APBI 402 / SOIL 502
SUSTAINABLE SOIL MANAGEMENT

TERM 2 - 2018/19

Course Instructors*:	Sean Smukler, MCML 123	Sean.Smukler@ubc.ca
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Lectures: Friday @ 1 – 2 pm (MacLeod 242)

Tutorial: Monday @ 3- 5 pm (MacLeod 242)

**Sean and Sandra are the appropriate contact persons regarding the general conduct of the course and some of the cases.*
Drs. Berch, Bomke, Prescott, Grayston and Mr. Van Ham prepared one case each and will be contributing their expertise during that specific unit of the course.

Course Description:
Application of fundamental, unifying soil science principles in sustainable management of forested, agricultural and urban or constructed ecosystems.

Approach:
To simulate a real-life evaluation of soil properties to establish the most appropriate management practice in a particular ecosystem.

Course Learning Outcomes:

Upon completion of APBI 402 / SOIL 502 students will be able to**:**

- Describe processes of soil genesis, recognize diagnostic features of natural soils, and relate management practices to information available in soil survey reports or other sources of information.
- Utilize physical, chemical and biological soil quality indicators to assess sustainability of land management practices.
- Characterize the soil chemical environment and its modification to enhance plant, animal and human health. (Specific topics may include: liming, fertilization, and remediation of chemical contamination).
- Describe soil biological processes with regard to nutrient cycling and management of organic inputs. (Specific topics may include: maintenance of soil organic matter, carbon sequestration, and recycling of various organic materials such as manures, biosolids, and green manures).

- Describe the soil physical environment and its manipulation and/or degradation in ecosystem management. (Specific topics may include compaction, trafficability, water management, soil erosion).
- Discuss the relationship of soil management to government and private sector policies. (Specific topics may include Forest practices code, urban development regulation, right to farm and farmland preservation legislation, environmental farm planning, and land reclamation legislation.

Course Format:

APBI 402 is run in conjunction with SOIL 502, with students enrolled in both courses participating in a modified problem-based learning (PBL) environment to meet the course learning outcomes listed above.

The course learning outcomes will be met through 3 case studies, each 4 weeks in duration. Groups of 4-6 students will be assigned either a **forestry**, **urban,** or an **agricultural** land management regime in which to pursue the case study learning outcomes. Each case will conclude with presentations from each group to enable a comparison of approaches within different land uses. Individual students will prepare 1,000 word reports, summarizing their own personal learning for each case. Groups will be organized to facilitate interdisciplinary discussion and to provide opportunities for students from different programs to benefit from their varied experience and educational backgrounds. Class meetings each week will consist of a 1-hour lecture and 2-hour discussion/PBL group activity.

There is no textbook for the course; background readings will be drawn from a variety of sources. Student assessment will be on the basis of a final examination, group presentations, individual student case reports, and a small component to recognize class participation.

Course Marks:

APBI 402-Sustainable Soil Management		**SOIL 502-Advanced Sustainable Soil Management**	
Final exam	35%	Final exam	35%
Case reports prepared by individuals (3)[a]	39%	Case reports prepared by individuals (3)[a]	30%
Case seminars prepared by groups (3)[b]	21%	Case seminars prepared by groups (3)[b]	21%
		Wikipedia article (1)[c]	9%
Class participation[d]	5%	Class participation[d]	5%
Bonus points[e]	±2%	Bonus points[e]	±2%

[a]***Written case reports*** of 1,000 words will be prepared by individual students and will be due a week after the group presentations. Written case reports will be assessed on the basis of content and quality of writing (for more details see section on "Case Report-Writing Tips" shown at the end of this syllabus). Content of the individual case reports should demonstrate that the student has achieved the case learning outcomes and is able to discuss them in the context of the case scenario. Also, in 1-2 paragraphs each student should compare (relate) learning outcomes of his/her case to the cases presented by other groups.
All reports should be handed in on time and 10% mark subtraction will be made for each day being late. Late term papers, passed day 7 will not be accepted.

[b]***Group presentations*** will be judged based on content, structure, and delivery. More detailed criteria for group presentations are given at the end of the course syllabus.

[c]***Wikipedia article for SOIL 502 students*** topic to be negotiated and approved by the course instructors.

[d]***Class participation*** will be assessed on the basis of contribution to in-class (verbal) and online (written) discussions.

[e]***Bonus points*** of ±2% will be awarded for attending annual workshop of the Pacific Regional Society of Soil Science (PRSSS) to be held at UBC in March. The attendance is mandatory and 2% will be deducted if students choose not to attend. Up to 2% will be awarded for ~500 word synopsis of the workshop written from the student's perspective and suitable for publication in the PRSSS Newsletter.

It is highly recommended that students attend SOIL 500 – Soil Science seminar (every Friday at 3-4 pm) since seminar topics will be complementary to what we are covering in this course.

