

# SUSTAINABLE SOIL MANAGEMENT

TERM 2 - 2015/16

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**Lectures:** Friday @ 1 – 2 pm (MCML 160)

**Tutorial:** Monday @ 3- 5 pm (MCML 154)

*\*Maja and Sandra are the appropriate contact persons regarding the general conduct of the course and some of the cases. Drs. Prescott, Grayston, Berch, Bomke 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.

## 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.
- 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 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 and environmental farm planning) 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 seminars 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 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 by individuals (3) <sup>a</sup>	30%	Case reports by individuals (3) <sup>a</sup>	24%
Case seminars by groups (3) <sup>b</sup>	30%	Case seminars by groups (3) <sup>b</sup>	24%
		Term paper (1) <sup>c</sup>	12%
Class participation <sup>d</sup>	5%	Class participation <sup>d</sup>	5%

<sup>a</sup>**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. 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. Some writing tips are given at the end of the course syllabus.

All reports should be handed in on time and 10% mark subtraction will be made for each day being late.

<sup>b</sup>**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.

<sup>c</sup>**Term paper for SOIL 502 students** of approximately 1,500 words on a soil management topic to be negotiated and approved by the course instructors.

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

It is highly recommended that students attend SOIL 500 – Soil Science seminar (every Friday at 3-4 pm) since most 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 (3<sup>rd</sup> 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. 2<sup>nd</sup> edition. CRC Press, Boca Raton, FL. 456 pp.
- Fisher, R.F. and D. Binkley. 2000.** Ecology and management of forest soils. 3<sup>rd</sup> 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 3-5 pm) MCML 154	Date	Lecture (Fri 1-2 pm) MCML 160
1	Monday Jan 4	Course introduction & Soil Sci. review ( <b>Maja</b> )	Friday Jan 8	<b>Lecture Maja:</b> Introduction to soil quality approach: history, principles, criticism <b>Case 1 (Soil physics)</b> •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 11	<b>Case 1 (Soil physics)</b> 3-4 pm: <b>Lecture Maja</b> – Physical attributes of soil quality 4-5 pm: Group work	Friday Jan 15	Group work
3	Monday Jan 18	<b>Case 1 (Soil physics)</b> 3-4 pm: <b>Lecture Sandra:</b> Soil erosion 4-5 pm: Group work	Friday Jan 22	Group work
4	Monday Jan 25	<b>Case 1 (Soil physics)</b> Group work	Friday Jan 29	Group work to assist groups and individual students to prepare for oral presentations and written reports
5	Monday Feb 1	<b>Case 1 (Soil physics)</b> Group presentations and synthesis	Friday Feb 5	<b>Lecture Sandra:</b> Can we afford to ignore century of science in soil diagnosis? <b>Case 2 (Soil chemistry):</b> •Salal Cedar Hemlock Integrated Research Program •Soil fertility assessment of the UBC Farm •Soil chemical assessment of fabricated mixes at the Vancouver Landfill •NEW CASE: Re-grounding in Riley Park
6	Monday Feb 8	<i>Family Day – UBC closed</i>	Friday Feb 12	Group work
	Feb 15	<i>Reading break - UBC closed</i>	Feb 19	<i>Reading break - UBC closed</i>
7	Monday	<b>Case 2 (Soil chemistry)</b> 3-4 pm: <b>Lecture Mike Van Ham -</b>	Friday	Group work

	Feb 22	Use of biosolids to create constructed soils <b>4-5 pm: Group work</b>	Feb 26	
8	Monday Feb 29	<b>Case 2 (Soil chemistry)</b> 3-4 pm: <i>Lecture Cindy Prescott -</i> Forest nutrition management 4-5 pm: Group work	Friday Mar 4	Group work
9	Monday Mar 7	<b>Case 2 (Soil chemistry)</b> Group presentations and synthesis	Friday Mar 11	<i>Lecture Sandra:</i> Indicators for soil biological properties and processes <b>Case 3 (Soil biology):</b> <ul style="list-style-type: none"> <li>•Soil fauna at a LTSP site</li> <li>•Effects of long-term grazing on abundance and diversity of soil mesofauna</li> <li>•Effects of variable retention harvesting on soil microbial communities in coastal BC forests</li> </ul>
10	Monday Mar 14	<b>Case 2 (Soil biology)</b> Group work	Friday Mar 18	Group work
11	Monday Mar 21	<b>Case 3 (Soil biology)</b> 3-4 pm: <i>Lecture Shannon Berch -</i> Soil biota & forest productivity 4-5 pm: Group work	Friday Mar 25	<i>Good Friday – UBC closed</i>
12	Monday Mar 28	<i>Easter Monday – UBC closed</i>	Friday Apr 1	Group work
13	Monday Apr 4	<b>Case 3 (Soil biology)</b> Group presentations	Friday Apr 8	<i>Lecture Maja &amp; Sandra:</i> Course summary

# Judging Criteria for Group Presentations

**Group presentations** will be judged based on content (6 points), structure (3 points), and delivery (1 points).

## **Content:**

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. Purpose or objective for presentation was clearly articulated.
3. Purpose or objective stated was achieved.

## **Structure:**

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. Closed in a manner that linked to the purpose (e.g., summary of main points, suggestions for future research/directions, thought-provoking comments/questions where do we go from here?).
4. Length (kept to allotted time).

## **Delivery:**

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. Presenters were well organized.
5. 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

**Case reports** will be evaluated based on content and organization (6 points), comparison of your own case to other cases (3 points), and grammar and clarity of the writing style (1 points). Pls submit your term papers as Word (not pdf) files.

### Content and organization:

- 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 climate, topography, parent material, and type of vegetation on the study site(s).
- Outline study objective(s).
- Develop a soil quality framework [**Function → Process → Attribute (Property) → Indicator**] and justify selection of indicators focusing on the management practices of your case study.
- Discuss the data of your case study.
- 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.

### Comparison to other cases:

- In the conclusion, **briefly** summarize the body of your report and restate your argument. Check it against the study objective(s) to make sure you have not wandered away from it.
- In 1-2 paragraphs, compare and/or relate key findings of your case to the cases presented by other groups.

### Grammar and writing style:

- 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.
- Avoid quotes, they are usually taken out of context. Also, we prefer to see your own writings and interpretations than someone else's.
- 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/get-study-help/academic-integrity/>
- We strongly encourage you to refer to:
  - a) "**The Elements of Style**" by Strunk and White (<http://www.bartleby.com/141/>).
  - b) "**Professional Communications Handbook**" by Garland and Shackleton (<http://lfs-lc-collabtm.sites.olt.ubc.ca/files/2013/11/professional.communication.handbook.pdf> ).
- ↳ **Word limit of 1,000 words** does not include tables, figures, list of references, cover page, and appendix (assuming that you decide to include appendix in your paper).
- ↳ When preparing, and reviewing your paper before you submit it, make sure that your paper is **correct, clear, concise, consistent, and complete** (co-called 5 Cs of communication).