

SPRUCE Research Safety Summary

- Updated SPRUCE Research Safety Summary is now available.
- ORNL Users can use this link to [Access RSS 7728.7 in RHACS](#).
- Note that the previous version, RSS 7728.6, has been retired.

Logged in as Leslie Hook

Important Note:

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- This copy is provided on the SPRUCE website for the convenience of non-ORNL collaborating participants who do not have access to the internal ORNL RHACS system and are unable to read the RSS and follow all of the embedded links.
- Embedded links will be unavailable outside of the RHACS system. Forest Service JHAs (ORNL annotated) attachments to the RSS are also provided as information only copies.
- Non-ORNL collaborators may read these selected documents for background information but ***the official copy is maintained as a hardcopy document at the SPRUCE Office, in Grand Rapids.***
- Non-ORNL collaborators must read this hardcopy version and sign the appropriate acknowledgement form which will be maintained as an official SPRUCE record.

RSS No	7728.7		
Status	Authorized		
Minor Revisions	None.		
Last Modified by	Fowler, David E (27217) on 6/18/2015 8:39:59 AM		
Notice	This information is current as of 7/15/2015 9:49:59 AM . The official copy of this Research Safety Summary is the online version. Before using a printed copy, you must verify that it is the most recent version. Any printed copies provided to individuals for the purpose of controlling work must be controlled in accordance with the Document Control subject area.		
Title	ESD Off-Site: Minnesota SPRUCE Experiment--Climate Change Response SFA		
Approvals/Authorizations	Date/Time	Name	Role
	6/17/2015 5:52:29 PM	Hanson, Paul J (29602)	Group Leader
	6/18/2015 8:39:51 AM	Fowler, David E (27217)	Division Work Authority
Description Text	[POC STUMP NOTE- The presence of GREEN text in this RSS is indicative of substantive changes that have been made to the RSS since the last major revision.]		
	Experimental work under the Response SFA will focus on the identification of critical response functions for terrestrial organisms, communities, and ecosystems. Both direct and indirect effects of these experimental perturbations will be analyzed to develop and refine models needed for full Earth system analyses. Response SFA research will be organized around a climate change manipulation focusing on the combined response of multiple levels of warming at ambient or elevated CO ₂ (eCO ₂) levels.		
	A more detailed discussion of the scientific goals/outcomes of the proposed work can be found in the expanded project description attachment and the project's website: http://mnspruce.ornl.gov/		
	The experiment will provide a platform for testing mechanisms controlling vulnerability of organisms and ecosystems to important climate change variables (e.g., thresholds for organism decline or mortality, limitations to regeneration, biogeochemical limitations to productivity).		
The experiment will evaluate the response of existing biological communities to a range of warming levels			

	<p>from ambient to +8°C. The ambient, +4°C and +8°C warming treatments will also be conducted at eCO₂ (in the range of 800 to 900 ppm).</p> <p>The experiment will be conducted in a Picea mariana [black spruce] – Sphagnum spp. forest in northern Minnesota. This ecosystem located at the southern extent of the spatially expansive boreal peatland forests is considered to be especially vulnerable to climate change and to have important feedbacks on the atmosphere and climate.</p> <p>This science plan for the Response SFA also describes support for core long-term tracking of the hydrologic, biogeochemical and biological response of the Walker Branch Watershed to inter-annual climatic variations.</p>
Description File	Project Description.pdf
Division	X042: Environmental Sciences Division
Start Date	9/8/2009
End Date	None.
Account	None.
General Notes	<p>A website has been developed for the SPRUCE Project providing tabs along the top of the page for items such as Project Description, Resources, Participants, Collaborations, etc. This site can be viewed at: http://mnspruce.ornl.gov.</p> <p>NOTE: A control copy of this RSS along with the ORNL annotated versions of the USFS JHA's can be found under the Collaborations tab.</p> <hr/> <p>A pre-job briefing work aid has been developed for EESD field activities. While the use of the work aid is not mandatory, it is highly encouraged. Project task leaders may use the following job aid in performing the pre-job brief: https://portal05.ornl.gov/sites/eesd/ops_west/RSSDocuments/LinkedPDFs/BESD_START_Job_Safety_Briefing_Card_Rev_0.pdf</p> <p>It is intended to help field teams recognize and identify known or potential hazards posed by their field activities and the mitigating actions required to address the hazards. Situational awareness is emphasized and encouraged. Contact your Division Safety Officer or Safety Services Representative for assistance in using this work aid, as needed.</p> <hr/> <p>Note 1: Nearly all field work for this RSS will be performed at the Marcell Experiment Station in Minnesota managed by the United States Forest Service (USFS). RSS participants will read and understand Job Hazards Analyses (JHAs) required by the USFS to work at the site as part of the work control package.</p> <p>Note 2: Be advised that nearly all JHAs attached to this RSS have been annotated by ORNL Subject Matter Experts (SMEs). The annotations have been made in order to document (1) certain Forest Service requirements that have been waived or (2) where some requirements for the ORNL participants have been clarified or established within this RSS instead.</p> <p>Note 3: Not all Forest Service JHAs are attached here at this time. The scope of this RSS (and attached JHAs) is limited to the potential hazards (and subsequent controls) that are known at this time. Other JHAs and RSS hazard questions & controls will be identified and implemented via major or minor revisions before additional phases of lab or field work commence.</p> <p>Note 4: Due to the remote nature of the work, First-Aid, CPR/AED, and Bloodborne Pathogen Training is suggested for all project participants. ESD Line Management encourages ORNL/UT-B Staff members to keep this training active and in their list of training certifications.</p> <p>Note 5: A daily pre-job safety briefing is recommended to discuss the goals, tasks, and associated</p>

