
Microcosms Sample adjacent to enclosures	, Kostka	6,8 2018	selected	Peat, porewater	yes	Planned
Living, green Sphagnum for microbiome studies	Kostka	7/2018	selected	Vegetation	yes	Planned

SPRUCE Collaborator TASKS	Understanding the mechanisms underlying heterotrophic CO_2 and CH_4 fluxes in a peatland with deep soil warming and atmospheric CO_2 enrichment					
Principal Contact:	Scott Bridgham, Univ. of Oregon, bridgham@uoregon.edu					
Co-Investigators:	Jason Keller, Chapman Univ.; Qianlai Zhuang, Purdue Univ.					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Porewater H2, acetate, phenolics	Scott Bridgham	6/2-9/14	small piezometers	porewater H2, acetate, phenolics, etc.	yes	Level 0, Yes
Porewater H2, acetate, phenolics	Scott Bridgham	7/21/14	small piezometers	porewater H2, acetate, phenolics, etc.	yes	Level 0, Yes
Porewater H2, acetate, phenolics	Scott Bridgham	9/8-10/14	small piezometers	porewater H2, acetate, phenolics, etc.	yes	Level 0, Yes
Methane Cycle Observations	Scott Bridgham	9/8-10/14	peat cores	CH4 and CO2 production, CH4 pathways, homoacetogenesis, total acetate production (along with other fermentation products)--all at in situ temps.	Data	Level 0, Yes
acetate, phenolics	Scott Bridgham	4/1-2/2015	small piezometers	acetate, phenolics, etc.	Porewater frozen at -20 C	Planned
Methane Cycle Observations	Scott Bridgham	3 times during 2015 growing season	peat cores	CH4 and CO2 production, CH4 pathways, homoacetogenesis, total acetate production (along with other fermentation products), anaerobic CH4 oxidation	Data	Planned

Determination of gross CH4 production and consumption	Scott Bridgham	3 times during 2015 growing season	TBD	Determination of gross CH4 production and consumption using 13CH4 dilution in plots if OK'd, otherwise outside plots.	Data	Planned
Potentially mineralizable C in peat profile in long-term lab incubations	Scott Bridgham	Fall 2017 if renewal funded	peat cores	Potentially mineralizable C in peat profile in long-term lab incubations	Data	Planned
Addition of labeled organic substrates in lab to follow fermentation pathways	Scott Bridgham	2016, 2017 if renewal funded	peat cores	Addition of labeled organic substrates in lab to follow fermentation pathways	Data	Planned

SPRUCE Collaborator TASKS	Mercury and Sulfur Dynamics in the SPRUCE Experiment					
Principal Contact:	**Brandy Toner, toner@umn.edu**					
Co-Investigators:	Edward Nater (nater001@umn.edu), Jessica Gutknecht (jgut@umn.edu), Randall Kolka (rkolka@fs.fed.us), Stephen Sebestyen (ssebestyen@fs.fed.us)					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
(1) ^{14}C, ^{13}C for C-dating, bulk density, total C (peat)	Brandy Toner	Winter 2011	Outside SPRUCE chambers (S1, S2, Bog Lake)	Frozen peat blocks, 1 cm increments on cellulose extracted from sphagnum	yes	External hard drives at UMN, shared-drive at UMN with off-site back-up

(2) Sulfur XANES (complete):	Brandy Toner	“time zero” 2012	Chambers (analyzed, treed hollows): 4,6,7,10,13,16,17,20, 21 [3,5,8,9,11,14,15,19*] Chambers (analyzed, treed hummocks): 4,6,10,13,17 [7,21*] Chambers (no tree, hum): [4*] Chambers (no tree, hol): [4*]	Peat from cores, frozen under N2	Yes, for un-analyzed samples, indicated with * ; materials shared with Jessica Gutknecht for d34S analysis and Dwyane Elias for hgcAB gene analysis	External hard drives at UMN, shared-drive at UMN with off-site back-up; http://dx.doi.org/10.3334/CDIAC/spruce.027
(3) Total mercury and methyl-mercury, CNS (complete):	Brandy Toner	“time zero” 2012	Chambers (4,5,6,7,8,9,10,11,13,14, 15,16,17,19,20,21) Total for most samples; methyl-mercury for selected samples	Peat from cores, freeze-dried	Yes, for majority of samples	External hard drives at UMN, shared-drive at UMN with off-site back-up; http://dx.doi.org/10.3334/CDIAC/spruce.027
(4) Dissolved sulfur and mercury species, hydrogen sulfide (H2S), sulfate (SO4 2-), S-DOM, total mercury, methyl-mercury (in progress)	Brandy Toner	Summer 2013	Outside SPRUCE chambers (S1, S3, Bog Lake)	Piezometer water, frozen, freeze-dried	no	External hard drives at UMN, shared-drive at UMN with off-site back-up