COURSE OUTLINE

Course Introduction (Week 1) General concept of soil quality and sustainable land management

Case 1: (Weeks 1 through 5)
Case specific learning outcome: Describe soil physical environment and its manipulation and/or degradation in ecosystem management.
Case scenarios**:**
- Forestry: Impacts of mechanical disturbance on soil quality on forest landings
- Agriculture: Cattle grazing impacts on soil quality on grasslands
- Regional development: Soil erosion in the middle mountains in Nepal

Case 2: (Weeks 5 through 9)
Case specific learning outcome: Characterize the soil chemical environment and its modification to enhance plant, animal and human health.
Case scenarios**:**
- Forestry: Salal Cedar Hemlock Integrated Research Program (SCHIRP)
- Agriculture: Soil testing as a tool for monitoring soil quality; the UBC Farm Case
- Managed: Fabricated soil mixtures used as cover for Vancouver Landfill
- Urban: Re-grounding in Riley Park, Vancouver, BC

Case 3: (Weeks 9 through 13)
Case specific learning outcome: Describe soil biological processes and application to nutrient cycling and management of organic inputs.
Case Scenarios**:**
- Forestry: Soil fauna on the long-term soil productivity (LTSP) sites in BC
- Forestry: Effects of variable retention harvesting on soil microbial communities in Coastal BC Forests
- Agriculture: Soil mesofauna on grazed rangelands in BC

GENERAL REFERENCES:

Brady N.C., and R.R. Weil. 2010. Elements of the nature and properties of soils (3rd ed.). Pearson Education, Upper Saddle River, NJ. 624 pp.

Craul, P.J. 1999. Urban soils: applications and practices. Wiley, New York. NY.

Doran, J.W. and A.J. Jones. 1996. Methods for Assessing Soil Quality. SSSA Special Publication Number 49. SSSA. Madison, WI. 410 pp.

Edwards, C.A. 2004. Earthworm ecology. 2nd edition. CRC Press, Boca Raton, FL. 456 pp.

Fisher, R.F. and D. Binkley. 2000. Ecology and management of forest soils. 3rd ed. John Wiley and Sons Inc., New York. 489 pp.

Krzic M., T. Naugler, S. Dyanatkar, and C. Crowley. 2010. Virtual Soil Lab Modules. The University of British Columbia, Vancouver. [http://soilweb.landfood.ubc.ca/labmodules/]

Krzic, M., K. Wiseman, L. Dampier, S. Grand, J. Wilson and D. Gaumont-Guay. 2013. SoilWeb200: An Online Educational Tool for the APBI 200 course: Introduction to Soil Science. The University of British Columbia, Vancouver [http://soilweb200.landfood.ubc.ca]

Magdoff, F.R. and R.R. Weil. 2004. Soil organic matter in sustainable agriculture. CRC Press, Boca Raton, FL. 416 pp.

Tisdale, S.L., W.L. Nelson, J.D. Beaton and J. Havlin. 1999. Soil Fertility and Fertilizers. Collier-Macmillan.

Schedule for tutorials and lectures

Week	Date	Tutorial (Mon 3-5pm)	Date	Lecture (Fri 1-2pm)
1			Friday Jan 4	***Lecture Sandra:*** Introduction to soil quality concept **Case 1 (Soil physics)** • impacts of mechanical soil disturbance on soil quality on forest landings in BC • soil erosion in the middle mountains in Nepal • cattle grazing and its impacts on soil quality
2	Monday Jan 7	**Case 1 (Soil physics)** 3-4pm: ***Lecture Sandra*** Physical attributes of soil quality 4-5pm: Group work	Friday Jan 11	Group work
3	Monday Jan 14	**Case 1 (Soil physics)** 3-4pm: ***Lecture Sean*** Soil Erosion 4-5pm: Group work	Friday Jan 18	Group work
4	Monday Jan 21	**Case 1 (Soil physics)** Group work	Friday Jan 25	Group work to assist groups and individual students to prepare for oral presentations and written reports
5	Monday Jan 28	**Case 1 (Soil physics)** Group presentations and synthesis	Friday Feb 1	***Lecture Sean:*** Can we afford to ignore century of science in soil diagnosis? **Case 2 (Soil Chemistry)**: • Salal Cedar Hemlock Integrated Research Program • Soil fertility assessment of the UBC Farm • Soil chemical assessment of fabricated mixes as the Vancouver Landfill • Re-grounding in Riley Park
6	Monday Feb 4	3-4pm: ***Lecture Mike van Ham*** Use of biosolids to create constructed soils 4-5pm: Group work	Friday Feb 8	Group work
7	Monday Feb 11	3-4 pm ***Lecture Cindy Prescott*** 4-5 pm Group work	Friday Feb 15	Group work