	hazards for the day's activities.
General Attachments	JHA/Field Work (ORNL SME Annotated August 2010).doc ; JHA/Fieldwork_jha (ORNL SME Annotated August 2010).doc ; JHA/Insect (ORNL SME Annotated August 2010).doc ; JHA/Personal Safety (ORNL SME Annotated August 2010).doc ; JHA/Plants & Animals JHA (ORNL SME Annotated August 2010).doc ; JHA/Tick (ORNL SME Annotated August 2010).doc ; JHA/Weather (ORNL SME Annotated August 2010).doc ; JHA/Dehydration (ORNL SME Annotated August 2010).doc ; Ladder Use (ORNL SME Annotated August 2010).doc ; JHA/Soil sampling (ORNL SME Annotated-Updated June 2014).doc ; RSS 7728 QEA FINAL (updated 06-2015).pdf
Point of Contact	Cline, Steven R (35073)
Division Work Authority	Fowler, David E (27217)
Principal Investigator	Hanson, Paul J (29602);
PI Delegates	Huczko, Kathy (927469);
Group Leaders	Hanson, Paul J (29602);
Participants	Bowling, Michael (924229); Brice, Deanne Jane (745282); Childs, Joanne (742253); Griffiths, Natalie A (976981); Hanson, Paul J (29602); Hook, Leslie A (31797); Iversen, Colleen (905477); Kluber, Laurel A (3023400); Latimer, John M (3028384); Lester, Brian P (978820); Lowe, Kenneth Alan (34120); Mayes, Melanie (742503); Moore, Jessica A (986947); Nettles IV, William R (3013707); Norby, Richard J (27150); O'Neill, Caitlin P (3037352); Oleheiser, Keith C (3021249); Patterson, Courtney M (3017885); Phillips, Jana Randolph (746669); Rewcastle, Kenna E (3016244); Riggs, Jeffery S (23528); Schadt, Christopher Warren (902616); Tompkins, Samantha A (3028031); Vander Stel, Holly M (3028583); Warren, Jeffrey (944146); Weston, David (924106); Wullschleger, Stan D (34406);
Required Reviewers	Allman, Steve L (15068) - <i>DESO Reviewer</i> ; Childs, Steve Evans (34637) - <i>WSR review</i> ; Nettles IV, William R (3013707) - <i>Required Participant Reviewer</i> ; Stump, Jarrad D (902929) - <i>Lead POC/DSO for this version of the RSS</i> ;
Optional Reviewers	Bush, Andrew C (70748) - <i>ORNL Fall Protection SME</i> ; Childs, Joanne (742253) - <i>Lab Space Manager Reviewer</i> ; Cline, Steven R (35073) - <i>Division POC Reviewer</i> ; Hanson, Paul J (29602) - <i>Optional GL Reviewer</i> ; Huczko, Kathy (927469) - <i>Project Manager reviewer</i> ; Phillips, Jana Randolph (746669) - <i>Lab Space Manager & Participant Reviewer</i> ; Sabo, Karen A (966556) - <i>Optional Quality reviewer</i> ;
Lab Space Managers	Childs, Joanne (742253); Phillips, Jana Randolph (746669)
Locations	 Building 102GRAND, Room 01 - <i>SPRUCE Project Office</i> ; Building 1506, Room 129B - <i>Lab work on samples from Minnesota</i> ; Building 1521, Room 101 - <i>Lab work on samples from Minnesota</i> ; Building 1521, Room 102 - <i>Lab work on samples from Minnesota</i> ; Building 1521, Room 103 - <i>Lab work on samples from Minnesota</i> ; Field Work - <i>Work in Black Spruce - Sphagnum Bog</i> ; Off-Site Work - <i>Minnesota research site</i>
Nepa Documentation	NEPA Document Number 3627X. Following the preparation and review of an Environmental Assessment on the SPRUCE project, a Finding of No Significant Impact was found and we have permission to proceed. All the planned lab work here at ORNL also falls within fall within the scope of ESD's Division Categorical Exclusion (CX) for Small Scale R&D projects (2657X) For the initial site sampling & field work currently covered by this RSS, it has been determined that the new off-site deployment activities (e.g. activity bullets 1, 7 and 9 of the CX) also fall within the same ESD CX. This current Categorical Exclusion (CX) is available online at the NEPA Homepage: http://www-ep.ornl.gov/nepa/PDFDocs/2657X.pdf ; Consult EPO/ECR or POC if you feel any planned activities might fall outside of the scope of this CX.
Hazards	5.1 This operation involves work on or near equipment with unguarded, energized electrical components. Potential Training: Please refer to SBMS Exhibit: Electrical Safety Training Requirements . Requirements: Electrical Safety Lockout/Tagout Hazard Notes: This question has been marked to raise awareness that participants of this RSS are not permitted to conduct work on unguarded electrical systems that are energized (or that have the potential to become energized) at >50 volts.

Control Notes:

Only qualified electrical workers that have completed the proper ORNL training, or subcontractors will conduct this type of work.

At the SPRUCE site only authorized participants of [RSS 11438](#) or properly trained F&O technicians (under their own F&O work controls) will conduct work on energized systems >50 volts.

NOTE: Any participants working on a de-energized system that requires the application of a personal lock must have completed the ORNL Lockout/Tagout (LOTO) training and have been issued a personal locking device as per the SBMS LOTO subject area: <https://sbms.ornl.gov/sbms/sbmsearch/subjarea/LOTO/sa.cfm>

Locations:

Building 102GRAND, Room 01

Field Work

Off-Site Work

Attachments:

None.

5.4 This operation involves exposure to one or more of the following electrical hazard sources:

- RF or sub RF;
- Significant electromagnetic (EM) fields;
- Direct current (DC) sources;
- Batteries, other than household batteries;
- Capacitors;
- Unguarded inductive systems that pose a hazard.

Potential Training:

Please refer to SBMS Exhibit: [Electrical Safety Training Requirements](#).

Requirements:

[Electrical Safety](#)

Hazard Notes:

Battery charging will be conducted within the field, at the SPRUCE office in Grand Rapids, and at the bog site workshop, because some instruments use deep cycle batteries and must be recharged.

Control Notes:

Several types of batteries and battery packs (i.e. sealed LI-COR batteries, mini-rhizotron batteries, etc.) will be charged in designated areas. Batteries will not be charged when frozen, as this increases the likelihood of fracturing the battery casing. Batteries that have visible signs of damage will not be connected to the charger and will be taken out of service for proper disposal. **Manufacturer's instructions for charging/safety will be followed.**

Note: PPE and other requirements for charging deep cycle batteries should be posted at the charging station and can also be found within the following work-aid: https://portal05.ornl.gov/sites/eesd/ops_west/RSSDocuments/LinkedPDFs/Marine-Auto-ATV-BatteryCharging.pdf.

Minimum electrical safety training and qualification for persons working on or near unguarded electrical connections to batteries (>1000 watts short circuit available power) should include Electrical Worker (<50 Volts), Direct Current and Batteries.

If question arise please contact the [Division Electrical Safety Officer \(DESO\)](#).

Locations:

Building 102GRAND, Room 01

Field Work

Off-Site Work

Attachments:

None.

5.5 This operation involves the operation of breakers, disconnects, starters or similar electrical equipment up to 600 volts with doors or covers on.

Potential Training:
Breaker, Disconnect and Starter Operator
Electrical Safety Outside the Office

Requirements:
[Electrical Safety](#)

Hazard Notes:
Electrical breakers and/or disconnects may need to be operated at the SPRUCE site.

Control Notes:
Those participants operating breakers or disconnects must complete the ORNL LRN Breaker & Disconnect Training. Participants shall only operate breakers or disconnects with the doors/covers in place and shall not exceed the voltages outlined within their level of training.

NOTE: Robert Nettles will conduct a site specific discussion for all participants that will be operating breakers or disconnects at the SPRUCE site to identify systems that require a higher level of training to operate.