(5) Total mercury and methyl-mercury (peat; in progress)	Brandy Toner	06/03/2014	Chambers (4,6,8,10,13,16,17,19,20,21 [partial core])	Peat from cores, freeze-dried	Yes, for majority of samples	External hard drives at UMN, shared-drive at UMN with off-site back-up
(6) Total mercury and methyl-mercury (peat; in progress)	Brandy Toner	09/09/2014	Chambers (4,6,8,10,13,16,17,19,20)	Peat from cores, freeze-dried	Yes, for majority of samples	External hard drives at UMN, shared-drive at UMN with off-site back-up
(7) Total mercury (spruce needles)	Brandy Toner	Winter 2014	Outside SPRUCE chambers (S1, S3, S6)	Yr 1 Black spruce needles	no	External hard drives at UMN, shared-drive at UMN with off-site back-up
(8) Sulfur XANES (peat) (in progress):	Brandy Toner	Yearly (August 2015-20XX)	Treatment and control chambers	Peat from cores, stored frozen under N2	yes	External hard drives at UMN, shared-drive at UMN with off-site back-up
(9) Total- and methyl-mercury (peat) (in progress):	Brandy Toner	Yearly (August 2015)	Treatment and control chambers	Peat from cores, stored frozen	yes	External hard drives at UMN, shared-drive at UMN with off-site back-up

(10) Total- and methyl-mercury (pore water) (in progress):	Brandy Toner	Monthly (April – November 2016-20XX)	Treatment and control chambers	Piezometer, stored cold	no	External hard drives at UMN, shared-drive at UMN with off-site back-up; https://doi.org/10.25581/spruce.064/1504231
(11) Total mercury	Brandy Toner	03/20/2015	Treatment and control chambers	Black spruce needles	no	External hard drives at UMN, shared-drive at UMN with off-site back-up
(12) Sulfur XANES (outflow at stand-pipe) (in progress):	Brandy Toner	Monthly (April – November 2017-20XX)	Treatment and control chambers	Outflow waters sampled at stand-pipe, stored frozen under N2, analyzed freeze-dried	no	External hard drives at UMN, shared-drive at UMN with off-site back-up
(13) Total- and methyl-mercury (outflow at stand-pipe) (in progress):	Brandy Toner	Monthly (April – November 2017-20XX)	Treatment and control chambers	Outflow waters sampled at stand-pipe and by auto-sampler, stored cold	no	External hard drives at UMN, shared-drive at UMN with off-site back-up
(14) Aqueous sulfur species (total dissolved sulfide)	Brandy Toner	Monthly (April – November 20XX-20YY)	Treatment and control chambers	Piezometer, stored frozen under N2	no	planned
(15) (%CNS and $\delta^{34}S$ ($\delta^{15}N$ and $\delta^{13}C$ if needed)	Jessica Gutknecht	Yearly (2012, 2015-20XX)	Treatment and control chambers	Peat from cores, stored dried and ground	Yes, very small amounts	External hard drives at UMN, shared-drive at UMN with off-site back-up

(16) sulfur reduction rates	Jessica Gutknecht	Yearly 2019-20XX	Treatment and control chambers	Fresh peat samples	no	planned

SPRUCE Collaborator TASKS	Improving models to predict phenological responses to global change					
Principal Contact:	Andrew Richardson; arichardson@oeb.harvard.edu					
Co-Investigators:	Miriam Johnston (mjohnston@g.harvard.edu)					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Phenology Images	Andrew Richardson	2015 and beyond	Plots 4, 6,8,10, 11, 13,16,17.19. 20	Photographs (.jpeg) acquired using NetCamSC 1.3 megapixel Stardot cameras (Buena Park, CA).	Yes Images	Images will be publicly available on the PhenoCam web page (http://phenocam.sr.unh.edu/),
Vegetation Phenology in Experimental Plots from Phenocam Imagery, 2015-2017	Andrew Richardson					Level 0, Yes Level 1, Yes https://doi.org/10.3334/CDIAC/spruce.045
Ground Observations of Phenology in Experimental Plots, 2016-2017	Andrew Richardson					Level 0, Yes Level 1, Yes https://doi.org/10.3334/CDIAC/spruce.044

We will install networked digital cameras to take photographs, every 30 minutes, of the vegetation in each experimental chamber. The cameras will be installed as soon as chamber construction has been completed (June 2015). The stated goal is to collect data during two complete growing seasons, but cameras will be kept in place for as long as feasible (ideally the 10 year duration of the experiment). Although DOE funding ends in August 2015, the PI will use other funds to support camera maintenance in future years.						
Phenology Notes and Site Photographs	Various ORNL Staff	2011 and beyond	EM site and Plots 4, 6, 7, 8, 10, 11, 13,, 16, 17, 19, 20 & 21	Periodic notes	Excel Files and images	Level 0, Yes Level 1, Yes https://doi.org/10.25581/spruce.054/1444106

SPRUCE Collaborator TASKS	Long term responses of nonstructural carbon to elevated CO_2 and temperature in boreal peatland bog forest vegetation					
Principal Contact:	Morgan Furze; mfurze@fas.harvard.edu					
Co-Investigators:	Andrew Richardson (arichardson@oeb.harvard.edu)					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Nonstructural Carbohydrates	Morgan Furze	April, June, September, November 2013	S1-Bog	Measured NSC (bulk sugars and starch) in tissue samples acquired from Anna Jensen: *P. mariana* (root, branch) *L. laricina* (root, branch) *C. calyculata* (foliage, branch) *L. groenlandicum* (foliage, branch)	Data	Level 0, Yes Level 1, Not yet uploaded to SPRUCE website

