Detailed Agenda: FS-IP Soils Study Tour (Tuesday 7 June – Thursday 16 June 2016, travel inclusive)

University of Michigan Biological Station (UMBS), Pellston, MI

Instructors: Kris Johnson, Jim Le Moine, Luke Nave, Hobie Perry, Matt Warren

Agenda overview:

Monday 6 June: Arrival to Pellston

Tuesday 7 June: Check-in at UMBS administrative office, get settled in, shopping trip for supplies

Wednesday 8 June: Introductions and background

Thursday 9 June: Inventory design

Friday 10 June: Field sampling methods, day 1 (upland soils)

Saturday 11 June: Field sampling methods, day 2 (wetland soils)

Sunday 12 June: Field sampling methods, open consultation (ad hoc field trips)

Monday 13 June: Lab sample processing, archival, and data entry

Tuesday 14 June: Calculations, data analysis, data analysis consultation

Wednesday 15 June: Scaling, reporting, mapping, and consultation on these topics

Thursday 16 June: Participants depart

Monday 6 June Participants converge at UMBS, Pellston, MI. UMBS is located approximately 10km east of Pellston, which has a full service commercial airport (PLN). The preferred carrier is Delta from Detroit (DTW). UMBS is known locally as the "Bug Camp" and is located on route C-64, about 8km east of the village of Pellston. C-64 is the intersection next to the BP gas station. The entrance to UMBS is on a sudden curve in the road on the north side of C-64, and is marked with a large blue sign. See maps at the end of this agenda for directions.

Tuesday 7 June Participants check in at the Administration Building office. Rafael Flores gives a tour of important locations on the UMBS campus. Vans depart in the afternoon from the Dorm Lounge for a trip to Wal-Mart in Cheboygan for supplies.

Wednesday 8 June: Introductions and background

0700-0800 Breakfast in the dining hall.

0815-0830 Stockard Lakeside Laboratory, Seminar Room. Presentation of study tour goals, learning objectives, and approach (Luke Nave, Assistant Research Scientist, UMBS).

Goals: Familiarize participants with methods in the design, execution and interpretation of belowground C inventory.

Objectives: Focus on core methods for 5 stages of belowground C inventory

1) Study Design- Designs for inventory vs. research, random vs systematic vs stratified sampling, considerations of scale of inventory, case study examples from inventory projects, pro/con scenarios
2) Field Methods- tools for and methods of sampling soil and belowground C stocks: various pit- and core-based techniques for collecting samples from upland and wetland soils with a range of physical properties
3) Lab Methods- sample processing/preparation (mass and volume measurements, sieving, drying, grinding), organic matter and C determination; sample archiving; data entry
4) Calculations, Data Analysis and Interpretation- mass density, bulk density, and volumetric stone content calculations; bulk density, % organic matter and %C prediction equations; soil and root C stock calculations, profile summations and fixed depths; summary statistics
5) Scaling, Reporting and Mapping- spatial extrapolation, interpolation and mapping; reporting frameworks,

Approach: Technical presentations from instructors and participants, field trips to diverse soils for demonstration and practice, guided lab work and data analysis, and consultation and discussion.

0830-0900 Welcome and introduction to UMBS (Knute Nadelhoffer, Director, UMBS)

0900-0945 Instructors, interpreters, and workshop coordinators introduce themselves and give 5 minute presentations. Instructors will describe their professional positions, experience and work; workshop coordinators will describe the mission of FS International Programs and the motivation for the tour.

0945-1000 Coffee break in the Seminar Room.

1000-1130 Six of the participants give individual, 10 minute introductory presentations (with 5 minutes for question and answer after each). Presentations should be no more than 5 slides and focus on the participant's professional position, project objectives, and technical challenges (*e.g.*, problem sites, physical resources).

1130-1230 Lunch served in the dining hall.

1300-1415 Stockard Lakeside Lab, Seminar Room. Five more participants give their 5-slide, 10 minute introductory presentations (5 minutes for questions after each presentation).

1415-1430 Coffee break in the Seminar Room.

1430-1530 The remaining 4 participants give their 5-slide, 10 minute introductory presentations (5 minutes for questions after each presentation).

1530-1615 Group discussion: Participant expectations, technical needs, requests for extra time on selected agenda topics. Rafael Flores and Rachel Sheridan (of International Programs) facilitate the discussion and interact with technical instructors to accommodate suggestions into the agenda for the remainder of the tour.

1615-1700 Case study Presentation about soil C inventory of bedrock soils (Kris Johnson, Research Biologist, USDA-FS Northern Research Station). Introduction to Mexico study and Yucatan site, motivation and objectives, problems unique to bedrock soils.