Locations:
Building 102GRAND, Room 01
Building 1506, Room 129B
Building 1521, Room 101
Building 1521, Room 102
Building 1521, Room 103
Field Work
Off-Site Work

Attachments:
None.

5.6 This operation involves the potential for electrical shock or the release of other hazardous energy (consider mechanical as well as sources such as pneumatic, hydraulic, thermal, chemical, and pressurized fluids) other than as described elsewhere in this RSS.

Requirements:
[Electrical Safety](#)
[Occupational Hazard Controls](#)

Hazard Notes:
Static Discharges (Hazard Note): Walking on the decking (glass-reinforced Copolymer polypropylene, manufactured by TRUE DECK) of the boardwalk often results in static buildup. Participants are experiencing static discharge/shock when touching metallic objects.

Temporary Power Cords (Hazard Notes): Flexiable power cords (i.e. equipment cords and extension cords) will be used at the site.

Control Notes:
Static Discharges (Control Notes): Participants are typically familiar with the feeling from static shocks after contact with door knobs, exiting cars, etc. The sensation from a static shock is a “burst” of energy that can be mildly painful, but the feeling dissipates almost instantly. In contrast, a shock from an alternating current (AC) source is identified as an unpleasant tingling or very fast pulsating sensation that persists as long as the person remains in contact with the energized part or until the AC source is turned off.

Participants are to use their own discretion to determine if a received shock is an **expected** static displacement, or **unexpected** contact with energized equipment. Should participants feel that they have contacted **unexpected** electrical energy, they shall stop work, inform others in the work area of the potential hazard, and immediately report the concern to the SPRUCE Principle Investigator, Ops support staff, or the ORNL LSS in order for verification and any follow-up actions or reporting to occur.

Temporary Power Cords (Control Notes): Flexible cords must be used in accordance with applicable sections of OSHA 29 CFR 1910 Subpart S-Electrical (1910.305).

Flexible cords and cables shall be approved for conditions and locations of use (e.g. outdoors, in potentially wet or damp locations, etc.). Although some cords are listed for wet locations, their design does not permit a watertight plug connection. Extension cords and/or power strips will not be daisy-chained; permanent wiring should be installed instead. Flexible cords may be used only in continuous lengths without splice.

Flexible cords must be of sufficient gauge **in the American Wire Gauge (AWG) diameter**, and be designed to support the amperage and voltage of the equipment being connected.

Ensure that flexible cords and cables are adequately protected if run through doorways, windows, or other pinch points. This can be achieved by using wood blocks to prevent windows or doors closing, schedule 80 UV-resistant PVC to run extension cords through, or protective ramps with cord compartments.

Locations:

Building 102GRAND, Room 01
Building 1506, Room 129B
Building 1521, Room 101
Building 1521, Room 102
Building 1521, Room 103
Field Work
Off-Site Work

Attachments:

None.

7.1 This operation involves work conducted under the [OSHA Laboratory Standard](#).

Potential Training:

General Hazard Communication
ORNL Chemical Hygiene Plan
ORNL Hazard Communication Job Specific Training
OSHA Lab Standard Training - Includes site-specific

Requirements:

[Chemical Safety](#)

Hazard Notes:

Some activities occur in laboratories to prepare and process samples before and after field-deployment.

At the present time, all of the associated lab activities present no or very low hazards to the participants. Any lab activities for this RSS that may present significant ESH hazards will most likely be controlled by other authorized ESD RSSs that occur in these lab/process areas.

Control Notes:

All participants working in these labs must be trained to the CHP and have site specific training to the space(s).

All work in labs controlled by the [ORNL Chemical Hygiene Plan \(CHP\)](#) require safety glasses with side shields as the minimum level of eye protection, unless official LSM signage (approved by POC/DSO) provides waivers to this requirement.

Be advised that most, if not all, lab activities will be covered and described in better detail in other authorized RSSs such as [RSS 4788](#) and [RSS 2524](#). All staff/guests performing activities covered by such "associated" RSSs must also be a listed participant of and adhere to the requirements of them.

Locations:

Building 102GRAND, Room 01
Building 1506, Room 129B
Building 1521, Room 101
Building 1521, Room 102
Building 1521, Room 103

Attachments:

None.

7.2 This operation involves work conducted under the [OSHA Hazard Communication Program \(HAZCOM\)](#).

Potential Training:

General Hazard Communication
ORNL Hazard Communication Job-Specific Training

Requirements:

[Chemical Safety](#)

Hazard Notes:

Some chemicals (e.g. isopropyl alcohol, acetone, **ethanol**) shall be transported to and used within the field location, in non-laboratory settings.

Control Notes:

All participants working with chemicals in the field must be ORNL HAZCOM trained and be familiar with the materials (i.e., have access to and be aware of the product Safety Data Sheets (SDS's)).

To meet HAZCOM labeling requirements, secondary chemical containers (not used/stored in "labs") must be labeled with the identity of the hazardous chemical(s) and appropriate hazard warnings (via words or symbols) which provide at least general information regarding the physical and health hazards. This labeling requirement applies unless: the hazardous chemical(s) is only used by the person transferring the chemical from the primary container; the person that performed the transfer has constant control of the container; AND, the chemical is completely used within the work shift.

Chemical-specific PPE and safety precautions will be followed as prescribed in the SDS unless discussion(s) with ES&H POC or Division Safety Officer (DSO) determines other precautions or PPE are required.

Locations:

Field Work
Off-Site Work

Attachments:

None.

7.7 This operation involves chemicals or wastes that are [flammable](#) or [combustible](#).

Requirements:

[Chemical Safety](#)

[Exposure Assessments](#)

[Personal Protective Equipment](#)

Hazard Notes:

Gasoline will be transported to and used in the field for various uses (i.e. gas powered generator, ATV, etc.).

Small amounts of isopropyl alcohol, acetone and **ethanol** will be transported to and used in the field for cleaning sampling tubing and instrumentation.

Propane air heating units will be in use to warm the air inside the chambers.

Control Notes:**General Controls for Flammable & Combustible Liquid Storage:**

Small amounts of flammable and combustible liquid storage (including waste) outside of approved storage devices is permitted in each lab (i.e., up to 4 liters in general lab area/benchtops and up to 4L in a hood can be stored outside of a cabinet or refrigeration unit approved for such flammable/combustible liquid storage). More information and requirements for combustible

and flammable storage and handling can be found in SBMS at: <https://sbms.ornl.gov/sbms/SBMSearch/SubjArea/chemsafe/ExhibitFlamCOmbust.cfm>

GASOLINE HANDLING IN FIELD: Gasoline is listed as an eye irritant, safety glasses with side shields shall be worn when fueling equipment from portable containers.

Refer to Question 15.1 regarding transportation issues for gasoline.

Propane tanks are secured on appropriate pads located near the service road and will be hard piped into the individual heating units of the chambers. The heating units themselves are located outside of the chamber and are ducted into the chamber to warm the ambient air.