Nonstructural Carbohydrates	Morgan Furze	June 2015, January 2016, June 2016, January 2017, June 2017, June 2018 (annual sampling will continue indefinitely)	Within the 10 experimental chambers Designated sample trees may need to be specified to ensure no conflict with other studies.	At each sampling date, I will collect a 6 to 8cm multiyear branch sample from n=3 trees of each of the below species per experimental chamber (n=10), to yield 120 samples per collection: *P. mariana, L. laricina, C. calyculata, L. groenlandicum* NSC content will be measured for each sample. Coordination with Physiology group needed for branch sampling. Additional samples for each species will be collected, each sampling date, from plants growing outside of the enclosures.	Surplus freeze-dried and ground plant tissue that is not analyzed for NSC will be archived in a -80° freezer at Harvard for future analyses.	Planned upload to SPRUCE website

SPRUCE Collaborator TASKS	Lichen community responses to warming					
Principal Contact:	**Bruce McCune, Oregon State University; Bruce.McCune@science.oregonstate.edu**					
Co-Investigators:	**Sarah Jovan, USDA Forest Service, Portland, OR; Peter R. Nelson, Univ of Maine, Fort Kent; Robert J. Smith, Oregon State University**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material ?**	**Data Archive Status**
Document lichen community composition	Bruce McCune	Annually, Aug 2013–2017	4,5,6,8,10,11,13,14, 16,17,19,20	Non-destructive observation	Data	Level 1, Yes https://doi.org/10.25581/spruce.048/1425889
Lichen transplant biomass	Bruce McCune	Annually, Aug 2013–2017	4,5,6,8,10,11,13,14, 16,17,19,20	Non-destructive weighing	Data	Level 1, Yes https://doi.org/10.25581/spruce.048/1425889
Document lichen community composition off-site	Bruce McCune	Aug 2015	Beyond SPRUCE area, Marcell Exp Forest	Non-destructive observation	Data	To do ??

SPRUCE Collaborator TASKS	Can Microbial Ecology and Mycorrhizal Functioning Inform Climate Change Models?					
Principal Contact:	**Kirsten S. Hofmockel, kirsten.hofmockel@gmail.com**					
Co-Investigators:	**Erik Hobbie**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Peat hydrolytic enzyme assays	Kirsten Hofmockel	6/5/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC)	Level 0, Yes
Peat hydrolytic enzyme assays	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
pH	Kirsten Hofmockel	6/5/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC)	Level 0, Yes
pH	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Gravimetric water content	Kirsten Hofmockel	6/5/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC)	Level 0, Yes
Gravimetric water content	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
microbial biomass C and N	Kirsten Hofmockel	6/5/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC)	Level 0, Yes

microbial biomass C and N	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Ergosterol	Kirsten Hofmockel	6/5/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC)	Level 0, Yes
Ergosterol	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (DNA)	Kirsten Hofmockel	6/5/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (DNA)	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Fungal ITS amplicon sequences (DNA)	Kirsten Hofmockel	6/5/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC)	Level 0, Yes
Fungal ITS amplicon sequences (DNA)	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Fresh peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Sporocarp collection	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Sporocarps	NA	Level 0, Yes
Peat hydrolytic enzyme assays	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Peat hydrolytic enzyme assays	Kirsten Hofmockel	6/18/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes

Peat hydrolytic enzyme assays	Kirsten Hofmockel	9/9/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
pH	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
pH	Kirsten Hofmockel	6/18/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
pH	Kirsten Hofmockel	9/9/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Gravimetric water content	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Gravimetric water content	Kirsten Hofmockel	6/18/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Gravimetric water content	Kirsten Hofmockel	9/9/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
microbial biomass C and N	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
microbial biomass C and N	Kirsten Hofmockel	6/18/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes

microbial biomass C and N	Kirsten Hofmockel	9/9/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Ergosterol	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Ergosterol	Kirsten Hofmockel	6/18/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Ergosterol	Kirsten Hofmockel	9/9/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (DNA)	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (DNA)	Kirsten Hofmockel	6/18/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (DNA)	Kirsten Hofmockel	9/9/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Fungal ITS amplicon sequences (DNA)	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Fungal ITS amplicon sequences (DNA)	Kirsten Hofmockel	6/18/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes

Fungal ITS amplicon sequences (DNA)	Kirsten Hofmockel	9/9/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Fungal hyphae stable isotopic signature	Kirsten Hofmockel	9/20/2013	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Fungal hyphae stable isotopic signature	Kirsten Hofmockel	6/18/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Fungal hyphae stable isotopic signature	Kirsten Hofmockel	9/9/2014	S1 south end (outside of the rings)	Ingrowth peat cores: hummock 0 to -30 cm; hollow 0 to -20 cm	Frozen (-80ºC) & Dried (105ºC)	Level 0, Yes
Peat Hydrolytic Enzyme Assays	Kirsten Hofmockel	06162015 08162016	S1 (12 Rings)	Ingrowth peat & sand cores: hummock 0 to -30 cm; hollow 0 to -30 cm	Frozen (-20ºC) ~~& Dried (105ºC)~~	Level 0, Yes
Peat Hydrolytic Enzyme Assays	Kirsten Hofmockel	06032014 09092014 06162015	S1 (12 Rings)	Fresh peat from Deep Peat Heating experiment	Frozen (-20ºC)	Level 0, Yes
Peat Hydrolytic Enzyme Assays	Kirsten Hofmockel	08242016 082017	S1 (12 Rings)	Fresh peat from Whole Ecosystem Warming experiment	Frozen (-20ºC)	Level 0, Yes
Peat Hydrolytic Enzyme Assays	Kirsten Hofmockel	05312014	S1 (12 Rings)	Fresh peat cores: paired hummock and hollow (0 to -30 cm); replaced with **ingrowth cores**	Frozen (-20ºC)	Level 0, Yes
pH	Kirsten Hofmockel	05312014	S1 (12 Rings)	Fresh peat cores: paired hummock and hollow (0 to -30 cm); replaced with **ingrowth cores**	Frozen (-20ºC)	Level 0, Yes
Gravimetric Water Content	Kirsten Hofmockel	06162015 08192016	S1 (12 Rings)	Ingrowth peat & sand cores: hummock 0 to -30 cm; hollow 0 to -30 cm	Date	Level 0, Yes