	Monday Feb 18	***Family day – UBC closed*** ***Reading break – no classes***	Friday Feb 22	***Reading break – no classes***
8	Monday Feb 25	**Case 2 (Soil chemistry)** Group work	Friday Mar 1	Group work
9	Monday Mar 4	**Case 2 (Soil chemistry)** Group presentations and synthesis	Friday Mar 8	***Lecture Sandra:*** Indicators for soil biological properties and processes **Case 3 (Soil biology):** • Soil fauna at a LTSP site • Effects of long-term grazing on abundance and diversity of soil mesofauna • Effects of variable retention harvesting on soil microbial communities in coastal BC forests
10	Monday Mar 11	**Case 3 (Soil biology)** Group work	Friday Mar 15	Group work
11	Monday Mar 18	**Case 3 (Soil biology)** 3-4pm: ***Lecture Shannon Berch*** Soil biota and forest productivity 4-5pm: Group work	Friday Mar 22	Group work
12	Monday Mar 25	Group work	Friday Mar 29	'**Lecture Sean & Sandra:** *Course summary*
13	Monday Apr 1	**Case 3 (Soil biology)** Group presentations and synthesis		

Group Presentations: Components & Judging Criteria

Group presentations will be judged based on content (60%), structure (30%), and delivery (10%).

Content (60%)

1. Content was presented in a clear and concise manner.

    a. Explains theory and potentially complex material clearly (e.g., no jargon or jargon is explained).

    b. There was sufficient detail for an out-of-field observer to follow the presentation.

2. Objective for your case study was clearly articulated.

3. Provide explanation on how were data collected (e.g., study sites and management treatments are described, differences among soil types are explained).

4. Explain the key findings of your study case (e.g., summary of main points, suggestions for future research/directions, thought-provoking comments on where do we go from here).

5. At the end of your presentation, post 2 questions about the most relevant findings of your case.

Structure (30%)

1. The presentation started in a manner that captured the audience's interest and was relevant to the body of the presentation.

2. The points were presented in a logical manner.

3. The presentation is closed in a manner that links key findings to the study case's objective.

4. Length (kept to allotted time).

Delivery (10%)

1. The students' presentation kept the audience's interest and engaged the interest and participation of the other groups.

2. Audio-visual aides were used in a manner that supported the presentation.

3. Speech: projected well (everyone could hear), presenters did not speak too quickly.

4. Handled questions well (if did not understand question paraphrased back to the questioner, demonstrated critical thinking if answer is not immediately obvious, makes an educated guess, if does not know the answer says so, shows confidence in ability to answer questions).

Case Report: Writing Tips & Grading Criteria

Word limit of 1,000 words does **not** include tables, figures, list of references, cover page, and appendix (assuming that you decide to include an appendix in your paper).

- Tips on how to approach preparing the case report:
  - Before you start writing the report, make an outline and identify the key sub-sections.
  - During the writing process, refer frequently to the learning outcomes to keep yourself on track.
  - Before you submit the paper, make sure that it is **correct, clear, concise, consistent,** and **complete** (so-called 5 Cs of communication).

CONTENT (40%)

- Provide background information on the study site(s) and management practices (or treatments if your case is done on an experimental field) as well as soil type, climate, topography, parent material, and type of vegetation on the study site(s). Soil type should be discussed regarding its natural advantages and disadvantages for a specific management practice.
- Outline study objective(s).
- Develop a soil quality framework [**Function → Process → Attribute (Property) → Indicator**] and justify selection of indicators focusing on the management practice of your case study.
- Discuss key data of your case study, ensuring that you address both data trends and connections among different groups of data.
- Briefly summarize the body of your report and restate your argument. Always remember to check do your conclusions match the study objective(s).

ORGANIZATION (20%)

- Use logical structure appropriate to report's topic.
- Provide background information on case setup (e.g., study treatments, soil, climate) and integrate it with data discussion.

COMPARISON TO OTHER CASES (30%)

- In 1-2 paragraphs, compare and/or relate key findings of your case to the cases presented by other groups. Focus on the soil function, processes and properties (indicators), avoiding any elaboration of different management practices used in different case studies. Consider developing a table highlighting similarities and differences between cases.

GRAMMAR AND WRITING STYLE (10%)

- Ensure that your report is free of spelling, punctuation, and grammatical errors.
- Keep your sentences simple. That does not necessarily mean that your thoughts are simple. Complex and adjective-laden sentences just make your great ideas hard to follow.
- Each paragraph should contain one main idea. Paragraphs should be logically organized. For example, you should discuss ideas in the order in which they appear in your introduction.
- As a university student, you are expected to submit original work and give credit to other peoples' ideas; hence, plagiarism will not be tolerated. If you are unclear on the concept, please see *http://learningcommons.ubc.ca/resource-guides/avoid-plagiarism/*
- We strongly encourage you to refer to "**Professional Communications Handbook**" by Garland and Shackleton (http://lfs-lc-collabtm.sites.olt.ubc.ca/files/2013/11/professional.communication.handbook.pdf).