If participants suspect a leak from the tanks or the piping system supplying the heating units (such as the smell of propane, a hissing sound, etc.) everyone is to immediately evacuate the area. A procedure will be developed after construction of the system and will include knowledge of the system and operation of accessible shut off valves, and who to contact after leak detection and prevention.

No open flames or smoking will be permitted near the propane cylinders or prototype chamber, and the area shall be posted to reflect this requirement.

Note: Maintenance of the propane and/or heating system will be handled by appropriate ORNL crafts/personnel and/or subcontractors. Project staff will only be involved in setting and monitoring temperature control points.

Locations:

Building 102GRAND, Room 01

Field Work

Off-Site Work

Attachments:

None.

8.2 This operation generates [hazardous waste](#).

Potential Training:

RCRA 90 Day or 180 Day Accumulation Area

RCRA HAZARDOUS WASTE CHARACTERIZATION AT ORNL

RCRA LAND DISPOSAL RESTRICTIONS FOR GENERATORS

RCRA SATELLITE ACCUMULATION AREA AT ORNL

Waste Generator Awareness Training

Requirements:

[Environmental Management](#)

[Manage Waste and Excess Materials](#)

Hazard Notes:

Used magnesium perchlorate from the LiCor will be managed as a hazardous waste (oxidizer).

Control Notes:

Under the memorandum of understanding (MOU) with the USFS all wastes generated at the field site or office location (102GRAND) will be managed by the USFS along with their waste products.

Locations:

Building 102GRAND, Room 01

Field Work

Off-Site Work

Attachments:

None.

8.1 This operation involves the use of quarantined soils, plants, or pests.

Requirements:

[Environmental Management](#)

[Move Soils, Plants or Plant Products, or Other Contaminated Equipment](#)

Hazard Notes:

This question has been marked to raise awareness since USDA or State quarantine restrictions change

with time.

Evaluation of local restrictions on the transportation of soils and plant materials to-and-from the research locations must be evaluated.

Note: Precautions should be taken to avoid cross-contamination of "clean" soils with other quarantined soils.

Control Notes:

Marcell Experiment Station Soils: The research site north of Grand Rapids, MN currently has no known restrictions. We may bring back soils and leaf liter, and ultimately dispose of them, with no restrictions.

Locations:

Building 1506, Room 129B

Building 1521, Room 101

Building 1521, Room 102

Building 1521, Room 103

Field Work

Off-Site Work

Attachments:

None.

8.1 This operation generates excavated soils.

2 **Requirements:**

[Environmental Management](#)

[Excavation/Penetration](#)

[Manage Radiological Aspects of Excavated Soil](#)

Hazard Notes:

Manual soil coring/sampling will be performed on this project. Some of these cores into deep peat may be over 1 meter deep. Experimental areas within which all ORNL research sampling will take place and be identified.

Ground penetrations will also be made by research staff for the installation of various equipment/materials (i.e. probes, tubes, etc.).

Control Notes:

All of the soil coring/sampling to be performed will be performed off-site. As a result, ORNL's excavation/penetration requirements are not applicable.

It is the responsibility of the PI and RSS participants to ensure that any requirements of the USDA Forest Service facilities be met before any such sampling is performed in order to avoid buried utilities, etc. **If ground penetrations are to be made outside of the bog (Marcell Experiment Station) footprint where project knowledge cannot be applied a Minnesota state required One-Call shall be made (1-800-252-1166) prior to conducting the work.**

Locations:

Field Work

Off-Site Work

Attachments:

None.

9.2 This operation involves exposure to moving or rotating parts, such as motors, shafts, pulleys, belts, or any other potential mechanical energy.

Requirements:

[Occupational Hazard Controls](#)

Hazard Notes:

ATV Use (Hazard Notes): An all terrain utility vehicle (ATUV) will be used to access certain areas of the site and transport materials.

Power Tools (Hazard Notes): Some hand and portable power tools (e.g. drills, bow saws, etc.) may be used during work activities.

Snow Blower (Hazard Notes): A walk behind snow blower will be used by participants to clear snow at the work sites.

Control Notes:

ATV Use (Control Notes): Workers riding in government vehicles (trucks and the ATUV) will use seat belts and obey all traffic rules.

A work-aid has been established to allow RSS participants to also use an ESD owned ATUV under this RSS. All required PPE, administrative controls and training documentation needed for this activity are embedded in the work-aid

at: https://portal05.ornl.gov/sites/eesd/ops_west/RSSDocuments/LinkedPDFs/Polaris_Ranger_800_Work-Aid_and_Operator_Manual.pdf

NOTE: This ATUV has a removable snow blower attachment that will only be used by individuals trained and approved for its operation.

Power Tools (Control Notes): When using hand and portable power tools users shall ensure that they have donned the proper PPE for the device being used (e.g. safety glasses with side shields where flying particles/debris are being generated). Note: If there is a potential for injury to the face a face shield shall be used in addition to safety glasses.

Workers hands shall not contact any moving or rotating part of the equipment (such as when using a drill, saw, etc.). A safe working distance for the rest of the body shall be maintained from the moving or rotating parts of the equipment to prevent loose fitting clothing from contacting and being drawn into the moving parts.

Snow Blower (Control Notes): The snow blower will be used in accordance with the manufacturers instructions. Any questions or mechanical issues with the snow blower shall be reported to the PI and/or Robert Nettles.

Locations:

Field Work

Off-Site Work

Attachments:

None.

11. This operation involves a vessel operated at greater than 100 psi.

2 **Requirements:**

[Design](#)

[Pressure System Safety](#)

Hazard Notes:

Portable pressure chambers will be used to conduct plant moisture stress (PMS) measurements. These instruments are pressurized/operated by filling a portable tank from a nurse tank (standard size cylinder).

Control Notes:

Plant Moisture Stress (PMS) Controls:

- All participants using this instruments must be familiar with their use and follow manufacturer guidelines and operating instructions which can all be found at <http://pmsinstrument.com/> and at <http://www.pmsinstrument.com/resources/>
- All in-service regulators shall be receipt inspected and only field portable tanks having a hydrostatic acceptance test within the last 5 years will be used.
- All cylinders not internal to the instruments, will be stored and used valve end up, with cylinders secured to prevent instability.
- Portable tanks (secondary chemical containers) filled for use in the field must be properly labeled with identity of the hazardous chemical(s) and appropriate hazard warnings to meet Hazcomm requirements UNLESS the following conditions exist: (a)The contents will be used

by only one person who has constant control over the container, and (b)The person transfers the hazardous chemical from a labeled container; and, the transferred gas will be immediately used (i.e. during the work shift) by the person performing the transfer.

Locations:

Building 102GRAND, Room 01

Field Work

Off-Site Work

Attachments:

None.