1700-1800 Pre-dinner reception at Director's cabin

1800-1900 Dinner served in dining hall

1915-2015 Lakeside Lab, Seminar Room. Geologic and natural history of the region (Nave). This presentation will provide participants with historical context for the region and an understanding of its soils.

NOTE-ELIMINATE THE EVENING TRIP TO WAL-MART

Thursday 9 June: Overview of study design

0700-0800 Breakfast served in dining hall.

0830-0900 Lakeside Lab, Seminar Room. Overview of study design: Spatial and sampling designs for research vs. inventory; random, systematic, and gridded spatial designs, considerations of inventory scale and scope, pros and cons of various designs (Luke Nave)

0900-1000 Case study presentation on wetland C inventory. Overall approach, design of inventory, execution of inventory, and lessons learned (Matt Warren, Research Ecologist, USDA-FS Northern Research Station)

1000-1015 Coffee break in the Seminar Room.

1015-1130 Participant presentations. Three or four participants who are experienced with large-scale inventory projects give 10-15 minute presentations about how these projects were designed. Description and discussion of project goals, constraints, approach, successes/failures.

1130-1230 Lunch served in dining hall.

1300-1600 Depart from the Dorm for field visits to three UMBS research sites. (Chris Gough, Assistant Research Professor, Virginia Commonwealth University; Jim Le Moine, Lab Manager, UMBS; Chris Vogel, Research Scientist, UMBS). The purpose of the morning field visits is to inspect monitoring and experimental installations and appreciate how they add detail and process understanding to carbon inventory work. Stops will include an experimental forest chronosequence for studying long-term carbon accumulation, a set of litter input manipulations aimed at understanding controls on soil organic matter dynamics, and a long-term paired eddy-flux/biometric carbon monitoring site.

1615-1715 Four volunteers work with Jim Le Moine to organize data sheets, labeled sample bags, and small hand tools for field day on Friday. Remaining participants work with Luke Nave to review the care, handling, and assembly/disassembly of sampling tools (corers, augers).

1800-1900 Dinner served in dining hall

1930-2030 Depart from the Dorm for a walking tour of UMBS laboratory facilities, including analytical instrumentation and the Biotron, an underground laboratory for observing and manipulating intact soil. Jim Le Moine will lead the tour.

Friday 10 June: Sampling upland soils

0700-0800 Breakfast served in dining hall.

0815-1115 Depart from the Dorm for morning soil sampling. Participants will be asked to split into the two groups identified on Monday afternoon. This morning, Group A will travel with Kris Johnson to perform quantitative pit sampling of a thin bedrock soil. Group B will travel with Luke Nave to perform pit-face and core sampling of deep mineral soils.

1130-1230 Lunch served in the dining hall.

1245-1515 Depart from the Dorm for afternoon soil sampling. Group A will travel with Luke Nave to perform pit-face and core sampling of deep mineral soils, while Group B will travel with Kris Johnson to perform quantitative pit sampling of a thin bedrock soil.

1530-1700 Groups return to UMBS, set up samples for drying, clean and reorganize tools. 5 volunteers will work with Jim Le Moine to prepare samples for drying; remaining participants will work with Luke Nave to clean, dry, and organize sampling tools.

1800-1900 Dinner served in dining hall

1930-2130 Sunset pontoon boat ride on Douglas Lake (Jim Le Moine and Luke Nave, skippers. Sunset is at 21:28 on this day of the year)

Saturday 11 June: Sampling wetland soils

0700-0800 Breakfast served in dining hall.

0815-1115 Morning field sampling: Depart from the Dorm. We will follow the same approach as with Friday (two groups; switching places after lunch). This morning, Group A will sample a mucky mineral subaqueous soil with Matt Warren, while Group B samples a saturated organic soil with Luke Nave.

1130-1230 Lunch served in the dining hall.

1245-1515 Depart from the Dorm for afternoon soil sampling. Group A will travel with Luke Nave to sample a saturated organic soil with Luke Nave, while Group B will travel with Matt Warren to sample a mucky mineral subaqueous soil with Matt Warren.

1530-1630 Groups return to UMBS, set up samples for drying, clean and reorganize tools. 5 volunteers will work with Jim Le Moine to prepare samples for drying; remaining participants will work with Luke Nave to clean, dry, and organize sampling tools.

1630-1700 Call for interest in visits to specific soils tomorrow for review or additional demonstration/practice of sampling activities.