Gravimetric Water Content	Kirsten Hofmockel	06162015	S1 (12 Rings)	Fresh peat from Deep Peat Heating experiment	Data	Level 0, Yes
Gravimetric Water Content	Kirsten Hofmockel	05312014	S1 (12 Rings)	Fresh peat cores: paired hummock and hollow (0 to -30 cm); replaced with **ingrowth cores**	Data	Level 0, Yes
Microbial Biomass C and N	Kirsten Hofmockel	06162015 08192016	S1 (12 Rings)	Ingrowth peat & sand cores: hummock 0 to -30 cm; hollow 0 to -30 cm	Data	Level 0, Yes
Microbial Biomass C and N	Kirsten Hofmockel	06032014 09092014 06162015 06142016	S1 (12 Rings)	Fresh peat from Deep Peat Heating experiment	Data	Level 0, Yes
Microbial Biomass C and N	Kirsten Hofmockel	08242016 082017	S1 (12 Rings)	Fresh peat from Whole Ecosystem Warming experiment	Data	Level 0, Yes
Microbial Biomass C and N	Kirsten Hofmockel	05312014	S1 (12 Rings)	Fresh peat cores: paired hummock and hollow (0 to -30 cm); replaced with **ingrowth cores**	Data	Level 0, Yes
Bacterial 16S amplicon sequences (DNA)	Kirsten Hofmockel	06162015 08162016	S1 (12 Rings)	Ingrowth peat & sand cores: hummock 0 to -30 cm; hollow 0 to -30 cm	Frozen (-80ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (DNA)	Kirsten Hofmockel	06032014 09092014 06162015 06142016	S1 (12 Rings)	Fresh peat from Deep Peat Heating experiment	Frozen (-80ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (DNA)	Kirsten Hofmockel	08242016 082017	S1 (12 Rings)	Fresh peat from Whole Ecosystem Warming experiment	Frozen (-80ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (DNA)	Kirsten Hofmockel	05312014	S1 (12 Rings)	Fresh peat cores: paired hummock and hollow (0 to -30 cm); replaced with **ingrowth cores**	Frozen (-80ºC)	Level 0, Yes

Bacterial 16S amplicon sequences (DNA)	Kirsten Hofmockel	08242016	S1 (12 Rings)	Ingrowth sand bags: hollow 0-10	Frozen (-80ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (cDNA)	Kirsten Hofmockel	08192016	S1 (12 Rings)	Ingrowth peat & sand cores: hummock 0 to -30 cm; hollow 0 to -30 cm	Frozen (-80ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (cDNA)	Kirsten Hofmockel	06032014 09092014 06162015 06142016	S1 (12 Rings)	Fresh peat from Deep Peat Heating experiment	Frozen (-80ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (cDNA)	Kirsten Hofmockel	08242016 082017	S1 (12 Rings)	Fresh peat from Whole Ecosystem Warming experiment	Frozen (-80ºC)	Level 0, Yes
Fungal ITS amplicon sequences (DNA)	Kirsten Hofmockel	06162015 08162016	S1 (12 Rings)	Ingrowth peat & sand cores: hummock 0 to -30 cm; hollow 0 to -30 cm	Frozen (-80ºC)	Level 0, Yes
Fungal ITS amplicon sequences (DNA)	Kirsten Hofmockel	06032014 09092014 06162015 06142016	S1 (12 Rings)	Fresh peat from Deep Peat Heating experiment	Frozen (-80ºC)	Level 0, Yes
Fungal ITS amplicon sequences (DNA)	Kirsten Hofmockel	08242016 082017	S1 (12 Rings)	Fresh peat from Whole Ecosystem Warming experiment	Frozen (-80ºC)	Level 0, Yes
Fungal ITS amplicon sequences (DNA)	Kirsten Hofmockel	05312014	S1 (12 Rings)	Fresh peat cores: paired hummock and hollow (0 to -30 cm); replaced with **ingrowth cores**	Frozen (-80ºC)	Level 0, Yes
Fungal ITS amplicon sequences (DNA)	Kirsten Hofmockel	08242016	S1 (12 Rings)	Ingrowth sand bags: hollow 0-10	Frozen (-80ºC)	Level 0, Yes
Fungal ITS amplicon sequences (cDNA)	Kirsten Hofmockel	08192016	S1 (12 Rings)	Ingrowth peat & sand cores: hummock 0 to -30 cm; hollow 0 to -30 cm	Frozen (-80ºC)	Level 0, Yes