11. This operation involves compressed gases at greater than 100 psi.

5 **Requirements:**

[Compressed Gas Cylinders and Related Systems](#)

Hazard Notes:

Compressed Nitrogen will be used at the offsite location during the course of these experiments.

Other calibration gases (such as compressed air, CO₂, CH₄) will be used both within the field and at the 102GRAND lease space.

Large (20 ton) CO₂ tanks shall be used to put CO₂ into the experimental chambers.

Propane tanks will be present at the site to supply air heating units to warm the air inside the chambers.

Control Notes:

Standard best laboratory practices will be observed in the use of gas cylinders: Labels on compressed gas cylinders will be checked to verify the stated contents prior to use. Cylinders will be secured and stored in an appropriate area until needed. Users will determine to the best of their ability that cylinders are not defective or leaking. Regulators will be placed by trained personnel and will be inspected if their integrity is questioned.

Calibration gases will be maintained as a mixture containing concentrations within an ambient range (<1,000ppm CO₂; <100ppm CH₄).

NOTE: All requirements and guidance on compressed gas cylinder use can be found at: https://sbms.ornl.gov/sbms/SBMSearch/subjarea/cgc/cgc_sa.cfm

Those present at the site shall leave the area immediately should a known, unexpected release of CO₂ from the large tank occur. The potential for an unknown build-up of CO₂ concentrations inside enclosed areas that could create and asphyxiation hazard has been considered and is essentially not a risk due to the presence of open air/natural ventilation.

NOTE: Be advised that should the SPRUCE site loose power pressure could build up within the CO₂ tanks resulting in the pressure relief valves operating. This may produce a loud sound and result in a rapid discharge of CO₂. Participants should remain away from the tanks should the site loose power.

Please refer to Question 7.7 for controls concerning propane usage.

Locations:

Building 102GRAND, Room 01

Field Work

Off-Site Work

Attachments:

[RSS 7728 Nitrogen release worst case scenario 102Grand.pdf](#)

12. This operation involves sources of [thermal hazards](#), such as heaters, ovens, [cryogenics](#), or uninsulated steam lines.

0 **Requirements:**

[Exposure Assessments](#)

Hazard Notes:

Commercial drying ovens are used in the labs following field sampling campaigns, etc.

Samples may be treated or preserved via the use of dry-ice and/or liquid nitrogen.

Control Notes:

Typical drying temperatures range from 60 to 105 °C. Appropriate insulated gloves should be worn to avoid burns when handling hot materials.

Follow any and all posted signage associated with the equipment.

Cryogenic & Dry Ice Controls:

Cryo/thermal gloves are available for use when extended handling time of cold materials is required while inside freezers or while removing items from freezers. Gloves (cotton, leather or other material) that eliminate the direct contact and minimize temperature transfer between the objects being handled and the skin may be used when more dexterity is needed and handling time is minimal.

At minimum, safety glasses with side shields are required any time cryogenic liquids, exposed to the atmosphere, are present. Goggles provide the best protection for the eyes. A full face shield **shall** be used when a cryogenic liquid is transferred to an open container where there is a potential for bubbling.

Tongs shall be available for removing samples from liquid nitrogen.

Only containers specifically designed for the purpose of holding cryogenic liquids should be used when freezing samples with liquid nitrogen.

Further info can be found in the controlling SBMS

Exhibit: <https://sbms.ornl.gov/sbms/SBMSearch/subjarea/GSH/ExhibitCryogenics.cfm>

Dry Ice Usage Controls (see Q15.4 for additional dry ice shipping controls)

- (1) Never store dry ice in an airtight container/use loose fitting lids to prevent pressure build-up
- (2) Do not touch dry ice with your skin! Use tongs, insulated (thick) gloves or an oven mitt and safety glasses with side shields when handling dry ice.
- (3) Use in a well ventilated area and keep the material away from your face/breathing zone.

Dry Ice Supplemental information: If field trucks are not utilized, be cautious if transporting dry ice inside vehicles compartments. Dry Ice should be in closed coolers. One should have adequate ventilation of the vehicle compartment and should not recirculate the air in the vehicle.

Note: Transport of dry ice in government or rental vehicles by RSS participants is not restricted; however, If participants should need to prepare and ship samples and/or materials on dry ice other than by ground transport, DOT function-specific training must be taken (there is currently no ORNL qualification number for this training and records of this outside training will be maintained by the DTO).

Locations:

Building 102GRAND, Room 01

Building 1506, Room 129B

Building 1521, Room 101

Building 1521, Room 103

Field Work

Off-Site Work

Attachments:

None.

13.1 This operation involves sources of [excessive noise](#). (E.g., such that you would have to shout at a distance of 3 feet to communicate to a co-worker, or louder than busy traffic.)

Requirements:

[Exposure Assessments](#)

[Hearing Conservation](#)

Hazard Notes:

Hearing protection may be required during the use of some types of equipment associated with this project (e.g. some hand/portable power tools; within close proximity of gas powered generators; while using some air driven/pneumatic/electric equipment such as the Rhino Hammer or Bosch Hammer, etc.).

Control Notes:

Hearing protection is required for exposures in excess of 85 dbA. Hearing protection devices (HPDs) (i.e., earplugs or earmuffs) with a proper noise reduction rating (NRR) are required for the operator of the equipment (and perhaps other employees working adjacent to the equipment) during use. Hearing protection provided according to OSHA 29 CFR 1910.95.

Participants of this RSS that use HPDs (either on a mandatory or voluntary basis) must understand why the PPE is required and review the proper use and fit of hearing protection devices document found at:

https://portal05.ornl.gov/sites/eesd/ops_west/RSSDocuments/LinkedPDFs/BSD_ESD_HPDI_GUIDE.pdf

Personnel identified as having known or potential noise exposures exceeding the Occupational Exposure Limit of 85 dBA, 8-hour time-weighted average must be enrolled in the Hearing Conservation Program (HCP) and receive HCP training (initial and refresher as required). It is the supervisor's responsibility to enroll the worker in the HCP using the ORNL Medical Services Division Mandatory Enrollment Form (<https://portal06.ornl.gov/sites/hsd/Documents/pdfs/mandprog.pdf>). Consult your DSO for assistance.

Locations:

Field Work

Off-Site Work

Attachments:

None.

13.3 This operation involves [ergonomic hazards](#) (e.g., lifting, pulling/pushing, vibration, posture, repetitive motion, etc.).

Requirements:

[Occupational Hazard Controls](#)

Hazard Notes:

Potential Ergonomic Hazards Include:

- Carrying field equipment and sampling gear (tools, batteries, etc.) can present ergonomic hazards if loads are not carried properly, etc.
- Ergonomic hazards also exist due to tower climbing activities.
- Traveling on bog boardwalks when wet represents a plausible slipping and/or twisting hazard.
- Lowering and raising the extension platforms to access the center of the experimental plots presents a lifting, bending, and twisting concern.
- Lifting the air driven and/or electric hammering devices (i.e. Rhino Hammer or Bosch Hammer).