1800-2200 BBQ at Sturgeon Bay, Lake Michigan

Sunday 12 June: Field trip to Mackinac Island

On Sundays, a cold breakfast is served in the dining hall from 0700-0800, and a hearty brunch is served in from 1030-1130 (there is no lunch).

Sunday will feature an organized recreational field trip to Mackinac Island. Rachel Sheridan and Rafael Flores will coordinate transportation, dining, and shopping activities.

Monday 13 June: **Lab processing soil samples**

0700-0800 Breakfast served in dining hall.

0830-1130 (Seminar Room): First, a 20-minute presentation by Jim Le Moine delineating the workflow for sample processing and archiving. Participants will share in the sieving, weighing, and other processing steps for soil samples collected the previous 3 days, with guidance from the instructors. Participants will also do some simple sample analyses including Munsell color classification, pH measurement, and set up a run of samples for combustion at 500 C to determine organic matter content. As weights and volumes are being written down, two computers will be available so that participants can periodically enter their data into a common spreadsheet.

Coffee will be available in seminar room throughout the morning.

1130-1230 Lunch served in dining hall.

1300-1700 Continue sample processing.

1800-1900 Dinner served in dining hall

Tuesday 14 June: **Data analysis and interpretation**

0700-0800 Breakfast served in dining hall.

0800-0830 Seminar room: 3 volunteers will re-weigh 500C combustion samples and enter the data on a data sheet.

0830-0900 Seminar room: (Luke Nave) Concepts and applications of soil physical measurements and properties: mass, volume, density, pH, organic matter concentration. Why are there different bulk density measurements and what are their applications? What approaches are available for estimating soil properties when they cannot be directly measured? What important soil properties can be estimated from soil texture and color? Why are pH and organic matter concentration important metrics of soil quality in their own right?

0900-0930 Seminar Room: (Kris Johnson) Concepts and applications of soil mass, volume, and density calculation, using a spreadsheet designed for the quantitative pit method of soil sampling.

0930-1130 Lakeside Lab, Information Center (on ground floor): Nave and Johnson give a guided introduction to a common spreadsheet for entering and reviewing raw data. Files will contain the raw data entered on Monday and the group will collectively do quality checks on the data (sample names, masses, densities, volumes, etc.). A signup sheet will be available for participants to take on different data analysis projects in the PM session. Some example topics are below; participants can select to do these for any number of sites according to their interests.

Soil C stocks in top 30 cm across sites	Soil C stocks in top 1 m across sites
Soil C stocks in top 30 cm across methods	Soil C stocks in top 1 m across methods
Relationships between %OM and Db	Relationships between %OM and %C
Effects of Db method on layer/horizon SOC stock	Core vs. pit- differences in Db, %OM of layers
Depth distribution of %OM	%OM vs. Munsell color
Depth distribution of SOC stock (layer vs. horizon)	Depth distribution of pH
Rock volume vs. Rock mass- density test	Depth distribution of root biomass
Root biomass vs SOC across individual layers	Total root biomass across sites

1130-1230 Lunch served in dining hall.

1230-1530 Lakeside Lab, Information Center. Participants use a version of the morning spreadsheet that contains data from previous years to prepare summary results/figures for the projects the selected before lunch.

Open consultation by instructors at large during the afternoon session

1530-1730 Lakeside Lab, Seminar Room. Each participant shares a few slides describing their approach, their results, and taking questions (~8 minutes each).

1800-1900 Dinner served in dining hall

Wednesday 15 June: Scaling and reporting belowground C measurements

0700-0800 Breakfast served in dining hall.

0830-1130 LaRue Computer Lab. Mario Guevara and Kris Johnson present a guided overview and case studies of interpolation, extrapolation, scaling and mapping of soil carbon data, using examples from Mexico, the U.S., and Honduras.

1130-1230 Lunch served in dining hall.

1300-1400 Lakeside Lab, Seminar Room: Question and answer with Mario and Kris on methods of scaling, mapping, etc.

1400-1415 Coffee break in seminar room

1415-1545 Soil carbon reporting in the context of UNFCCC and REDD+ frameworks (Hobie Perry, USDA-Forest Service, Forest Inventory and Analysis).

1545-1630 Interactive discussion on scaling, mapping, reporting, etc. Facilitation by Rafael and Rachel, with Hobie, Kris, and Mario as technical panelists.

1630-1715 Evaluative discussion. Rachel and Rafael, facilitators. Include discussion of technical, logistical, and content aspects of the tour. Suggestions for improvement, discussion of strengths and valuable experiences are all welcome.