Fungal ITS amplicon sequences (cDNA)	Kirsten Hofmockel	06032014 09092014 06162015 06142016	S1 (12 Rings)	Fresh peat from Deep Peat Heating experiment	Frozen (-80ºC)	Level 0, Yes
Fungal ITS amplicon sequences (cDNA)	Kirsten Hofmockel	08242016 082017	S1 (12 Rings)	Fresh peat from Whole Ecosystem Warming experiment	Frozen (-80ºC)	Level 0, Yes
Meta-transcriptomics on selected samples amplicon sequences (cDNA)	Kirsten Hofmockel	08192014	S1 (12 Rings)	Ingrowth peat & sand cores: hummock 0 to -30 cm; hollow 0 to -30 cm	Frozen (-80ºC)	Level 0, Yes
Meta-transcriptomics on selected samples amplicon sequences (cDNA)	Kirsten Hofmockel	06032014 09092014	S1 (12 Rings)	Fresh peat from Deep Peat Heating experiment	Frozen (-80ºC)	Level 0, Yes
Meta-transcriptomics on selected samples amplicon sequences (cDNA)	Kirsten Hofmockel	08242016 082017	S1 (12 Rings)	Fresh peat from Whole Ecosystem Warming experiment	Frozen (-80ºC)	Level 0, Yes
Ergosterol	Kirsten Hofmockel	06162015 08192016	S1 (12 Rings)	Ingrowth peat & sand cores: hummock 0 to -30 cm; hollow 0 to -30 cm	Frozen (-20ºC)	Level 0, Yes
Ergosterol	Kirsten Hofmockel	05312014	S1 (12 Rings)	Fresh peat cores: paired hummock and hollow (0 to -30 cm); replaced with **ingrowth cores**	Frozen (-20ºC)	Level 0, Yes
Microcosm respiration	Kirsten Hofmockel	1/7/2015 – 4/11/2015 2015	Lab incubation	Fresh peat: hummock, 0 to -15 cm	Data	Level 0, Yes
Peat hydrolytic enzyme assays	Kirsten Hofmockel	4/22/2015 – 4/25/2015	Lab incubation (peat from outside of the rings)	Fresh peat: hummock, 0 to -15 cm	Frozen (-80ºC)	Level 0, Yes

Microcosm respiration	Kirsten Hofmockel	4/22/2015 – 4/25/2015	Lab incubation (peat from outside of the rings)	Fresh peat: hummock, 0 to -15 cm	Data	Level 0, Yes
Microbial Biomass C and N	Kirsten Hofmockel	4/22/2015 – 4/25/2015	Lab incubation (peat from outside of the rings)	Fresh peat: hummock, 0 to -15 cm	Data	Level 0, Yes
Gravimetric water content	Kirsten Hofmockel	4/22/2015 – 4/25/2015	Lab incubation (peat from outside of the rings)	Fresh peat: hummock, 0 to -15 cm	Frozen (-80ºC)	Level 0, Yes
Bacterial 16S amplicon sequences (DNA)	Kirsten Hofmockel	4/22/2015 – 4/25/2015	Lab incubation (peat from outside of the rings)	Fresh peat: hummock, 0 to -15 cm	Frozen (-80ºC)	Level 0, Yes
Fungal ITS amplicon sequences (DNA)	Kirsten Hofmockel	4/22/2015 – 4/25/2015	Lab incubation (peat from outside of the rings)	Fresh peat: hummock, 0 to -15 cm	Frozen (-80ºC)	Level 0, Yes
Sporocarp Collection	Erik Hobbie	09092014 10102016	S1 (12 Rings)	Sporocarp removal from plots Essentially nondestructive	Data	Level 0, Yes
Berry Collection	Erik Hobbie	08302016	S1 (12 Rings)	Berry Removal from plots	Data	Level 0, Yes
$\delta^{15}N$, $\delta^{13}N$	Erik Hobbie	On-going	S1-Bog Plots	Berries and sporocarps	Data	Level O, Yes
Fungal hyphae stable isotopic signature	Kirsten Hofmockel	06162015 08162016	S1 (12 Rings)	Ingrowth peat & sand cores: hummock 0 to -30 cm; hollow 0 to -30 cm	Frozen (-20ºC) ~~& Dried (105ºC)~~	Level 0, Yes

SPRUCE Collaborator TASKS	Peatland Mercury Cycling in a Changing Climate: A Large-Scale Field Manipulation Study					
Principal Contact:	**Dr. Carl Mitchell (University of Toronto Scarborough); carl.mitchell@utoronto.ca**					
Co-Investigators:	**Dr. Kristine Haynes; k.haynes@utoronto.ca** **Dr. Randy Kolka (USFS)**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Trial of Mercury Flux Monitoring Using Dynamic Flux Chambers		Aug. 2013	two flux chambers placed (for 24 hrs) in each of Plots #6, 8, 10, 19	gaseous fluxes	N/A	Level 0 Kristine Haynes
Pre-DPH Gaseous Mercury Flux Monitoring using Dynamic Flux Chambers		May-June 2014	two flux chambers placed (for 24 hrs) in each of Plots #4, 6, 10, 13, 17, 19	gaseous fluxes	N/A	Level 0 Kristine Haynes
Pre-DPH SPRUCE Peat Sampling for Total Mercury Analysis		June 2014	Plots #4, 6, 8, 10, 11, 13, 16, 17, 19, 20	peat (0-50, 75-100 cm)	remainder of lyophilized peat archived	Level 0 Kristine Haynes
Peak-DPH (temps. achieved at depth) Gaseous Mercury Flux Monitoring using Dynamic Flux Chambers		Aug. 2014	two flux chambers placed (for 24 hrs) in each of Plots #4, 6, 10, 13, 17, 19	gaseous fluxes	N/A	Level 0 Kristine Haynes