Control Notes:

As outlined in several of the JHAs in the attached USFS package, participants should avoid awkward positions and should follow proper lifting and carrying techniques. Under extended field sampling

situations, personnel should rotate job tasks to limit continuous actions, or take breaks as needed.

Tips for Lifting Heavy Items: Lifting is strenuous, and proper bending and lifting techniques are strongly encouraged in order to perform it safely. By bending at the knees instead of at the waist and lifting with the large, strong muscles of the legs instead of the small muscles of the back, back injuries can be prevented and may reduce the potential for lower back pain.

For most workers, lifting loads over 20 kgs. (44 lbs.) results in an increased number and severity of back injuries. Personnel should be very cautious and use proper lifting techniques when lifting any load, especially those loads approaching 40 lbs. A team lift is recommended for all loads with weights at or above 40 lbs. Individuals should seek assistance, even for lesser weights depending on their personal capabilities and the bulkiness of the item.

Bog boardwalks are elevated above the surrounding saturated conditions to keep them dry. The newly installed board walks are textured to further limit the potential for slips, trips, twists, and falls when the boardwalks may be wet from precipitation. When the boardwalks are covered with snow in winter special care including shoveling off the boardwalks should be taken to ensure their safe use.

Locations:

Field Work

Off-Site Work

Attachments:

None.

13. This operation involves work in [extreme climates](#) or temperatures.

5 **Potential Training:**

Heat Stress Training

Requirements:

[Occupational Hazard Controls](#)

Hazard Notes:

Field work in hot and especially cold conditions. Work outdoors with potential for inclement and/or severe weather conditions.

Control Notes:

As outlined in several of the JHAs (e.g., "dehydration", "fieldwork", "snowshoe travel", "weather") in the attached USFS package, participants must follow many controls to maximize their safety during severe weather events in northern Minnesota (heavy snow, thunderstorms, etc depending upon the time of year)

Participants working in the field need to be aware of heat and cold stress symptoms. For more information regarding extreme climates or temperatures see links below:

<http://www.osha.gov/Publications/OSHA3154.pdf>

<https://www.osha.gov/SLTC/emergencypreparedness/guides/cold.html>

Supervisors must ensure that participants complete heat stress training prior to performing work under this RSS involving elevated temperatures. Line management may conduct and document heat stress training or have participants complete the web-based Heat Stress Training course.

During inclement weather, if you can hear thunder or see lightning you are within the strike distance of the lightning. Stop your activities, evacuate the site and seek safe shelter immediately. Safe shelter may be obtained in a permanent structure or in a vehicle with windows closed. If there is not time to get to such protected areas, find a low-lying, open place that is a safe distance from trees, poles, or metal objects, or standing water that can conduct electricity. Get into and stay in a tucked position.

Additional ORNL Controls to supplement USFS JHAs:

- [Wait thirty minutes after the last strike before resuming field activities.](#)
- [Travel to and from hotel/lodging areas to the Marcell Experiment Station via rental vehicles or government vehicles may involve may require winter driver skills and practices that rarely needed in east Tennessee. Participants should keep heavy blankets and emergency](#)

supplies in vehicles during the winter periods.

Locations:

Field Work
Off-Site Work

Attachments:

None.

13. This operation involves [elevated work areas or platforms](#).

7 **Requirements:**

[Fall Protection, Scaffolding, and Aerial Lifts](#)

[Ladders](#)

[Occupational Hazard Controls](#)

Hazard Notes:

To access instrumentation and trees it may be necessary to occasionally use a step ladder and/or extension ladder. The spongy surface of the bog may make the safe use of a ladder difficult.

Ladders may also be used (by ORNL staff and collaborators) within the plot enclosures to access instruments or equipment.

Articulated ladders will be used at the site to access trees, obtain samples, conduct measurements, etc. These ladders can be configured for use like a standard step or extension ladder, or can be positioned to span across the boardwalks and/or the drop down planks.

Each experimental plot/ring at the SPRUCE site has a tower in the center which is outfitted with environmental monitoring equipment (refer to attached picture). It will be necessary for certain participants to periodically climb the towers to install, repair, and/or replace these instruments.

Control Notes:

Ladder use in bogs must be supported by a solid surface and include a spotting individual to ensure that the ladder does not shift from its position on the solid board or walkway. Ladder users shall be familiar with the SBMS [Using Ladders Safety](#) procedure and the US Forest Service Ladder Use JHA located within the General Attachments section. Ladder users must successfully complete the ORNL LRN Ladder Training before use.

All ORNL staff and project collaborators (non-ORNL staff) accessing instruments or equipment secured to the 18 foot structural member of the plot enclosures must follow the instructions listed within this work-

aid: https://portal05.ornl.gov/sites/eesd/ops_west/RSSDocuments/LinkedPDFs/Extension_Ladder_Use_Within_SPRUCE_Enclosure_Work-Aid.pdf

Use of the articulated ladders must be done in accordance with the associated work-aid found here: https://portal05.ornl.gov/sites/eesd/ops_west/RSSDocuments/LinkedPDFs/Articulated_Ladder_WorkAid_for_SPRUCE_Enclosures.pdf

Users of these ladders must have the ORNL LRN ladder training (just as with any other ladder) and must also receive hands-on/site specific training (as specified within the work-aid) by the PI and/or the PI delegate(s). A list of authorized users will be maintained at the SPRUCE site office.

Only trained and authorized participants shall climb the towers. Tower climbers will utilize the proper fall protection PPE specified and approved by the ORNL Fall Protection SME.

All tower climbing activities conducted at the SPRUCE site in Bovey, MN shall be done in accordance

with the most current revision of the Fall Protection Plan. The plan can be found within the IDMS system at: https://recordsmgmt.ornl.gov/DMS_ORNL/View_Active.cfm?compnum=17371&Ask

ORNL Engineering has determined that the towers are climbable and has defined the maximum allowable weight of the climber (includes the weight of the employee, weight of tools, equipment employee will carry, clothing used by employee, PPE, etc.) to be **268 lbs**. The formal engineering calculations can be found at the following DAC number: DAC-STR-017143-A002.

[TEMP TOWER NOTE: Towers damaged while attempting to install the Lad-SAF system shall NOT be climbed or exposed to any additional weight loading until they have been properly repaired. Upon final repair this temp note can be removed.]

NOTE: Towers may need to be laid down from their pedestal to replace damaged tower sections and/or replace monitoring equipment, and then stood back up. This activity shall be conducted in accordance with the Job Hazard Evaluation (JHE) attached to this question.