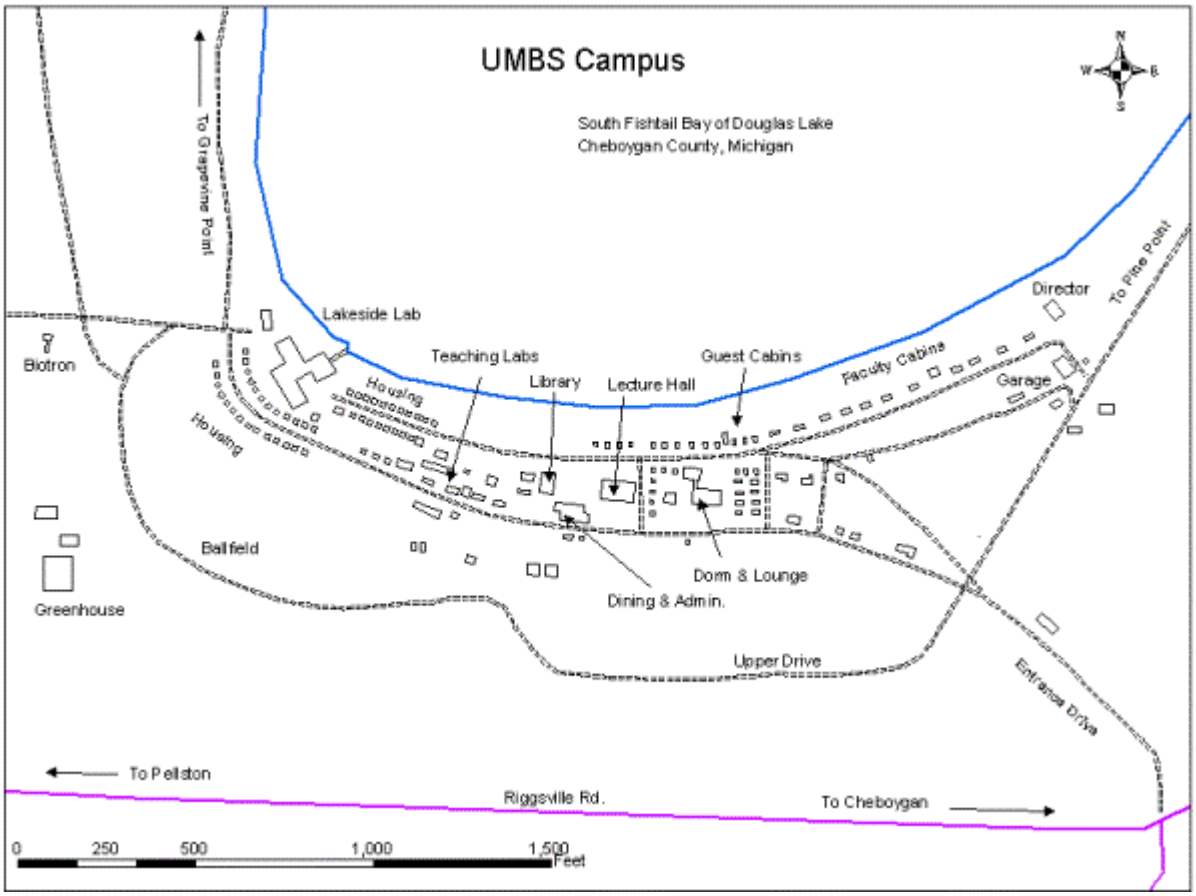
1715-1730 Participants fill out evaluation forms

1730-1800 Diplomas and photos

1800-1900 Dinner served in dining hall

Thursday 16 June: Participants depart


Biological Station
75
31
27
23
94
Detroit
Ann Arbor
LAKE MICHIGAN
Mackinac City
LAKE HURON
23
75
Cheboygan
C 66
Riggsville Rd.
DOUGLAS LAKE
Biological Station
C 64
exit 322
MULLETT LAKE
Pellston
C 64
31
Topinabee
BURT LAKE
Alanson
Indian River


UMBS Campus
South Fishtail Bay of Douglas Lake
Cheboygan County, Michigan
N
W
E
S
To Grapevine Point
Lakeside Lab
Biotron
Teaching Labs
Library
Lecture Hall
Guest Cabins
Faculty Cabins
Director
To Pine Point
Garage
Housing
Housing
Ballfield
Greenhouse
Dorm & Lounge
Dining & Admin.
Upper Drive
Entrance Drive
To Pellston
Riggsville Rd.
To Cheboygan
0
250
500
1,000
1,500
Feet