Peak-DPH (temps. achieved at depth) SPRUCE Peat Sampling for Total Mercury Analysis		Aug. 2014	Plots #4, 6, 8, 10, 11, 13, 16, 17, 19, 20	peat (0 – 100 cm)	remainder of lyophilized peat archived	Level 0 Kristine Haynes
End of DPH Gaseous Mercury Flux Monitoring using Dynamic Flux Chambers		June 2015	two flux chambers placed (for 24 hrs) in each of Plots #10, 13, 17, 19 (analyzer malfunction prior to completing Plots 4 and 6)	gaseous fluxes	N/A	Level 0 Kristine Haynes
End of DPH SPRUCE Peat Sampling for Total Mercury Analysis		June 2015	Plots #4, 6, 8, 10, 11, 13, 16, 17, 19, 20	peat (0 – 100 cm)	remainder of lyophilized peat archived	Level 0 Kristine Haynes

TGM Flux data published as:

Haynes, K. M., E. S. Kane, L. Potvin, E. A. Lilleskov, R. K. Kolka, and C. P. J. Mitchell (2017), Gaseous mercury fluxes in peatlands and the potential influence of climate change. Atmospheric Environment, 154, 247-259, http://dx.doi.org/10.1016/j.atmosenv.2017.01.049.

SPRUCE Collaborator TASKS	Effects of experimental warming & elevated CO_2 on trace gas emissions from a northern Minnesota black spruce peatland: measurement and modeling					
Principal Contact:	**Adrien Finzi. afinzi@bu.edu**					
Co-Investigators:	**Allison Gill**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Small Collar Test Measurements	Adrien Finzi	2014	Plots 4,6,8,10,11,13,16,17,19, 20	Automated flux collars	Data	Level 0, Yes
Automated Flux Collars	Adrien Finzi	2015-	Plots 4,6,8,10,11,13,16,17,19, 20	Automated flux collars: Hummock vs. Hollow	Data	Level 0, Yes Level-1, Yes http://dx.doi.org /10.3334/CDIAC /SPRUCE.016
Automated Flux Collars	Adrien Finzi	2016	Plots 4,6,8,10,11,13,16,17,19, 20	Automated flux collars: Hummock vs. Hollow	Data	Level 0, Yes Level-1, Yes http://dx.doi.org /10.3334/CDIAC /SPRUCE.016
Automated Flux Collars	Adrien Finzi	2017	Plots 4,6,8,10,11,13,16,17,19, 20	Automated flux collars: Hummock vs. Hollow	Data	Level 0, Level-1,

SPRUCE Collaborator TASKS	^{14}C, ^{13}C, and ^{2}H of surface CO_2 and CH_4 fluxes, canopy air/local atmosphere; ^{14}C-DOC; ^{13}C and ^{15}N Chip-SIP of methanogens/trophs; ebullition history reconstruction with porewater noble gas profiles					
Principal Contact:	**Karis McFarlane**					
Co-Investigators:	**Tom Guilderson, Xavier Mayali, Ate Visser, Jennifer Pett-Ridge, Mike Singleton**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
^{14}C, ^{13}C, ^{2}H of surface C fluxes	K. McFarlane	2014, April plus monthly June-Sept	All 10 treatment plots, **large surface chambers**	Gas/whole air	Data	Level 0, Yes Level1, Planned
^{14}C-DOC (w/Jeff Chanton)	K. McFarlane /J. CHANTON	2014 April plus monthly June-Sept	All 10 treatment plots plus outflux. Depths tbd.	Liquid/porewater	Data	2014 dataset being completed now.
^{14}C of canopy/local atmosphere CO_2 and CH_4	K. McFarlane	2015- CO_2: weekly June-Sept? CH_4: one time mid-summer	Possibly only at Plot 2 (ambient reference site) OR at Plot 6 and Plot 17.	Gas/whole air	Data	No data to date. Planned
Chip-SIP (w/ Joel Kostka and Jennifer Glass)	X. Mayali/J. Pett-Ridge	1 time, mid- to late-summer	TBD, will be multiple plots but undecided about replication.	Bulk Peat, incubated in lab.	Data, and Maybe	Need to discuss.
Noble gas from porewater profiles (coordinating w/ Steve Sebestyen)	A. Visser	1 time mid- to late-summer	TBD, will be multiple plots but undecided about replication.	Liquid/porewater	Data, and Maybe	Need to discuss.

SPRUCE Collaborator TASKS	Using microbial enzyme decomposition models to study the effects of peat warming and/or CO2 enrichment on peatland decomposition					
Principal Contact:	**Terri Jicha; jicha.terri@epa.gov**					
Co-Investigators:	**Terri Jicha, Colleen Elonen, Mary Moffett**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Available and total nutrients	Terri Jicha	Project sampling events 2014→ 2019	All SPRUCE study plots	Peat- composites acrotelm (0-40) Catotelm (50-75) Deep peat (100-200) September 2014 and forward.	Stored frozen and dried Duluth, MN	Level 0, Yes Levels 1 & 2, Planned
Microbial enzymes	Terri Jicha	Project sampling events 2014→ 2019	All SPRUCE study plots	Peat- composites acrotelm (0-40) Catotelm (50-75) Deep peat (100-200) September 2014 and forward.	Stored frozen Duluth, MN	Level 0, Yes Levels 1 & 2, Planned
Nitrification/denitrification	Terri Jicha	Project sampling events 2014→ 2019	All SPRUCE study plots	Peat- composites acrotelm (0-40) Catotelm (50-75) Deep peat (100-200) September 2014 and forward.	Stored frozen Duluth, MN	Level 0, Yes Levels 1 & 2, Planned
Dry wt/LOI	Terri Jicha	Project sampling events 2014→ 2019	All SPRUCE study plots	Peat- composites acrotelm (0-40) Catotelm (50-75) Deep peat (100-200) September 2014 and forward.	Stored Dried Duluth, MN	Level 0, Yes Levels 1 & 2, Planned