Locations:

Field Work
Off-Site Work

Attachments:

[SPRUCE Tower Picture.jpg](#)

[JHE- SPRUCE Environmental Tower Laydown-Erection Activity.pdf](#)

14. This operation involves work performed outside normal working hours (6am to 7pm).

2

Hazard Notes:

After hours work will be performed at both the SPRUCE field site and the 102GRAND office area.

Control Notes:

Refer to Question 16.0 for controls.

Locations:

Building 102GRAND, Room 01
Field Work
Off-Site Work

Attachments:

None.

15. This operation involves packaging or transporting chemicals, [hazardous materials](#), or [radiological materials](#) off site.

1

Potential Training:

Contact [Division Training Officer](#) for assistance in determining training needs.

Requirements:

[Commercial Motor Vehicle](#)

[Off-Site Transportation](#)

[Off-Site Transportation of Nonhazardous, Hazardous, and Radioactive Materials Shipments](#)

Hazard Notes:

Participants will have need to transport gasoline, compressed gas cylinders, and/or liquid nitrogen to the off-site field locations.

Rental vehicles will be used for work activities at the MN locations.

Control Notes:

Only project participants who have completed DOT Materials of Trade (MOT) training are permitted to transport hazardous chemicals by vehicle. The controlling subject area requires that such transport shall only occur in government vehicles and if material(s) being transported meet the MOT exception (applicable Packing group, volume limits, packed securely, properly labeled, etc). Gross Weight of all hazardous materials must be less than 440 lbs.

See subject area for restrictions on the use of other types of vehicles (e.g. rental or personal vehicles)

Specific Note Regarding Gasoline Transport:

The volume limits per container for Gasoline (DOT Class 3 flammable liquid, Packing Group II) is further reduced by other OSHA requirements such that it must be transported in safety cans with

capacities of 5 gallons or less.

NOTE: If you have not previously ascertained whether a particular chemical/volume fall within MOT limits, you must first verify with Transportation Management Organization (TMO).

An [SBMS variance request](#) was submitted requesting the approved use of rental vehicles to be used for transporting materials to and from the work site (S1 bog) and other areas of Northern MN. This variance has been approved and transportation via rental vehicles shall be permitted.

Note: Damage to rental vehicles from work activities may result in added expenses to the project (such as repair and/or purchase of the vehicle from the rental agency).

Locations:

Field Work

Off-Site Work

Attachments:

None.

16. This operation involves offsite work other than travel, office environments, and conferences

0 **Requirements:**

[Export Control Compliance](#)

[Foreign Travel](#)

Hazard Notes:

Most field work will be performed in northern Minnesota on the Marcell Experimental Forest operated and maintained by the USDA Forest Service.

Hazards- unexpected emergency requiring outside assistance in a field situation and ensuring all parties understand the responsibility of the others.

Control Notes:

When working off-site, staff ensure they consider any special precautions that may be needed in unusual environments. Local work control processes and health and safety requirements are generally followed when working at other facilities. (e.g. the SME-annotated JHAs attached in the general comments section)

At the off-site location, work conditions may be different from what was expected. If necessary, the resources of the Laboratory will still be available to you, e.g., your supervisor, subject matter experts (SME), ES&H support staff, and the Lab Shift Superintendent (LSS).

Participants should familiarize themselves with ORNL guidance related to offsite work available at: <https://sbms.ornl.gov/sbms/sbmsearch/subjarea/wppc/GuideOffsite.htm>

Emergency Communication Requirements:

A) When in the field, a person will have access to (and know how to operate) some means (ie., operable phone or radio and contact #) for getting timely emergency help.

B) When an individual is doing field work alone, he or she will have created the situation that someone will

- a) know where the field worker is;
- b) know when the fieldworker should return from the field; and
- c) take appropriate search actions if the fieldworker does not return in a timely fashion.

First Aid and Injury Reporting:

A first aid kit and AED (automated external defibrillator) will be maintained at both the S-1 Bog Field Trailer and SPRUCE Office in Grand Rapids (102Grand). However, only participants properly trained

in CPR/AED are allowed to use these AEDs.

When working off-site, personnel must have the emergency services phone numbers for the location and the numbers for the site point of contact immediately available. When in remote locations, personnel should be aware of the route from the worksite to the nearest medical facility and/or method to summon emergency services to the site. While off-site, employees with an injury or illness report to the nearest medical facility for treatment.

- See attachment for directions to nearest medical facilities to the Marcell Experimental Forest.
- Participants should also become familiar enough with these directions so that they can adequately describe where they are located in the event that an accident/injury is severe enough to require the assistance of emergency service providers to respond.

An individual involved in a work-related injury or illness will immediately seek the appropriate level of medical care as required by the event. As soon as reasonably possible after the event inform the supervisor for proper follow-up and reporting.

Employees with an injury or illness while on-site at ORNL report to the Health Services Division between the hours of 7:30 AM and 4:30 PM. After hours medical assistance is available by calling 911 on a land-line or the Laboratory Shift Superintendent (LSS) office at 865-574-6606.

Special Note: Due to the remote location, specialty clothing, PPE, drinking water, dry ice, shipping charges, etc. may also need to be procured via non-standard ORNL procurement Methods. Personal reimbursement may be possible if participants make purchases covered/discussed in the attached SBMS variance: <https://sbms.ornl.gov/sbms/variance/Related.cfm?VarianceID=1108>.

Locations:

Building 102GRAND, Room 01

Field Work

Off-Site Work

Attachments:

[Driving Directions--Bog_to Grand Rapids Hospital.pdf.pdf](#)

17. This work does require the project staff to prepare or modify engineering calculations, drawings or specifications that are to be traceable and on record? Engineering calculations, drawings or specifications must be traceable and on record if used for construction, fabrication, modification, installation, or acquisition of [engineered systems, structures, or components](#) and meet any of the following criteria:

- Have the potential to adversely affect the health and safety of staff, workers, the public, or the environment
- Failure could unacceptably impact program objectives
- Are currently recorded in the ORNL Engineering Files or Records
- Are or will be installed as an integral operating system in a new or existing UT-Battelle controlled facility

Requirements:

[Design](#)

Hazard Notes:

Engineered structures are present at the site (i.e. bog board walks, chamber structures, electrical and data infrastructure, gas lines, etc.).

Control Notes:

Research staff (i.e. RSS participants) **ARE NOT** responsible for the engineering designs and modifications of the structures associated with the SPRUCE project. All engineering designs, calculations, drawings, specifications, etc. have been and shall be conducted and maintained by the ORNL engineering department.

If there is an issue or concern identified by RSS participants at the site, relating to the engineered structures, research staff listed as participants will not attempt to correct these issues, but will refer back to Project Management to address the issue with ORNL engineering and/or the subcontractors

onsite building and maintaining the structures.

Locations:

Field Work
Off-Site Work

Attachments:

None.