Available and total nutrients, microbial enzymes, nitrification/denitrification, dry wt/LOI	Terri Jicha	May, July, September 2014-2015	Bog center (outside SPRUCE plots-transect 1 and 2), lagg, upland	Peat- composites acrotelm (0-40) Catotelm (50-75)	Stored Frozen and Dried	Level 0, Yes Levels 1 & 2, Planned
N2O flux	Terri Jicha	May 2017-August 2019	In plot collars, plus set of non-vegetated collars outside of plts	Plot collars	No	NA

SPRUCE Collaborator TASKS	Soil fauna biodiversity sampling at SPRUCE					
Principal Contact:	**Zoë Lindo**					
Co-Investigators:	Carlos Barreto (PhD student)					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Micro-arthropod Community Survey	Zoë Lindo	Later in 2015 Growing Season	All 10 treatment plots	Small Surface Sphagnum 'clumps'	Yes	Planned
Micro-arthropod Community Survey	Zoë Lindo & Kolka et al.	Oct 2015-2018 (end of growing season)	All 10 treatment plots	Small Surface Sphagnum 'clumps'	Yes	Planned
Micro-arthropod Community Survey	Zoë Lindo & Kolka et al.	Oct 2018	S1-Bog (3 random samples from outside each boardwalk transect)	Small Surface Sphagnum 'clumps'	Yes	Planned

SPRUCE Collaborator TASKS	Monitoring warming and elevated CO2 induced changes in photosynthetic efficiency via canopy spectral reflectance					
Principal Contact:	**Michael J. Falkowski**					
Co-Investigators:	**Evan Kane Michigan Technological University, Brian Benscoter Florida Atlantic University, Randy Kolka, USFS**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
NDVI	Falkwoski	Continuous during 2015 & 2016 growing seasons	One of Brian Palik's 1 x 2 m plots within each SPRUCE chamber footprint, both treated and controls	Spectral	Data	Level-0, Yes Level-1, Planned Level-2 Planned
Thermal IR	Falkwoski	Continuous during 2015 & 2016 growing seasons	One of Brian Palik's 1 x 2 m plots within each SPRUCE chamber footprint, both treated and controls	Spectral	Data	Level-0, Yes Level-1, Planned Level-2 Planned
Spectral Reflectance	Falkowski	Approximately bi-weekly during 2015 & 2016 growing seasons	One of Brian Palik's 1 x 2 m plots within each SPRUCE chamber footprint, both treated and controls	Spectral	Data	Level-0, Yes Level-1, Planned Level-2 Planned

SPRUCE Collaborator TASKS	Wood decomposition rates and functional types in a shifting climate					
Principal Contact:	**Jonathan Schilling, schillin@umn.edu**					
Co-Investigators:	**Jason Oliver (oliv0328@umn.edu); Randy Kolka (rkolka@fs.fed.us)**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Branch Wood Decay, Branch Wood Compositional Analysis, Branch Wood Microbial Community Analysis		Deployment – June 2015 Harvest – June 2016,2017, 2020, 2025	NPP areas, All Treatment	Litter Bag ($20cm^2$) with 10 pieces of spruce branch wood	Yes	Level 0, Yes Levels 1 & 2 Planned
Bole Wood Decay, Bole Wood Compositional Analysis, Bole Wood Microbial Community Analysis		Deployment - June 2015 Harvest- June 2020, 2025	NPP areas, All Treatment	Boles (Length= 20cm)	Yes	Level 0, Yes Levels 1 & 2 Planned

SPRUCE Collaborator TASKS	Microbial growth and carbon use partitioning under peatland warming and elevated CO_2					
Principal Contact:	**Jessica Gutknecht, jgut@umn.edu**					
Co-Investigators:	**None currently (funded currently from University startup). In the future possibly Brandy Toner, Ed Nater, Randy Kolka, and Steve Sebastyn**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
^{13}C PLFA	Jessica Gutknecht	2014 June/ September	Same location as group sampling, all plots and ambient plots. All depths were sampled but some depths will be combined for the analysis due to a limited amount of sample	Bulk peat	No	Level 0, Yes Levels 1 & 2, Planned 2017 External hard drives at UMN, shared-drive at UMN with off-site back-up;
^{13}C PLFA	Jessica Gutknecht	2015 June	Same location as group sampling, all plots and ambient plots. All depths were sampled but some depths will be combined for the analysis due to a limited amount of sample	Bulk peat	No	Level 0, Yes Levels 1 & 2, Planned 2017 External hard drives at UMN, shared-drive at UMN with off-site back-up;
^{13}C PLFA	Jessica Gutknecht	2016 June, July, August, October	Same location as group sampling in August, otherwise under boardwalks, all plots and ambient plots. All depths were sampled but some depths will be combined for the analysis due to a limited amount of sample	Bulk peat	Archived material will be freeze dried	planned External hard drives at UMN, shared-drive at UMN with off-site back-up;