18.6 A project-specific Quality Assurance Plan or Software Quality Assurance Plan is needed to address:

- the uniqueness or complexity of the project,
- [safety](#) or [general](#) software
- sponsor requirements, and/or
- data, calibration, training, and assessment management.

Requirements:

[Software Quality Assurance](#)

Hazard Notes:

Li-Cor gas analyzer calibration procedures are used for this project

Control Notes:

Li-Cor gas analyzer calibration procedure can be found at: https://recordsmgmt.ornl.gov/DMS_ORNL/View_Active.cfm?compnum=018618&Ask

Locations:

Building 102GRAND, Room 01
Building 1506, Room 129B
Building 1521, Room 101
Building 1521, Room 102
Building 1521, Room 103

Field Work
Off-Site Work

Attachments:

None.

La st **This operation involves hazards or risks not previously identified above.** Questions to consider:

- What can go wrong (what keeps you up at night?)
- What measures or controls are in place to prevent that from happening?
- Consider how do (or which of) the most important controls depend on human actions or behavior. Where might an error or omission impair the effectiveness of an important control?
- Consider any change that has been made (process, equipment, etc) which could inadvertently increase risk in another area.
- Error precursors are conditions or attitudes that increase the chances of an error during the performance of a specific task by a particular individual. Are there precursors that, if reduced or eliminated, would make the controls more likely to be effective?

Hazard Notes:

Methane (Hazard Notes): Potential for methane emissions.

Head Injury (Hazard Notes): Possible head injury from instrumentation positioned near the ground.

Field Hazards (Hazard Notes): The fact that much of the work for this project is in the field presents many hazards that are not included in the standard RSS question set.

Examples: Possible contact with curious black bears, biting & stinging insects, ticks, slips/trips/falls, etc.

Dust Masks (Hazard Notes): Many of the field tasks embedded in the JHA package require or suggest use of dust masks, and some lab related activities (e.g soil grinding, etc) may present the need or desire for dust mask usage by participants.

Sharps (Hazard Notes): Syringes with needles will be used to extract water samples from the bog.

Cutting Tools (Hazard Notes): Cutting tools will be used within the field for general use purposes and in association with the PMS instrument.

Safety Vests (Hazard Notes): High visibility clothing may be required at certain times.
Control Notes:

Methane (Control Notes): High concentration methane emissions from stored, subsurface pockets of naturally generated methane represent a low probability, but possible combustion danger if released. The open nature of the field environment would adequately disperse such releases if they happen, but staff should avoid ignition sources that may potentially spark methane gas should adequate ambient levels occur.

Head Injury (Control Notes): While working in and around environmental instrumentation installed in the bog, staff should be aware of elevated hard and sharp surfaces or corners that might represent a possible source of head injuries. These circumstances are not common, but should be considered while working at the bog surface level in their vicinity.

Field Hazards (Control Notes): In general, Participants that work outside and off the roads will wear appropriate clothing and additional PPE as discussed and prescribed in the USFS JHAs (unless annotated otherwise in the JHAs and discussed in this RSS).

Safety glasses with side shields shall be mandatory where the potential for eye injury exists (i.e. Dry/dusty conditions, low lying vegetation and/or tree limbs, etc.) and shall be left to the discretion of the individual in all other circumstances. Use tinted lenses/sunglasses as need to reduce glare/eyestrain in bright conditions or when snow is on the ground.

High top rubber work boots shall be utilized by research staff members needing to enter directly into the bog itself; otherwise, sturdy, closed-toed shoes or work boots are sufficient. When work involves the potential for damage to the foot or toes (i.e. working with heavy equipment that could be dropped onto the foot) a safety-toed boot is required.

Long pants shall be mandatory. Long sleeve shirts are optional and will be left to the discretion of the individual where the potential for insect bites, contact with poisonous plants, and cuts/scrapes exists.

Workers should remain alert while walking in the field since slippery and uneven surfaces could cause slips, trips and falls. Always be aware of where your co-workers are and other activities going on around you. Plan route carefully to avoid most uneven ground. Ensure you can see where you are putting your feet before walking. Avoid working in poor light conditions. Do not jump over or off anything. If there is a drop or ditch that has to be negotiated, lower yourself slowly or use existing bridges, steps, or paths etc. When walking down hill, walk across the slope and not down the steepest path, keeping your weight on the back foot as much as possible - if you slip you should try to fall backwards, not forwards! Take special care on slippery rocks.

Bears: Avoid contact and wait for the bears to remove themselves from the research site.

Insects: As discussed and supplemented in the JHAs, biting and stinging insects (ticks, mosquitos, hornets, bees, etc.) may be encountered in the field. Participants can use insect repellents with DEET on their skin and clothes or Permethrin on their clothes only, following the product instructions. As field conditions warrant (seasonal), participants will inspect themselves for tick and mosquito bites after field activities and subsequent showering.

Snakes: Poisonous snakes are unlikely to be present at the site. If snakes are encountered, minimize contact with them. Do not attempt to handle the snake unless absolutely necessary to remove from the work area. Use remote handling devices when possible to remove the snake.

Dust Masks (Control Notes): Whether required or recommended for use, any dust mask used by RSS

participants must be ORNL-issued and only used by participants properly trained on the limitations of their use. See SBMS <https://sbms.ornl.gov/sbms/SBMSearch/SubjArea/RP/RPprocedure8.cfm>

Sharps (Control Notes): Needles shall not be directly recapped using two-handed operations. Instead use safer alternative methods (i.e. foam block technique, etc.) to avoid the potential for puncture/needle sticks. Ensure all needles are recapped prior to walking around on the bog walkways. All sharps will be disposed of in appropriate sharps containers.

Cutting Tools (Control Notes): When using cutting tools with open blades participants must use these tools in a manner that keeps the cutting blade moving in a direction away from fingers, hands, and the body during cuts. A user should not walk with or transport a cutting tool, that is not being actively used, unless the blade is concealed (cut resistant container or blade cover, etc.). Use of ORNL approved “safer” cutting tools (as found within the hyperlink below) are strongly recommended.

Cut resistant gloves should be considered for all activities where cutting tools of any type are used.

For detailed information on cutting tool ratings see, <http://safetyfirst.ornl.gov/cpp/tools.cfm>

For detailed information on cut resistant gloves see, <http://safetyfirst.ornl.gov/cpp/gloves.cfm>

Razor blades, scalpels and other fixed blade or manually retractable blade knives will be disposed of in an approved sharps container. Extreme caution must be employed when changing blades on fixed or manually retractable blade knives.

Safety Vests (Control Notes): It is recommended that during large game hunting seasons, and certain construction activities participants wear a high visibility vest (i.e. blaze orange, high visibility green, etc.) to reduce the potential for being mistaken as an animal. Remember that the Marcell experiment site is public land.

Locations:

Building 102GRAND, Room 01

Field Work

Off-Site Work

Attachments:

None.