^{13}C PLFA	Jessica Gutknecht	Annual	All treatments, with group sampling	Bulk peat	Archived material may be frozen or freeze-dried	In Progress
Amino sugar analysis (potentially ^{13}C or ^{15}N)	Jessica Gutknecht	Annual	All treatments, with group sampling	Bulk peat	Archived material may be frozen or freeze-dried	Planned
^{34}S	Jessica Gutknecht	Annual and TBD	All treatments, with group and Toner lab sampling	Bulk peat and pore water	Archived material will be dried and ground in the Toner lab	Planned

SPRUCE Collaborator TASKS	Cryptic Fe cycling in peatland watersheds: linkages to SOM stabilization and loss					
Principal Contact:	**Steven Hall, stevenjh@iastate.edu**					
Co-Investigators:	**Steve Sebestyen, Natalie Griffiths**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Fe(II) and Fe(III) in enclosure outflow water	Steven Hall	Biweekly during frost-free season	Outflow standpipes from all enclosures	Outflow water	No	Level 0, Yes Levels 1 & 2, Planned
Fe(II) and Fe(III) in enclosure pore water	Steven Hall	Biweekly during frost-free season	Piezometers in all enclosures	Pore water	No	Level 0, Yes Levels 1 & 2, Planned

SPRUCE Collaborator TASKS	Cone production patterns in black spruce and tamarack with experimental warming and elevated CO_2.					
Principal Contact:	**Jalene LaMontagne, jlamont1@depaul.edu**					
Co-Investigators:						
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Individual tree cone production	Jalene LaMontagne	July 2017-2025	All SPRUCE enclosures and open plots	Visual counts of cones on trees	Data	Level -0, Levels 1 & 2 Planned

SPRUCE Collaborator TASKS	Terrestrial Laser Scanning Point Clouds and Products					
Principal Contact:	**Nancy Glenn,** nancyglenn@boisestate.edu					
Co-Investigators:	**Jake Graham,** jakegraham@u.boisestate.edu					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
TLS point clouds of plots	Jake Graham	July 2015 2016-present; bi-annual	All SPRUCE enclosures & ambient plots 7 & 21	Terrestrial laser scanning point cloud	Data (.las)	Level 0; yes
Plot DSM	Jake Graham	May 2016-present; annual	All SPRUCE enclosures & ambient plots 7 & 21	Digital Surface Models of bog surface inside boardwalks & outside large flux collars	Data (.txt, .tif)	Level 1; planned
Plot tree heights	Jake Graham	July/August 2015-present; annual	All SPRUCE enclosures & ambient plots 7 & 21	Tree heights	Data (.csv)	Level 1; planned
Plot tree voxel volumes	Jake Graham	July/August 2015-present; annual	All SPRUCE enclosures & ambient plots 7 & 21	Tree voxel volumes (separated by species)	Data (.csv)	Level 1; planned
Plot shrub canopy elevations	Jake Graham	July/August 2015-present; annual	All SPRUCE enclosures & ambient plots 7 & 21	Mean elevation of shrub canopy	Data (.csv)	Level 1; planned
Microform classifications	Jake Graham	May 2016-present; annual	All SPRUCE enclosures & ambient plots 7 & 21	Maps of hummocks and hollows inside boardwalks & outside large flux collars	Data (.txt, .tif)	Level 2; planned
Microform classifications	Jake Graham	May 2016-present; annual	All SPRUCE enclosures & ambient plots 7 & 21	Summary statistics and ELM microtopography parameters	Data (.csv)	Level 3; planned

SPRUCE Collaborator TASKS	Integrating acclimation capacity of tree species into assessments of climate change impacts on Canada's boreal forest productivity					
Principal Contact:	**Danielle Way, dway4@uwo.ca**					
Co-Investigators:	**Norm Hüner, Peter Reich, Martin Girardin, Juha Metsaranta**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Gas exchange A-Ci x T	Danielle Way	2019 and 2020	From all treatment plots	Larix and Picea needles	Data	Planned

SPRUCE Collaborator TASKS	Responses of aerial peatland insects across an experimental temperature gradient and elevated carbon dioxide					
Principal Contact:	**Sue Eggert, sue.l.eggert@usda.gov**					
Co-Investigators:	**Randy Kolka, randy.k.kolka@ usda.gov**					
Measurements	**Primary Contact**	**Sample periods**	**Plot Locations**	**Sample Type**	**Archival Material?**	**Data Archive Status**
Abundance of aerial insects	Sue Eggert	Weekly, April-June 2019	Two locations near each of three 1 x 2 m community monitoring plot within Plots 4, 6, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 21	Sticky card counts of insects	Data, Insect reference collection	Level-0, Planned Level-1, Planned Level-2 Planned
Biomass of aerial insects	Sue Eggert	Weekly, April-June 2019	Two locations near each of three 1 x 2 m community monitoring plots within Plots 4, 6, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 21	Sticky card counts of insects with biomass estimates	Data	Level-0, Planned Level-1, Planned Level-2 Planned
Flower abundance within community monitoring plots	Sue Eggert	Weekly, April-June 2019	Three 1 x 2 m community monitoring plots within Plots 4, 6, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 21	Flower counts	Data	Level-0, Planned Level-1, Planned Level-2 Planned
Wind speed at sticky card	Sue Eggert	Weekly, April-June 2019	Two locations near each of three 1 x 2 m community monitoring plots within Plots 4, 6, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 21	Anemometer wind speed at sticky card	Data	Level-0, Planned Level-1, Planned Level-2 Planned